

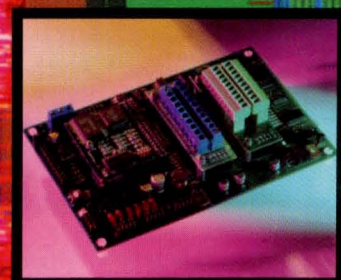
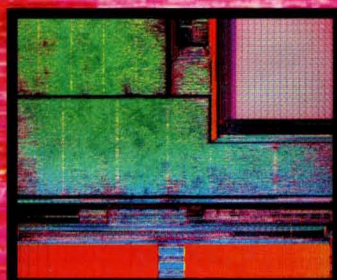
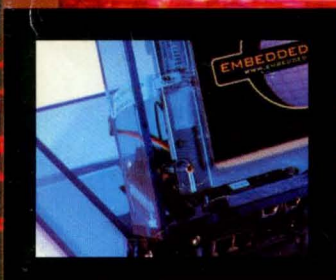
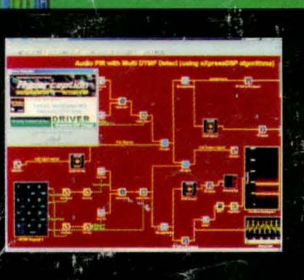
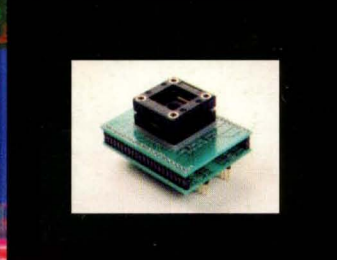
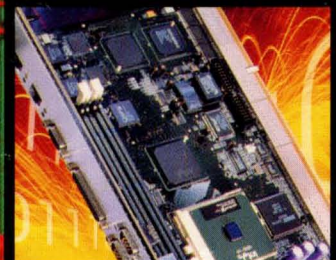
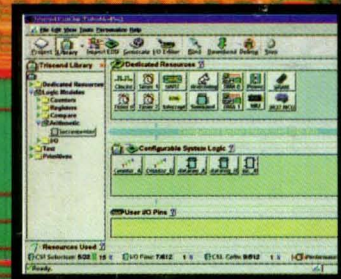
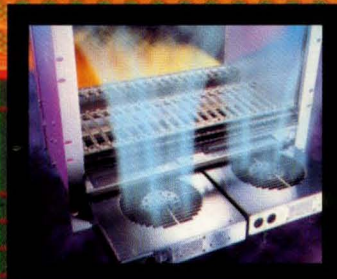
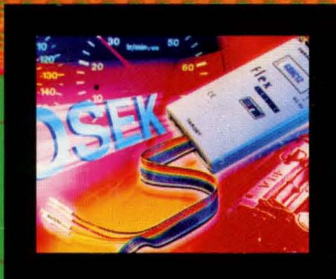
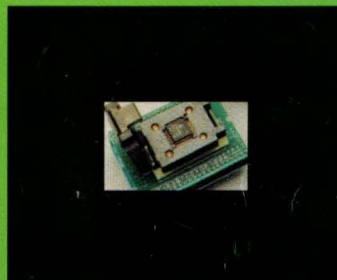
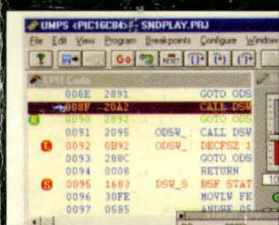
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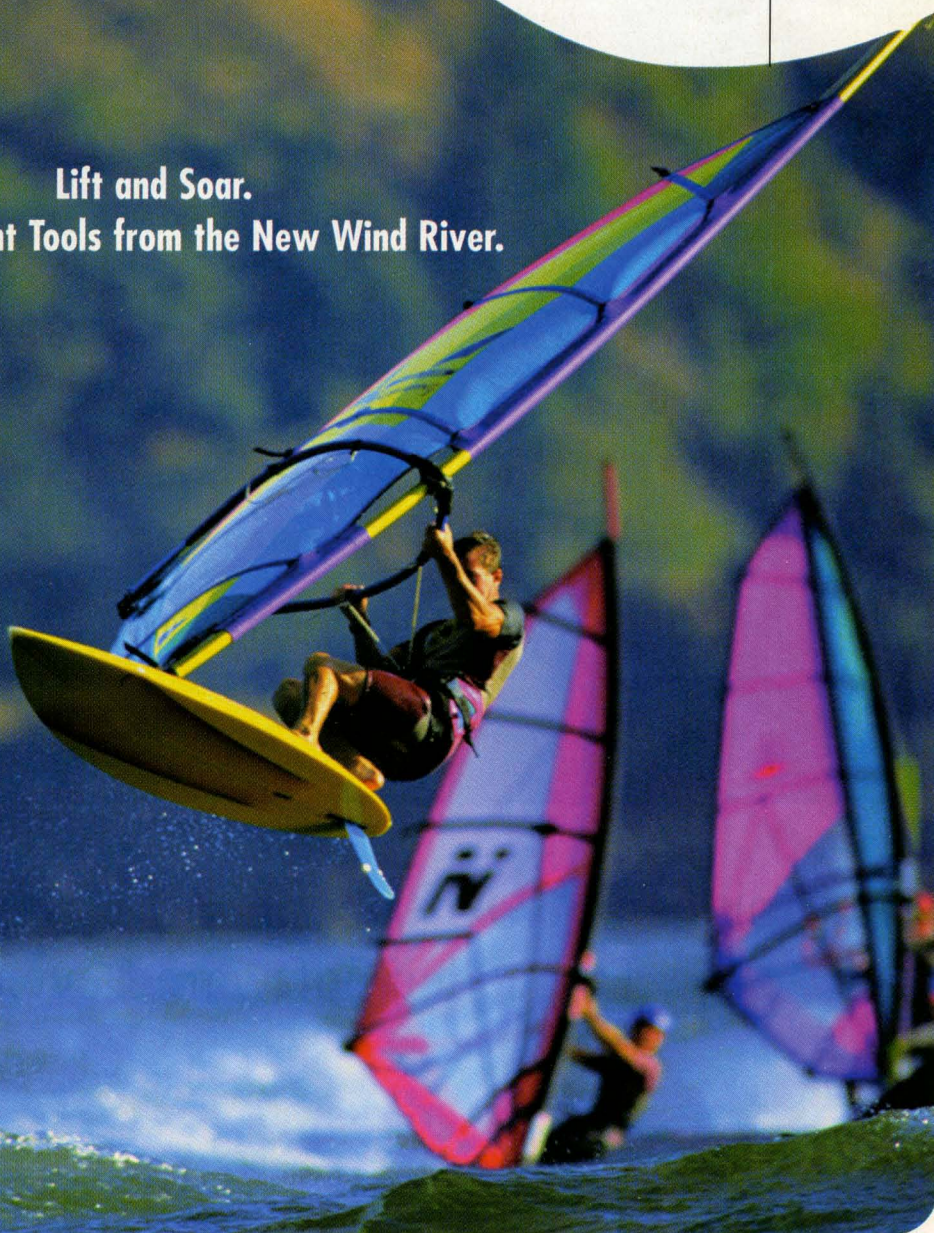
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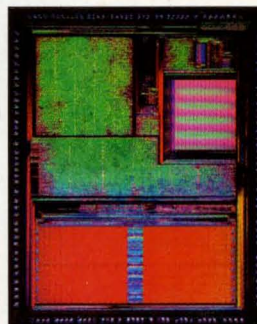
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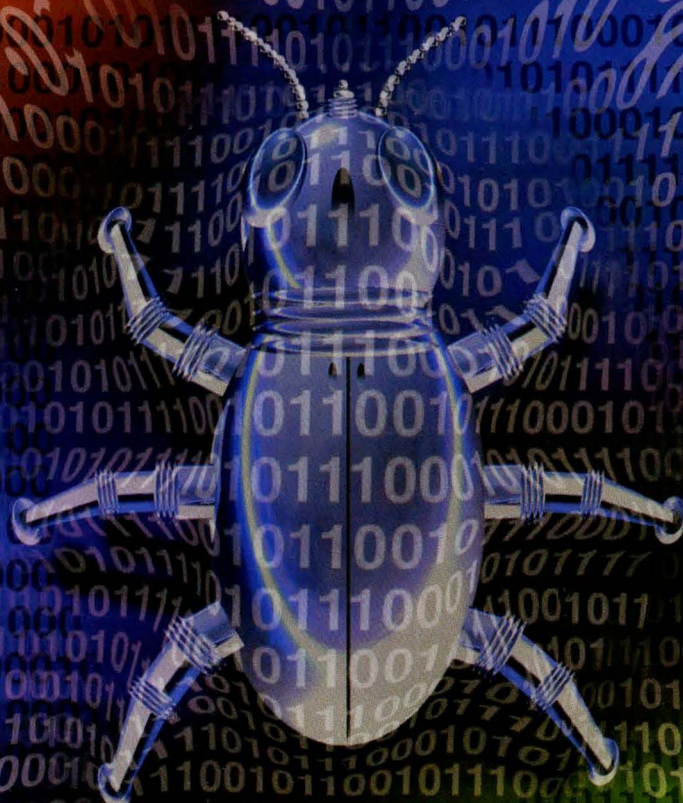
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Schools of Thought

Writing this column is one of the last items on my grand "Things to do list" for the annual Buyer's Guide. In fact, I don't know if I'll even get this where it needs to be before I miss another deadline.

My publishing deadlines, however, are coming to an end. I begin pursuit of my MBA at the University of Southern California (USC) this fall, and commuting between L.A. and San Francisco is just not an option.

Over the last several months, many of my colleagues have jokingly told me that after having produced three Buyer's Guides, grad school is going to be a piece of cake. After a few sleep-deprived nights and nonexistent weekends, I have to wonder if part of that might not be true.

In perusing the literature about what classes I'll be subjected to during my first year, I've drawn some correlations between getting this special issue out and my level of preparedness in my upcoming courses.

Communication for Management. Communication among the various groups that get this thing out is no small feat. When a discussion takes place and all parties involved leave the table feeling heard, understood, and satisfied, I consider communication successful. Past Buyer's Guide meetings have worried me more than this class does.

Contemporary Issues in Competitive Strategy. This course makes me think of the times the editors here spend creating all the categories that comprise the data in these tables. Is the section "System Engineering Tools" too broad, "BDM/JTAG Emulators" too specific? Should we have a category for hardware IP? Do we solicit the right kind of data in the Flash Memory pages? These issues certainly are contemporary, competitive, and strategic.

Behavior and Organizations. I could teach my own course on behavior and organizations after having three of these Buyer's Guides under my belt.

Operations Management. So nothing here quite resembles a supply chain and there are no legitimate testing models, but the operations surrounding the Buyer's Guide are fairly complex. About nine months prior to your reading this, we build the framework. A few months after that, we collect product data from hundreds of vendors. The data are then edited and put into a format we hope will be useful and helpful to readers. Many components of this process have been streamlined over the years and the use of the Internet has certainly helped. Maintaining data accuracy and ensuring that representative companies are included are paramount to the success and usefulness of this publication.

Giving you in-depth product information each year (and not just company names and addresses) is part of our commitment to providing you, our readers, with the editorial expertise you've come to rely on from *Embedded Systems Programming*. Putting together a directory of embedded systems products, building a car, or developing a global economic system—no doubt they have their parallels.

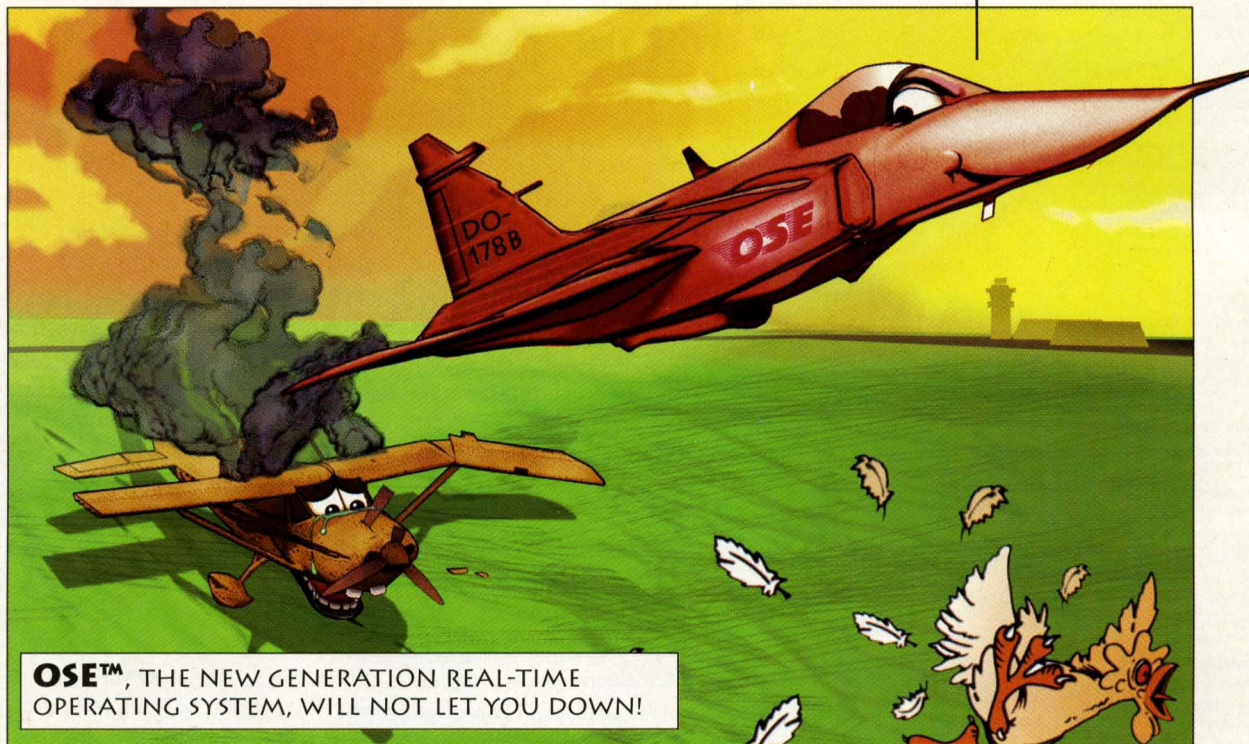
It would be an even greater stretch to find relationships between this issue and my first-year finance, accounting, statistics, and economics courses, but I'm looking forward to them just the same. Even though I'm not totally prepared for each of these classes, this job, like higher learning, has been educational, challenging, and enjoyable.



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Jack G. Ganssle

Faster!

A close friend who spent his career managing real estate recently read *The Soul of a New Machine*, Tracy Kidder's wonderful account of how engineers at Data General produced the Eclipse minicomputer in record time. We discussed it as we strolled down Bay Street in the sweltering summer heat of the tropics. Kirk found the book interesting and well written, but was dismayed at the high-pressure schedule and the people burnout. Then he made a comment that literally made me stop in my tracks: "I just couldn't believe that the picture Kidder paints of the high-pressure schedule is real—no one can work like that for long."

How could I explain to someone with no connection to the high-tech world how schedules are always the bane of our existence? That in my career, and in those of almost every engineer I know, every project we do is made to capricious and impossible deadlines? That the last decade has seen timelines shrink even more, so Kidder's depiction seems almost benign by today's standards?

So I'm left wondering if perhaps no one outside the technology business has a clue about how we're driven to madness by impossible schedules. Is our business unique?

Decent project management software appeared in the 1980s. Anyone can enter complex PERT charts describing every detail of implementing big endeavors. Who uses this stuff...successfully? I've watched uncounted developers attempt to build a schedule around an arbitrary deadline set by marketing; they move

triangles around like crazy, all except the final one, the one that has meaning, in an attempt to create a schedule that sounds believable, all the while knowing it's utter nonsense.

Of course, this is touted as an advance over the primitive, pre-GUI project planning packages we used to create meaningless schedules in the old days. Now we can fabricate data even faster.

People have been writing software

invariably wants all three legs: on-time delivery, perfect quality, and infinite features. He can't—and won't—get them. Surveys show 80% of all embedded systems are delivered late, a sure indicator that demanding everything yields nothing.

It seems logical that we must manage features aggressively, since schedule and quality issues will always be non-negotiable. Use requirements scrubbing to identify and remove

In the 21st century we'll see firmware folks spending breathtaking amounts on their tools.

for over 50 years, and building embedded systems for almost 30. The one constant over all of that time is that features increase while schedules shrink.

The twisted triad

We're trying to manage three conflicting things: an impossible schedule, an excess of desired features, and quality. Remove just one of the three and the project becomes trivial. Can we ship with lots and lots of bugs? If so, getting it out on time is pretty easy. Can we neglect the ship date? With infinite time we can get every feature working right.

This twisted triad dooms projects from the start when developers and management just don't recognize the truth buried in the conflict. The boss

those features that really are not needed. Build the system in a logical manner so that even if you're late, you can still deliver a product that does the most important things well.

There is, of course, one other ingredient that forms the backdrop of the twisted triad, one that is more the fabric of the development environment: resources. Decent tools, an adequate supply of smart people, and an enlightened management team all form the infrastructure of what we need to get the project done.

Over the decades, engineers learned to build embedded systems, but it seems management never figured out the appropriate role of resources in development projects. Somehow engineering projects are viewed much like building widgets on a production line. Need more wid-

The gritty truth is that before a package is truly reuseable, it must have been reused at least three times.

gets? Add more people, more machines. That just does not work in software engineering.

Fred Brooks, in his wonderful book *The Mythical Man-Month*, shows how adding people to a late software project invariably makes it even later.

Two developers have only a single communications channel between them, but as we add engineers the number of memo/meeting/e-mail links goes up with the number of people squared.

IBM found that as a project's

scope increases, software productivity goes down—dramatically—for the same reason. Their surveys showed code production (in number of lines per day) fell by an order of magnitude as projects grew.

Barry Boehm's Constructive Cost Model is probably the most accurate predictor of software schedules ever created. It, too, shows that timelines grow much faster than firmware size. Double the number of lines of code and the delivery date goes out by much more than a factor of two.

Yet "go hire some more people" seems the universal management mantra when a project plunges into trouble. Today, anyone who can spell "C" can get a high-paying job in the computer industry. Hiring more bodies, even if it were not a dysfunctional approach, is simply impossible.

Is there no hope? Will projects always be doomed to failure? Is the pressure so aptly illustrated in *The Soul of a New Machine* our destiny?

With project complexities exploding, it's clear that unless we dedicate ourselves to a new paradigm of development, using so much that has been learned about software engineering in the last half-century, we'll stagnate, wither, and fail. Those companies that accept new modes—and old proven modes—of thinking, will prosper. Two areas in particular are critical for new understanding, two areas that this volume deals with: tools and reuse.

Tools

In the 1940s all software was crafted in machine code. The '50s saw the introduction of the first compiled language, Fortran, which boosted coding efficiency almost overnight. Fortran came at the cost of bigger, slower code, a tradeoff that was then deemed unacceptable by too many engineers. But those who embraced Fortran were proven to be the vanguard of the future.

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ments about C++ and Java. Too slow, too big. Yet clearly C is tapped out, it's no longer giving the productivity boosts absolutely required to keep up with increasing product demands.

Advanced languages offer us the power of abstraction, of working with higher level views of our project. Abstraction is fundamental to our future. We can no longer afford to be concerned with bits and bytes. Whether you love it or hate it, the Windows API gives desktop developers an ineffably rich set of resources only a masochist would care to recreate.

Tools of various flavors are the enabling ingredient in abstracting us from lower level details. The first Fortran compiler, by today's standard laughably simple, gave engineers of the '50s a formidable weapon. Today we have so many more choices!

We largely accept the extra overhead associated with compilers. Other tools, all of which abstract us further from the code, cost more in overhead, yet promise that faster and better products are needed. UML, a design-level tool, holds much promise, and will no doubt be a standard part of the developer's repertoire before long.

Tool vendors often wonder why managers are so reluctant to spend money on software tools. Electrical engineers have no problem getting \$50,000 for a scope or logic analyzer, but that \$10,000 development system requires extreme justification and often outright subversion of the procurement process. It seems that managers still view code as a necessary evil, something they've got to use, but whose cost must be minimized.

Yet we all know that despite their distaste for anything binary, as soon as flaws appear in the hardware, management demands a firmware fix. Now, if not sooner.

This will change. In the 21st century we'll see firmware folks spending breathtaking amounts on their tools. Management will have to recognize that firmware is not free, that in fact it's the most expensive thing in the

universe. A tool that offers a handful of percent productivity improvement will be worth huge sums.

We'll learn this the hard way: by painful, expensive disasters. Even those may not be enough to drive the lesson home. Management will move on, retire, or die off. We, the embedded developers of today, will one day be in their shoes, and perhaps only then can affect change.

Reuse

Tools that help us write more code faster are just a part of the solution, however. Clearly a new model of reuse is desperately needed. A product comprised of a million lines of code—not uncommon anymore—is just too big to be built a line at a time, especially when the boss wants it shipped today.

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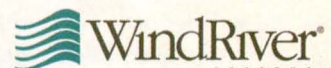
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Reuse is like a savings account: there's no value until you've put a lot into the account. The more you invest, the more benefit accrues.

opment in software engineering, the future simply must belong to reuse. Until we manage to beg, borrow, steal, or buy huge chunks of the code base, we'll be forever doomed to writing every last bloody line ourselves. That's intolerable.

Reuse means much more than hacking up some code we salvaged from a previous project. It's more than recycling 20% of the firmware. The future belongs to those whose projects are only 20% or 30% new code. Million-line-plus systems mean that even this extreme level of reuse still needs many person-years of development.

But let's define a few terms to show what reuse is, and what it's not. *Software salvaging* is using code again that was never designed for reuse. That is, hacking away at a base of crummy old source to somehow shoe-horn it into a new application.

Carrying-over code is porting firmware from an old project to a new one. Like salvaging, it's largely a matter of heroic source hacking.

True reuse is building systems a component at a time, not a line at a time. It's working with big blocks that work in well-defined ways, without digging into the guts to tweak, debug, or improve.

The gritty truth is, though, that before a package is truly reuseable, it must have been reused at least three times. In other words, domain analysis is hard. We're not smart enough to truly understand the range of applications where a chunk of software may be used. Every domain requires its own unique features and tweaks; till we've actually used the code several times, over a wide enough range of apps, we won't have generalized it enough to have it truly reuseable.

This suggests that reuse is terribly expensive. We spend money like mad

making decent code but don't reap the benefits until we've reused it three times. How many of us have the patience and discipline to create code over this sort of a time scale? Reuse is like a savings account: there's no value until you've put a lot into the account. The more you invest, the more benefit accrues.

Griss grouped companies into one of five levels of reuse maturity, ranging from "Initial," where ~20% to 20% of the code base gets recycled, to "Domain Oriented" reuse, where over 80% of the software exists up front—80%! Seems like a dream, but in fact vendors listed in this very publication already provide almost that amount of code for some applications. Extensive, seemingly impossible levels of code recycling are no longer the province of academics. For now these dreams are realized only for limited classes of products, like routers, but the future seems clear.

New ideas

Embedded systems sprawl over an infinite number of applications, so it's easy to despair, figuring that reuse might work fine in a few products, but never in mine. How many folks design colorimeters, strain gauges, blinking sneakers, or whatever it is that makes my company's products so unusual? What vendor would invest the megabucks needed to provide me with 80% of my unique app?

The future belongs to people brave enough and clever enough to discard old modes of thinking and adopt and create new ideas. We are going to find ways to design products using previously written code. The benefits are too compelling to continue building systems a line at a time. It may mean tossing resources, memory, and high-end CPUs at low end apps.

It may mean new tools. Surely we'll design systems differently. Though some of the implementation details are murky today, the outcome is pretty clear.

The biggest change will be in our attitudes, our approach to building products. Someday each of us, supported by management, will recognize two critical factors: firmware is the most expensive thing in the universe, and any idiot can write code. The future belongs to developers who find better ways to build products, not to super-coders.

Right now you're holding the single most comprehensive resource for embedded systems designers that has ever existed. No other source lists so many tools, RTOSes, networking packages, and so on. They're all listed here.

The first step towards development nirvana (nerdvana?) is to know where you can buy solutions, and you've got that in your hands now. The second step is to use it, to flip through the pages even when you're not really looking for something in particular, just to develop some familiarity with what's available.

So, to my friend Kirk and all the rest of the nonengineering world, we do work under enormous scheduling pressures. You the public demand it. Your digitally stabilized binoculars, that \$100 GPS receiver, the digital camera, and all of the other electronic products that make up your world all come from engineers struggling under impossible deadlines who somehow manage to produce amazingly inexpensive and reliable systems.

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Jack G. Ganssle is a lecturer and consultant on embedded development issues. He conducts seminars on embedded systems and helps companies with their embedded challenges. He founded two companies specializing in embedded systems. Contact him at jack@ganssle.com.

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Software Tools for Embedded Systems Development

The heftiest part of this volume is in the following section on software tools. Never have so many products been available. It's a little overwhelming, so let's look at a few of the options.

Compilers are the traditional mainstay of our tool suites. For years it's been rather hard to say much exciting or different about these products. Now some of the C++ compilers, though, will work with the evolving EC++ (Embedded C++) subset. This not-quite-yet standard addresses many of the problems that C++ brings to embedded systems, especially excessive memory footprints.

Java is quite literally exploding, with ever more JVMs and other Java products now available. Scan though the pages here and you'll see that this language may give C++ a run for its money. Java offers much of the power of OOP with much less complexity than C++.

Do look at the LINTs listed herein. LINT is like a compiler's syntax checker on steroids. It's one of the most effective and cheapest ways to ensure that your code doesn't have stupid mistakes, and should be part of every developer's toolset. Yet most software folks never use a LINT.

Add-on library packages thrive. Sometimes the libraries provided with compilers just aren't as efficient as they could be. Floating-point algorithms, in particular, often run too slowly for real-time use. In some cases it's because they comply with the C standard, which specifies doubles. If your app only needs six or seven digits of precision, an add-on library package may buy as

much as an order of magnitude in speed improvement. Some C libraries are also not entirely reentrant, boosting the after-market products as well.

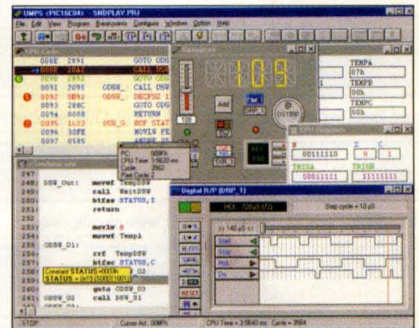
These pages show how the data communications mania has exploded. Your toaster better have an Internet connection now, and here's the place to come for the connectivity solutions. Adding a 'Net connection used to be a nightmare; now it's almost plug and play. TCP/IP stacks and web servers are listed for just about every processor made, including the 8-biters.

Datacomm is much more than the Internet. CAN, AppleTalk, RS-232, and a half dozen other protocols still form the base of much of the digitally chatting world.

DSP was once the province of hard-core signal processing products. Libraries listed here include all sorts of DSP algorithms. You need never write an FFT again.

Those of us who write about embedded systems frequently rail against home-brew RTOSes. Is there any prayer of reuse when we can't seem to buy even this basic ingredient? One reason developers give for not using a commercial RTOS is that they can't afford to pay royalties, or can't afford the up-front costs. Nonsense! Something like a hundred different such products follow in these pages, which sprawl across every conceivable pricing model. Some are nearly free. Every CPU from PIC to PowerPC is supported.

An area that's relatively new to the embedded world is that of databases.



It's sometimes hard to think of shoving a DBMS into firmware, yet as our systems get larger, manage more data, and connect to more of the world, many apps do indeed need to include some sort of database. All too often we wind up shoehorning a tiny homebrew database—which invariably grows as feature demands increase—into our product. Look at the DB products listed, as for some applications it makes sense to buy a package that implements real, relational, linked data access with standard query languages.

Debuggers are sort of a hermaphrodite, belonging both in this software tools section as well as under hardware tools. Emulators and BDMs, and in some cases, even logic analyzers, all use the software-based debuggers listed here. With recent industry consolidations products are changing; it's a good idea to scan these tables to get a sense of what is available from whom.

When we first started publishing the Buyer's Guide it was hard to find much more than compilers and debuggers. Now the range of products has exploded. Peruse these pages; getting just one might save you literally years of development. **esp**

SYSTEM ENGINEERING TOOLS


Product name	What kind of tool?	Target CPUs supported	Languages supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com								
accelTool SDK		Can be ported to any CPU	Assembly, C, C++, VHDL, Verilog, VB, Java, EC++, Javascript, HTML	Linux, Windows CE	✓		✓	
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com								
Nucleus EDE		68K, ARM, C16x, ColdFire, H8, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode, x86 Real Mode	Assembly, C	Windows 3.1/95/98/NT				✓
Nucleus MNT			Assembly, C, C++	Windows 3.1/95/98/NT				
Nucleus VNET			Assembly, C, C++	Windows 3.1/95/98/NT				
Advanced Visual Systems, Waltham, MA, (781) 890-4300, www.avs.com								
Express	Visual Data Mining and Analysis Tool	Alpha, MIPS, SPARC						
Aisys Inc., Santa Clara, CA, (408) 327-8820, www.aisysinc.com								
DriveWay-MPC8XX		MPC8xx	C, C++	Windows 3.1/95/98/NT	✓			
Altia Inc., Colorado Springs, CO, (719) 598-4299, www.altia.com								
Altia DESIGN, FACEPLATE	Simulation Graphics software							
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com								
Software Through		CPU-independent	Ada, C, C++, Java	Windows 3.1/95/98/NT, AIX, HP-UX,			✓	
Applied Dynamics International, Ann Arbor, MI, (734) 973-1300, www.adi.com								
BEACON	Code Generator	1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700						
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com								
CodeTEST ACT (Advanced Coverage Tools)	Software Test and Analysis Tools	All major 32 bit and many 16 bit						
CodeTEST Hardware-In-Circuit	Software Test and Analysis Tools	All major 32 bit and many 16 bit						
CodeTEST Native	Software Test and Analysis Tools	All major 32 bit and many 16 bit						
CodeTEST Software-In-Circuit	Software Test and Analysis Tools	All major 32 bit and many 16 bit						
CodeTEST VME	Software Test and Analysis Tools	All major 32 bit and many 16 bit						
LiveCODE	Object-oriented software design	PowerPC	C, C++	Windows 3.1/95/98/NT, Solaris			✓	
ARTISAN Software Tools, Portland, OR, (503) 245-6200, www.artisansw.com								
Real-time Studio			C, C++, Java	Windows 3.1/95/98/NT	✓		✓	✓

Requirements tracking	Defect tracking	Other system engineering tool	Code support	Code generation	UML support	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Product description
<div> <div>Technical Support</div> </div>													
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com													
✓				✓									accelTool is an interactive, web accessible, GUI-based customization tool for porting system software to OEM hardware. The accelTool SDK, via Accelent's e-microS web-accessibility, asks a user to furnish specific information about their particular hardware schematics and specifications. Based on initial user responses, the proprietary software language interface will ask a series of questions to further define the design.
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com													
✓	✓	✓		✓		180	\$	\$	\$	\$	\$	\$695	An Embedded Development Environment based on Microsoft Developer Studio. Allows engineers to compile, link, and debug embedded applications using cross-development tools within one environment.
		✓				180	\$	\$	\$	\$		\$995	A prototyping tool allowing engineers to develop Nucleus PLUS-based applications that execute as native Windows NT or Windows 95 processes.
		✓		✓		180	\$	\$	\$	\$		\$995	An embedded development environment based on Microsoft Developer Studio.
Advanced Visual Systems, Waltham, MA, (781) 890-4300, www.avs.com													
						0	\$	\$	\$	\$	\$		
Aisys Inc., Santa Clara, CA, (408) 327-8820, www.aisysinc.com													
		✓											DriveWay MPC8XX builds device drivers, boot and glue code that meet your precise specifications through a click and point interface. DriveWay produces highly tuned, fully tested and documented code in minutes.
Altia Inc., Colorado Springs, CO, (719) 598-4299, www.altia.com													
						0	U	\$	\$	\$	\$	\$995	Detailed, complex simulation models can be difficult to communicate.
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com													
✓		✓	✓	✓			\$	\$	\$	\$	\$	\$4,500	
Applied Dynamics International, Ann Arbor, MI, (734) 973-1300, www.adi.com													
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com													
						0	U	\$	\$	\$	\$		Provide detailed views of code execution during testing. MCDC, Decision and Statement coverage tools collect live, in-circuit program measurements, analyze test history and generate reports to document process and results.
						0	U	\$	\$	\$	\$		External probe hardware collection and communication systems deliver real-time visibility and accurate measurements for verification of test coverage and memory allocation, pinpointing critical performance and quality issues.
						0	U	\$	\$	\$	\$		Permit test and analysis in a host environment starting at coding. Analyze software test coverage and memory leaks, validate operation with deep trace.
						0	U	\$	\$	\$	\$		Allow test and analysis in actual target hardware, without external hardware tools. Provide a true run-time tool set for coverage, memory analysis, and software trace.
						0	U	\$	\$	\$	\$		Test and analysis tool suite designed for VME software developers and testers. View of complex VME embedded program operation, providing detailed software trace, VME performance, memory and coverage analysis.
		✓				0	U	\$	U	\$	\$		Interactive run-time tracing system, capture execution history and insert source-level statements directly.
ARTISAN Software Tools, Portland, OR, (503) 245-6200, www.artisansw.com													
✓		✓	✓	✓			\$		U	\$			Real-time Studio is a suite of development tools that includes ARTISAN's Real-time Studio Professional and Real-time Modeler. Using Real-time Studio products, design teams can capture software and system design, automate these captured designs and integrate them into a complete process, without disrupting existing development environments.

U - Unlimited free \$ - paid

SYSTEM ENGINEERING TOOLS

Product name	What kind of tool?	Target CPUs supported	Languages supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
Baan Visualstate, Aabyhoj, Denmark, 45 8625 1111, www.visualstate.com								
visualSTATE		1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PIC, PowerPC, SH, SPARC, TLC590/900, TMS320 and other TI DSPs	C, C++	Windows 3.1/95/98/NT	✓	✓		
blue river software GmbH, Germany, www.blue-river-software.com								
E32		CPU-independent	C	Windows 3.1/95/98/NT	✓			
O32		CPU-independent	C++	Windows 3.1/95/98/NT	✓			
V32		CPU-independent	C	Windows 3.1/95/98/NT	✓			
X32		CPU-independent	Assembly, C, Pascal, C++, Java	DOS, Windows 3.1/95/98/NT	✓			
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com								
CE Validator Application Tester								
CE Validator Platform Tester		ARM, SH, x86 Protected Mode, x86 Real Mode, PowerPC, MIPS		Windows CE				
CE XML Developer's Kit		ARM, x86 Real Mode, x86 Protected Mode, MIPS, SH, PowerPC	C, C++	Windows 3.1/95/98/NT, Windows CE		✓		
B-Tree Systems Inc., Eden Prairie, MN, (612) 936-7887, www.btree.com								
Validator Pro		68HC11, 68K, 8051 and derivatives, Alpha, i860, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode, Z80/Z180	C, C++	DOS, Windows 3.1/95/98/NT, Linux, Solaris	✓			
CAE Plus, Austin, TX, (512) 338-0165, www.cae-plus.com								
Afterburner		CPU-independent	Assembly, C, C++	Windows 3.1/95/98/NT, Solaris	✓			
ArchGen		CPU-independent	Assembly, C, C++	Windows 3.1/95/98/NT, Solaris	✓			
ASVP Builder		CPU-independent	Assembly, C, C++	Windows 3.1/95/98/NT, Solaris	✓			
CARDtools Systems, San Jose, CA, (408) 501-0880, www.cardtools.com								
NitroVP	Interpreter	ARM, MIPS, PowerPC, SH	C, C++	Windows 3.1/95/98/NT, Solaris	✓	✓		
Cimetrics Inc., Boston, MA, (617) 350-7550, www.cimetrics.com								
			C	DOS				
Cinderella, DK-2000 Frederiksber, Denmark, 45 21 42 12 80, www.cinderella.dk								
Cinderella SDL	Interpreter		C, ASN, MSC, SDL	Windows 3.1/95/98/NT		✓		
Datalight, Bothell, WA, (425) 951-8086, www.datalight.com								
FlashFX		68K, ARM, MIPS, PowerPC, SH, x86 Protected Mode, Can be ported to any CPU, x86 Real Mode		DOS, Windows 3.1/95/98/NT, Linux, Proprietary				



Quality Assurance Then

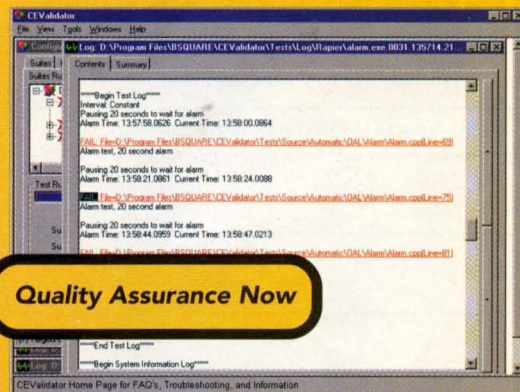
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SYSTEM ENGINEERING TOOLS

Requirements tracking	Defect tracking	Other system engineering tool	Carbs support	Code generation	UML support	Technical Support					Product updates	Training	Price	Comments
						Days of free phone support	BBS's/Web FRO's	bug lists, other	Phone support, standard	Phone support, 24-hour response				
Baan Visualstate, Aabyhoj, Denmark, 45 8625 1111, www.visualstate.com														
	✓		✓	✓	365	\$	\$		\$	\$				A toolsuite for the entire development process including UML-compliant graphical design environment. From the design, the user can make a complete formal verification, simulate, and generate production-ready code for most targets.
blue river software GmbH, Germany, www.blue-river-software.com														
			✓		180	U	\$	\$	\$	\$	DM12.350			E32 software life cycle for embedded systems based on V32.
			✓		180	U	\$	\$	\$	\$				O32 object-oriented software life cycle. A graphical interface for object-oriented modeling based on UML.
			✓		180	U	\$	\$	\$	\$	DM10650			V32 the software development environment of the ¶modern-software-life-cycle¶ featured under one user interface.
			✓		180	U	\$	\$	\$	\$	DM4485			X32 is a modern development environment consisting of several integrated tools. Via the source reengineering function you can transform existing source code into structogram format.
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com														
														CEValidator Application Tester tests your Windows CE-based applications. It generates automated testing scripts through interaction with the application, avoiding the need for programming. The three tools included in CEValidator Application Tester, Application Recorder, Test Builder, and GUI Tester, work together for applications on a Windows CE-based device.
														CEValidator Platform Tester automates the quality assurance process for testing the port of Windows CE to the target platform. Platform Tester provides a comprehensive set of tests for all components of a Windows CE-based project through a simple graphic interface. Platform Tester, an end to end solution, provides QA tools for every stage of device development.
					90	\$	\$		\$	\$	\$5,000			XML development tools for Windows CE V2.11+. Provides an XML parser, generator, and DOM manager. Compatible with IE 5.0 DOM interfaces. Includes COM components and source code.
B-Tree Systems Inc., Eden Prairie, MN, (612) 936-7887, www.btree.com														
	✓		✓		365	\$	\$		\$	\$				Automates both test creation and execution of functional and regression testing. Enables organizations to painlessly incorporate automation into their test environments and significantly improve test ROIs.
CAE Plus, Austin, TX, (512) 338-0165, www.cae-plus.com														
					90	\$			\$	\$	\$50,000			Creates clock-edge accurate C models from synthesizable TRL for fast, license-free simulation and protected IP delivery.
					90	\$			\$	\$	\$60,000			Creates clock-edge accurate C models and RTL design of complex cores from user-designed graphical microarchitecture models.
					90	\$			\$	\$	\$10,000			Environments for assembling clock edge accurate C models into a single IP-protected SOC model, then integrating hardware and software debugging tools for co-verification.
CARDtools Systems, San Jose, CA, (408) 501-0880, www.cardtools.com														
			✓	✓		U	\$	\$	\$	\$				A complete hardware and software co-design and co-simulation/verification tool that is used to prototype, model and simulate SOC/CPU based applications.
Cimetrics Inc., Boston, MA, (617) 350-7550, www.cimetrics.com														
	✓				365	U	U	\$	\$	\$				Network monitor.
Cinderella, DK-2000 Frederiksber, Denmark, 45 21 42 12 80, www.cinderella.dk														
	✓		✓		0	U			\$	\$	\$2.50			A CASE tool, for definition, analysis, and simulation of O-O software designs. It offers a unique incremental analyser and an integrated simulator which support rapid prototyping.
Datalight, Bothell, WA, (425) 951-8086, www.datalight.com														
					U						\$6 per 1,000 units			Full-featured flash file system, makes flash memory appear as a disk. Includes true wear leveling, scheduled garbage collection, uses only 12K ROM and 7K RAM. Portable to any OS and any CPU.

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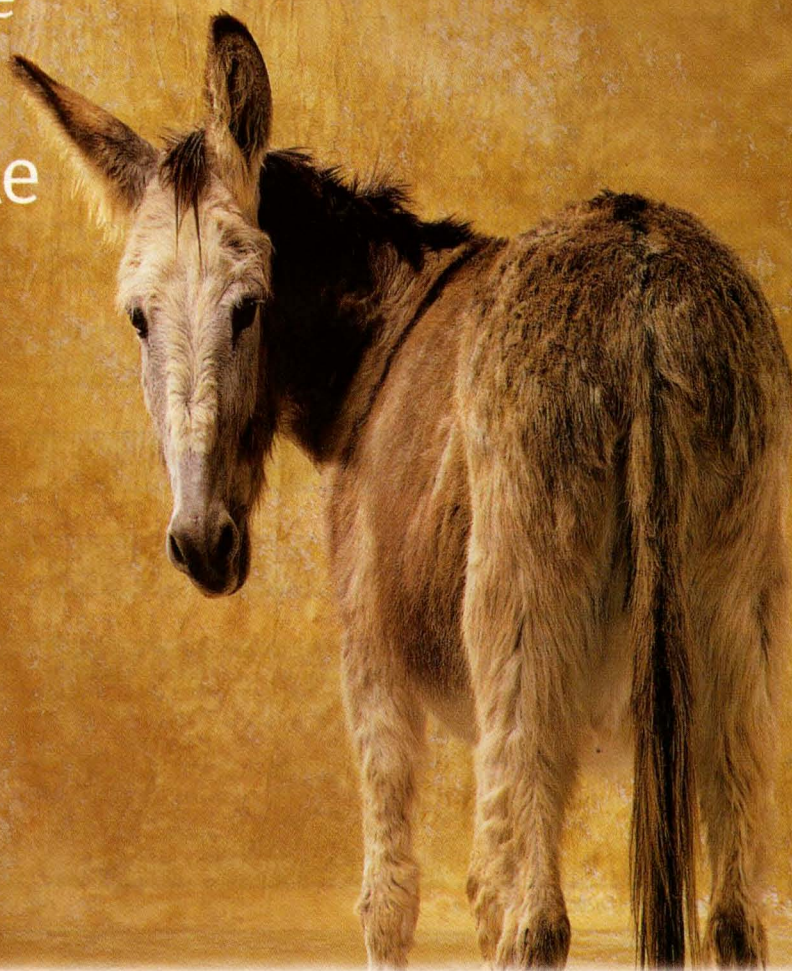
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can save the
only thing
more valuable
than your
time.



SYSTEM ENGINEERING TOOLS

Product name	What kind of tool?	Target CPUs supported	Language supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
DSPeSpecialists, Berlin, Germany, +49-30-467 805-0, www.dspezialists.de								
MATLAB PHI		DSP56300 family	Assembly, C	Windows 3.1/95/98/NT			✓	
Eclipse International Inc., Mountain View, CA, (650) 691-6400, www.eclipseint.com								
advanCE System Design Package for Windows CE		ARM, SH	C++, VB	Windows 3.1/95/98/NT	✓			
EDS, Troy, MI, (877) 877-7671, www.eds.com/embeddedsystems/								
Cal-Link	Calibration Editor (Cal-Link)	6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 80196, 80251, 8051 and derivatives, PowerPC, TMS320 and other TI DSPs, x86 Protected Mode, Z80/Z180						
e-SIM Inc., Pasadena, CA, (626) 584-7810, www.e-sim.com								
RapidPLUS			C, C++	Windows 3.1/95/98/NT	✓		✓	
Excel Software, Marshalltown, IA, (515) 752-5359, www.excelsoftware.com								
MacA&D			C, C++, Delphi, Pascal, Basic, Fortran, Java	Mac			✓	
MacTranslator	Object-oriented software design		C, Pascal, Basic, C++, Fortran, Java	Mac			✓	
WinA&D		CPU-independent	C, C++, Pascal, Basic, Delphi, Fortran, Java	Windows 3.1/95/98/NT			✓	
WinTranslator	Object-oriented software design	CPU-independent	C, C++, Fortran, Java, Basic, Delphi, Pascal	Windows 3.1/95/98/NT, Mac			✓	
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com								
Asim-G, Vsim-G, Msim-G	Cross compiler	SH, SPARC, SPARC Lite, FR30, F2MC 16	C	Solaris, HP-UX 9x	✓	✓		
Harmony Software Inc., Ivyland, PA, (215) 598-9663, www.ivystar.com								
Ivy* meta Specification- Driven Tool Builder				Solaris, HP-UX	✓		✓	
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com								
HI-WAVE	Cross compiler	68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, M Core, ST19, ST7, 8051XA, H8, PowerPC	Assembly, C, C++	Modula 2	✓	✓		
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com								
Hypersignal RIDE	Native compiler	TMS320 and other TI DSPs, ADSP2106x, 56K, ADSP2181	Assembly, C, C++	DOS, Windows 3.1/95/98/NT	✓	✓	✓	
I-Logix Inc., Andover, MA, (978) 682-2100, www.ilogix.com								
Rhapsody		1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PIC, PowerPC, SH, SPARC, TLCS90/900, TMS320 and other TI DSPs	C, C++, Java	Windows 3.1/95/98/NT			✓	
Statemate MAGNUM		1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PIC, PowerPC, SH, SPARC, TLCS90/900, TMS320 and other TI DSPs	Ada, C	Windows 3.1/95/98/NT, Solaris				
Jovian Systems Inc., Woburn, MA, (781) 937-6300, www.jovian.com								
Pegasus DSP Application Development Environment	Cross compiler	ADSP2106x, C62x, C67x	Assembly, C	Windows 3.1/95/98/NT				

Technical Support												Product description
Requirements tracking	Defect tracking	Other system engineering tool	Code support	Code generation	UML support	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	
DSPeSpecialists, Berlin, Germany, +49-30-467 805-0, www.dspepecialists.de												
			✓			U	U			\$	\$	Enables automatic code generation for fixed point DSPs using MATLAB/Simulink simulations. Code is automatically transferred and installed on the DSP system. This provides a ready-to-use stand alone system.
Eclipse International Inc., Mountain View, CA, (650) 691-6400, www.eclipseint.com												
	✓					U	\$	\$	U	\$		Provides OEMs with the complete design and development information to rapidly develop and deploy Windows CE based products.
EDS, Troy, MI, (877) 877-7671, www.eds.com/embeddedsystems/												
					45	U	\$	\$	\$	\$	\$5,000	Windows/PC based calibration editor, designed for use by product calibration engineers in real time, user friendly, uses advanced plug and play architecture to support many interfaces.
e-SIM Inc., Pasadena, CA, (626) 584-7810, www.e-sim.com												
			✓			U	\$		\$	\$		Human machine interface design and programming combines visualization tools with the power of a state machine engine.
Excel Software, Marshalltown, IA, (515) 752-5359, www.excelsoftware.com												
	✓		✓	✓	U	U	U	U	U	\$	\$495-\$1,995	Supports system analysis, requirements specification, software design, code generation and reengineering. Specific methods include Yourdon/DeMarco, Hatley/Pirbhai, Gane and Sarson structured analysis and design, UML, more.
	✓				U	U	U	U	U	\$	\$4,495	Automates the generation of diagrams and populates the data dictionary within MacA&D from existing source code. Object-oriented software written in C++ or Object Pascal is translated to class diagrams using UML, Booch, OMT, Shlaer/Mellor, etc.
			✓	✓	U	U	U	U	U	\$	\$495-\$1,995	WinA&D supports system analysis, requirements specification, software design, code generation, and reengineering.
	✓		✓		U	U	U	U	U	\$	\$495	WinTranslator automates the generation of diagrams and populates the data dictionary within WinA&D from existing source code. Object-oriented software written in C++, Java, or Object Pascal is translated to class diagrams using UML, Booch, OMT, Shlaer/Mellor, Coad/Yourdon, Fusion, or Jacobson notations.
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com												
					0	\$	\$		\$	\$		Provides Co-Verification tools for several applications: High speed functional/behavioral level, Hardware bus functional level, and so on.
Harmony Software Inc., Ivyland, PA, (215) 598-9663, www.ivystar.com												
	✓		✓		90		\$		\$	\$	\$450	Builds custom generators for system engineering specification languages, for software engineering code generation, and for software/system testing test script generation.
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com												
	✓		✓		180	\$	\$	\$	U	\$		Fast prototyping. Hardware and peripheral simulation.
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com												
	✓		✓			U	U	U	\$	\$	\$3,995	
I-Logix Inc., Andover, MA, (978) 682-2100, www.ilogix.com												
			✓	✓	60		\$		\$	\$		Rhapsody allows the embedded software engineer to model object-oriented software designs graphically utilizing the Unified Modeling Language (UML) and to simulate interactions and communications between objects and other software components. Graphical animation allows design diagrams on the development host to be debugged before testing the software on the target.
	✓		✓		60		\$		\$	\$		The Statemate MAGNUM suite enables real-time embedded system engineers to move rapidly to executable specifications and prototypes of complex embedded-systems through a unique combination of graphic modeling, simulation, code generation, and automatic documentation.
Jovian Systems Inc., Woburn, MA, (781) 937-6300, www.jovian.com												
	✓		✓		90	U	\$	\$	\$	\$	\$11,500+	Graphical DSP Development environment that produces complete applications including the host and DSP sides. Generates royalty-free Windows graphical user interface and DSP server program.

SYSTEM ENGINEERING TOOLS

Product name	What kind of tool?	Target CPUs supported	Language supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
Khoral Research Inc., Albuquerque, (505) 637-9500 x495, www.khoral.com								
Khoros Pro 2000		PowerPC	C, C++	Windows 3.1/95/98/NT, Linux, Solaris	✓		✓	✓
Mango Computers Ltd., Jerusalem, Israel, 972-2-532-8706, www.mangocom.com								
Mango Computers Ltd./System Engineering Tools 1	Native compiler	TMS320 and other TI DSPs, TigerSHARC, ADSP2106x	Assembly, MATLAB, C, C++	Windows 3.1/95/98/NT	✓			
MathWorks Inc., The, Natick, MA, (508) 647-7000, www.mathworks.com								
Control Design Automation Solution		68K, TMS320 and other TI DSPs, Alpha, PowerPC						
DSP Blockset				Windows 3.1/95/98/NT, HP, SGI, Solaris, Linux, IBM AIX	✓	✓	✓	
MATLAB				Windows 3.1/95/98/NT, Solaris, HP, IBM AIX, SGI, Linux	✓			
Motorola DSP Developer's Kit				Windows 3.1/95/98/NT, IBM AIX, HP,	✓	✓	✓	
Quantized Filtering Toolbox				Linux, IBM AIX, HP, SGI, Solaris	✓	✓	✓	
Real-Time Windows Target		x86 Protected Mode		Windows 3.1/95/98/NT, Linux, Solaris, IBM AIX, HP, SGI	✓			
Real-Time Workshop				Linux, HP, IBM AIX, SGI, Solaris	✓			
Simulink				Windows 3.1/95/98/NT, Linux, SGI, Solaris, HP, IBM AIX	✓		✓	
Stateflow				Windows 3.1/95/98/NT, Solaris, SGI, Linux			✓	
Stateflow Coder			C	Linux, Solaris, HP, IBM AIX, SGI	✓			
xPC Target		x86 Protected Mode		Windows 3.1/95/98/NT, Linux, Solaris, SGI, IBM AIX, HP	✓			
Mercury Computer Systems Inc., Chelmsford, MA, (978) 256-1300, www.mc.com								
TATL (Trace Analysis Tools and Library)		PowerPC, Other	C, Multiprocessor Performance Visualization Tool, C++	Windows 3.1/95/98/NT, Solaris				
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com								
MPLAB Integrated Development Environment	Integrated Development Environment	PIC						
MicroGOLD Software Inc., Freehold, NJ, (908) 668-4779, www.microgold.com								
WithClass	Native compiler	x86 Protected Mode, x86 Real Mode	Ada, C, C++, Java	Windows 3.1/95/98/NT			✓	

Technical Support													Product description
Requirements tracking	Defect tracking	Other system engineering tool	Cobol support	Code generation	UML support	Days of free phone support	BBS/ Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	
Khoral Research Inc., Albuquerque, (505) 637-9500 x495, www.khoral.com													
	✓	✓	✓			15	U	\$	\$	\$	\$		Integrates a software development environment, software systems integration, and visual programming to: manage embedded hardware systems, design complex computing routines efficiently, and create solution-focused applications.
Mango Computers Ltd., Jerusalem, Israel, 972-2-532-8706, www.mangocom.com													
	✓		✓			30	U	U	\$	\$	\$		Offers a tool for Rapid Engineering of SHARC-based Products. Mango Math-Link EDS offers the ability to use high-level MATLAB commands which are compiled directly to the target DSP code eliminating the need to code in DSP assembler.
MathWorks Inc., The, Natick, MA, (508) 647-7000, www.mathworks.com													
							U			\$	\$	\$6,785	
✓		✓				365	U			\$	\$	\$1,000	The DSP Blockset provides filter design, spectral estimation, and transforms that are the algorithmic foundation for many applications in speech and audio processing, telephony, wireless and broadband communications, computer peripherals, radar/sonar, and medical electronics.
						365	U			\$	\$	\$1,900	MATLAB is an integrated technical computing environment that combines numeric computation, advanced graphics and visualization, and a high-level programming language.
✓		✓				365	U			\$	\$	\$600	The Motorola DSP Developer's Kit combines algorithm development, simulation, and verification capabilities of the MathWorks system-level design tools with the Motorola Suite56 assembly language development and debugging tools.
✓		✓				365	U			\$	\$	\$1,000	The Quantized Filtering Toolbox provides extensible design, analysis, and prototyping tools for fixed-point and custom precision floating-point filters used in DSP applications.
						365	U			\$	\$	\$2,000	Turnkey, single PC Windows target for C code generated by Real-Time Workshop. It provides users with an easy-to-use, integrated environment that lets them implement their design without hand coding and debugging.
				✓		365	U			\$	\$	\$7,500	Generates customizable C code from Simulink models. Real-Time Workshop automatically builds programs that can run in real time with existing simulation environments, or run standalone as a nonreal-time simulation.
						365	U			\$	\$	\$2,800	Graphical, block diagram environment for modeling, simulating, and analyzing non-linear, dynamic systems. Commonly used in control, DSP, and communication system designs, Simulink enables a top-down approach to design.
						365	U			\$	\$	\$2,800	Designed for embedded systems realization, Stateflow enables engineers and designers to quickly develop graphical models of event-driven systems utilizing finite state machine concepts, statechart formalisms, and flow diagram notation.
				✓		365	U			\$	\$	\$2,800	Generates integer or floating-point code for standalone targets. Stateflow Coder generates C code for the Stateflow portion of Simulink models, which can then be seamlessly incorporated into code generated by Real-Time Workshop.
						365	U			\$	\$	\$4,000	Add I/O blocks to Simulink block diagrams, generate code with Real-Time Workshop, and download the code to a second PC that runs the xPC Target real-time kernel.
Mercury Computer Systems Inc., Chelmsford, MA, (978) 256-1300, www.mc.com													
	✓	✓				90	U	U		\$	\$	\$7,000	Minimally intrusive multiprocessor post-mortem trace and analysis tool. Scales to 1000 processors. Synchronization resolution guaranteed to within one microsecond. Provides a graphical display of trace data. Histogram viewer included. Easy-to-use programmable instrumentation delivers power and flexibility to users and facilitates multiprocessor system-level debugging.
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com													
						U	U	U		U	U	Free	Includes a text editor, simulator, assembler, and project manager.
MicroGOLD Software Inc., Freehold, NJ, (908) 668-4779, www.microgold.com													
	✓	✓	✓			14	U	\$	\$	\$	\$	\$825	A UML tool that reverse engineers C++, Java, IDL, VB, Delphi and Perl. You can also create all UML diagrams and generate code and reports. VBA is integrated into the tool as well for added functionality.

SYSTEM ENGINEERING TOOLS

Product name	What kind of tool?	Target CPUs supported	Languages supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
Objective Interface, Reston, VA, (703) 295-6500, www.ois.com								
ORBExpress	Cross compiler	68K, Alpha, MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Ada, C++	Windows 3.1/95/98/NT, Linux, Solaris, VMS, SGI, Lynx, OSE, HP, HP-UX, UNIX, PSOS, VxWorks, DEC UNIX		✓		
Pathfinder Solutions Inc., Wrentham, MA, (888) 662-7284, www.pathfindersol.com								
Model Auditor analysis model verifier			checks analysis model semantics in UML	Windows 3.1/95/98/NT		✓		
Springboard model translation engine			Ada, translates models to any ASCII form, Assembly, C, C++, Forth, Fortran, Java	Windows 3.1/95/98/NT		✓		
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.pstii.com								
Precise/MQXsim		CPU-independent	C, C++, Other, MSC	Windows 3.1/95/98/NT	✓			
Precise/RTCSsim			C, MSC, C++	Windows 3.1/95/98/NT	✓			
Project Technology Inc., Tucson, AZ, (520) 544-2881, www.projtech.com								
BridgePoint, DesignPoint	Cross compiler	1750A, V80, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PIC, PowerPC, SH, SPARC, TLC590/900, TMS320 and other TI DSPs	Ada, Assembly, C, C++, Forth, Fortran, Java	Windows 3.1/95/98/NT, HP-UX, Solaris	✓	✓	✓	✓
Rational Software Corp., Cupertino, CA, (408) 863-4660, www.rational.com								
Rational Rose Realtime	Object-oriented software design	i860, i960, MIPS, PowerPC, Pentium, HP 9000 7xx, SPARC, PA RISC, Intel386CX/SX/EX, MPC 603E EC603E 740 750, 680x0	C, C++	Linux, AIX, Windows 2000, Nucleus, HP 9000, QNX Neutrino, SCO Unixware, HP-UX, Solaris, VxWorks, Proprietary, OSE, SGI		✓	✓	✓
Real-Time Innovations Inc., Sunnyvale, CA, (408) 734-4200, www.rti.com								
ControlShell		68K, MIPS, PowerPC, x86 Protected Mode	C, C++	Windows 3.1/95/98/NT, VxWorks, WindRiver VXWorks, Solaris		✓		
RTview Ltd., Ramat-Gan, Israel, 972-3-6123995, www.rtview.com								
SuaroundView	Real-time Application Monitoring and Visualization Tool	68K, ARM, MPC8xx, PowerPC, SH, x86 Protected Mode, x86 Real Mode						
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com								
VIPER	Interpreter	80196, 8051 and derivatives, Compact RISC, 80C186, TriCore, TMS320 and other TI DSPs	Chameleon Debugger	Windows 3.1/95/98/NT	✓			
Software Emancipation Technology Inc., Burlington, www.setech.com								
DISCOVER			C, C++, Java, Other	Windows 3.1/95/98/NT, Solaris, Other		✓		

Requirements tracking	Defect tracking	Other system engineering tool	Code support	Code generation	UML support	Technical Support					Price	Product description
						Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates		
Objective Interface, Reston, VA, (703) 295-6500, www.ois.com												
	✓	✓	✓	✓	365	\$	\$	\$	\$	\$	\$5,000	Provides software developers tools for building reliable, mission-critical systems. These tools include Object Request Brokers, training and support.
Pathfinder Solutions Inc., Wrentham, MA, (888) 662-7284, www.pathfindersol.com												
			✓	✓	90	U	\$	\$	\$	\$	\$3,000	This rigorous analysis model checking facility performs the most complete set of syntactic, semantic and consistency checks for UML analysis models available anywhere.
			✓	✓	90	U	\$	\$	\$	\$	\$3,000+	Extract the semantic content of analysis models from your CASE database using simple, flexible templates to translate your system into virtually any form.
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.psti.com												
	✓				90	\$	\$	\$	\$	\$	\$1,250	Precise/MQXsim is a version of the Precise/MQX RTOS that runs on a Windows host computer. The simulator, which supports all the Precise/MQX RTOS functionality, features and benefits, lets you code and test a Precise/MQX application without the need for embedded hardware and cross-compiler tools.
	✓				90	\$	\$	\$	\$	\$	\$1,750	Precise/RTCSsim is a version of the Precise/RTCS embedded Internet stack that runs on a Windows host computer in conjunction with Precise/MQXsim. The simulator lets you develop a Precise/RTCS application on a host computer before cross-compiling and loading the embedded application onto the target.
Project Technology Inc., Tucson, AZ, (520) 544-2881, www.projtech.com												
	✓	✓	✓	✓	0	\$	\$	\$	\$	\$	\$7,995	Develops complete applications from executable UML models that are automatically translated into high-performance target source code.
Rational Software Corp., Cupertino, CA, (408) 863-4660, www.rational.com												
✓	✓	✓	✓	✓	365	\$	\$	\$	\$	\$	\$4,995	Rational Rose RealTime is a comprehensive visual modeling environment that delivers notation, processes, and tools to meet real-time needs.
Real-Time Innovations Inc., Sunnyvale, CA, (408) 734-4200, www.rti.com												
			✓	✓	90	U	U	\$	\$	\$	\$13,250	ControlShell is the tool for intelligent control. With ControlShell, you create a clean object-oriented design, and then build your system from tested, maintainable, high-quality software components. It combines event-driven logic and sampled-data feedback control in a fully-automated visual programming system.
RTview Ltd., Ramat-Gan, Israel, 972-3-6123995, www.rtvie.com												
					90	U	\$		\$	\$		Equips developers with a highly flexible visualization tool for monitoring the dynamic behavior of embedded applications and for debugging real-time embedded software.
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com												
					365	U	\$	\$	\$	\$	\$950	Allows building custom user interfaces and panels allowing rapid prototyping and verification of the software before hardware is available. Uses drag and drop feature to combine LCD and seven segment displays, switches, buttons, 2D graphs, LEDs, and more
Software Emancipation Technology Inc., Burlington, www.setech.com												
	✓				365	\$	\$	\$	\$	\$		Comprehensive focused solutions for software development; captures detailed knowledge about the structure and operation of software; brings precision, manageability, and predictability to the software development process; enables more thorough understanding of large software systems; efficiently, accurately effects change to source code; reengineers or reorganizes a complex software system.

SYSTEM ENGINEERING TOOLS

Product name	What kind of tool?	Target CPU supported	Language supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
Stenkil Software AB, S-551 14 Jonkoping, Sweden, 46 36 345000, www.stenkil.com								
MakeApp		H8, Toshiba TX, MIPS, SH	C	Windows 3.1/95/98/NT	✓			
SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com								
TestBench Pro	Interpreter		C++, Perl	Windows 3.1/95/98/NT, HP-UX, Solaris		✓		
Syndesis Ltd., Athens, Greece, 30 1 7292985, www.flde.com								
FLDE AutoStudio	Cross compiler	68HC08, 68HC11, 68HC12, 68K, 80196, 80251, 8051 and derivatives, 8051XA, C16x, i860, MIPS, PowerPC, SPARC, x86 Real Mode	C	Windows 3.1/95/98/NT		✓		
Telelogic North America, Princeton, NJ, (609) 520-1935, www.telelogic.com								
LOGISCOPE			Ada, C, C++, Pascal, Cobol, Fortran, Java, PL/1	Windows 3.1/95/98/NT, RS6000, DEC, Solaris, AIX, HP		✓		
ObjectGEODE			C, C++	Windows 3.1/95/98/NT, SunOS, IBM AIX, HP-UX, Solaris	✓	✓	✓	
SCADE		SPARC, HP 9000 7xx	Ada, C, C++	Solaris, HP		✓		
Telelogic Tau 4.0			C, C++	Windows 3.1/95/98/NT, Linux, Solaris, SunOS, AIX, HP-UX	✓	✓	✓	✓
Time-Rover, Cupertino, CA, (408) 252-2808, www.time-rover.com								
Temporal Rover		1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PIC, PowerPC, SH, SPARC, TLC590/900, TMS320 and other TI DSPs	C, VHDL, C++, Verilog, Java	Windows 3.1/95/98/NT, Linux, Any with Java VM, Solaris		✓		
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com								
TimeWiz			Ada, Assembly, C, C++, Java	Windows 3.1/95/98/NT	✓			
Tri-Pacific Software Inc., Alameda, CA, (510) 814-1780, www.tripac.com								
RapidBuild		68K, 486, Motorola, All major 32 bit and many 16 bit, PowerPC	C, Graphical Multiprocessor Development Environment	Windows 3.1/95/98/NT, VxWorks, WindRiver VxWorks, Windows 2000		✓		
RapidRMA			Graphical Multiprocessor Development Environment	Windows 3.1/95/98/NT	✓	✓	✓	
RapidSched		Can be ported to any CPU	C++, Embedded C++	Windows 3.1/95/98/NT, SGI, Lynx, UNIX, OSE, Windows 2000, Sun/SPARC, VxWorks, Solaris				
RapidSim			Graphical Multiprocessor Development Environment	Windows 3.1/95/98/NT, UNIX	✓	✓	✓	

Requirements tracking	Defect tracking	Other system engineering tool	Cobol support	Code generation	UML support	Technical Support				Product updates	Training	Price	Product description
						Docs & free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response				
Stenkil Software AB, S-551 14 Jonkoping, Sweden, 46 36 345000, www.stenkil.com													
	√		√			\$	\$		\$			\$595 to \$895	A device driver development tool with visual configuration of peripheral modules, rule-checking, and automatic code generation.
SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com													
			√		U	U	U		\$			\$9, 500	Drastically reduces test bench coding and verification time by automatically generating self-checking, VHDL and Verilog test benches from graphically entered, reusable timing diagrams.
Syndesis Ltd., Athens, Greece, 30 1 7292985, www.flde.com													
	√	√	√		365	U	\$	U	\$	\$		\$3, 500	CASE tool for embedded control using a rule-based notation.
Telelogic North America, Princeton, NJ, (609) 520-1935, www.telelogic.com													
	√	√			√		\$	\$	\$	\$	\$	\$2, 600 to \$7, 900	Set of tools providing quality and test analysis through software metrics, test coverage and reverse engineering, enabling effective software production and maintenance. Available for C, C++, Ada, and Java.
		√		√	√		\$	\$	\$	\$	\$	\$2, 500 to \$17,000	Object-Oriented tool suite for real-time and distributed applications that covers the complete development phase: analysis and design, simulation, code generation, testing, and quality assessment.
	√	√		√	√		\$	\$	\$	\$	\$	\$26, 000	An industrial solution for the development of safety critical time-cycled real time systems. Based on a formal technology developed in cooperation with Aerospatiale and Schneider Electric.
√	√		√	√	√								
Time-Rover, Cupertino, CA, (408) 252-2808, www.time-rover.com													
√	√	√				365	U	\$	\$	\$	\$		Specification-based verification for reactive systems and protocols.
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com													
		√				60	U	\$	\$	\$	\$		Visually and hierarchically represents, analyzes, simulates, documents and charts your system. Use Rate-Monotonic Analysis (RMA) to determine if worst-case time constraints are met.
Tri-Pacific Software Inc., Alameda, CA, (510) 814-1780, www.tripac.com													
	√		√			30						\$3, 000	Rapid prototyping GUI tool for VxWorks users which generates C code. This tool allows real-time engineers to quickly build small prototypes of an application in a GUI environment to run on VxWorks targets. The timing data can then be collected in WindView and fed into TPSI's RMA tool, RapidRMA for building high-quality candidate models of the application architecture.
√	√	√	√		√	30						\$3, 500	Prototyping Environment for Real-Time Systems based on Rate Monotonic Analysis capable of analyzing Real-Time CORBA architectures. Contains interfaces to Wind River's VxWorks and Enea OSE's Illuminator tools.
		√	√		√	30						\$7, 000	Implements a Deadline Monotonic scheduler with DASPCP (Distributed Affected Set Priority Ceiling Protocol) for resource sharing. It currently works in conjunction with ORBexpress from OIS, e*ORB from Vertel and VisiBroker from Highlander/Inprise. Available on various real-time operating systems.
√	√	√		√	30							\$800	It extends the RapidRMA's modeling and allows simulation and scenario driven analysis.

Product name	What kind of tool?	Target CPUs supported	Language supported	Platforms supported	Hardware/software co-design	Co-verification	Object-oriented software design	Version control
UNIS spol. s r.o., BRNO, Czech Republic, +420 5 41515291, www.unis.cz								
Processor Expert		68HC08, 68HC12, Atmel AVR90, ColdFire, Fujitsu families, MPC8xx, PIC, TLCS90/900, V800	Assembly, C, C++, Java	Windows 3.1/95/98/NT	✓	✓	✓	
VaST Systems Technology, Sunnyvale, CA, (408) 328-0909, www.vastsystems.com								
CoMET	Native compiler	68K, ARM, NEC 41xx, MIPS, SH, SPARC, x86 Real Mode	Assembly, Modal, C, C++, Verilog, VHDL	Windows 3.1/95/98/NT, Solaris	✓	✓	✓	
Vector CANtech Inc., Novi, MI, (248) 449-9290, www.vector-cantech.com								
CANalyzer								
CANape								
CANoe								
Vector Software, North Kingstown, RI, (401) 295-5855, www.vectors.com								
VectorCAST		68HC08, 68HC11, 68HC12, 68K, Alpha, ARM, ColdFire, MIPS, PowerPC, SPARC, TMS320 and other TI DSPs, x86 Protected Mode	Ada, C, C++	Windows 3.1/95/98/NT, HP-UX, AIX, Digital Unix, Solaris				
Vertel, Woodland Hills, CA, www.vertel.com								
e*ORB		MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode		Windows 3.1/95/98/NT, Linux, VxWorks, Windows CE, Solaris			✓	

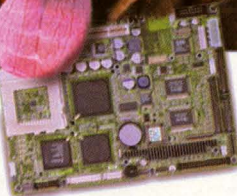
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PCM-9574 Features

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- AC97 3D stereo surround sound
- 2X AGP & 3D VGA/LCD
- 10/100 Mbps Ethernet & optional PanelLink
- One CompactFlash socket for CFC
- Software MPEG II playback
- 203mm x 146mm (8" x 5.75")



- Socket 370 CPU
- AC97 Audio
- 2X AGP 3D Accelerator
- Optional Software Modem



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Advantech Technologies, Inc.
Tel: 949-789-7178 Fax: 949-789-7179
Email: EPCinfo@advantech.com

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www.advantech.com/epc

Technical Support										Product description		
Requirements tracking	Defect tracking	Other system engineering tool	Code support	Code generation	UML support	Days of free phone support	BBS/Web FAQ, bug lists, other	Phone support, standard	Phone support, 24-hour response			
UNIS spol. s r.o., BRNO, Czech Republic, +420 5 41515291, www.unis.cz												
	✓		✓		5	U	\$	\$	\$	\$	First component oriented rapid application builder environment for 8- and 32-bit microprocessors and embedded systems. Using component palette, user can build microcontroller application from supplied components.	
VaST Systems Technology, Sunnyvale, CA, (408) 328-0909, www.vastsystems.com												
			✓			U	\$	\$	\$	\$	\$60,000	Hardware-software engineering tool.
Vector CANtech Inc., Novi, MI, (248) 449-9290, www.vector-cantech.com												
	✓						U			\$	\$4,410	CANalyzer is a high-end programmable CAN analysis tool for network traffic.
	✓						U			\$	\$4,500	CANape allows high speed CAN ECU interaction for monitoring and calibration.
	✓						U			\$	\$11,030	CANoe is for designing and modeling multiple CAN modules and there network behavior. Modules may be simulated and/or real in any combination.
Vector Software, North Kingstown, RI, (401) 295-5855, www.vectors.com												
	✓			✓			\$	\$	\$	\$	\$	The VectorCAST products scan C/C++ and Ada source code and automatically generate the test code necessary to construct executable test harnesses for both host and embedded environments. VectorCAST is the first comprehensive module test tool that effectively automates all aspects of developer module testing.
Vertel, Woodland Hills, CA, www.vertel.com												
			✓	✓			\$	\$	\$	\$	\$	e*ORB software, the Vertel family of CORBA ORB (Object Request Broker) and CORBA Services, is designed for embedded systems development where performance and memory footprint are critical design requirements. e*ORB goes where no CORBA has gone before, inside your applications for handheld, palm-sized devices and set-top boxes. Both C++ and Java versions are available.

development tools

C/C++/EC++ Compilers
True Time Simulator
Real Time Debugger
I/O Simulation and Stimulation
Real Time Kernel
Peripheral Builder
BDI BDM / JTAG Interfaces

Motorola

HC05, HC08, HC11, HC12,
HC16, M-CORE, M68xxx/3xx,
PowerPC

Philips

8051XA

STMicroelectronics

ST7, ST16, ST19

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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPUs supported	Languages supported	Typical ROM req'd, min in 1,000's of bytes		Typical ROM req'd, max in 1,000's of bytes		Typical RAM req'd, min in 1,000's of bytes		Typical RAM req'd, max in 1,000's of bytes		Multitasking strategy	Typical context switch time, in clock cycles	MMU support	Modular link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
3L Ltd., Edinburgh, United Kingdom, 44-131-662-4333																	
Diamond	TMS320 and other TI DSPs	Assembly, C		5	10					Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities					✓	✓	
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com																	
Nucleus GRAFIX	68K, ARM, ColdFire, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode	Assembly, C										4 to 30					
Nucleus iPLUS	68K, ARM, x86 Real Mode, PowerPC	Assembly, C															
Nucleus OSEK	C16x	Assembly, C															
Nucleus PLUS	68HC11, 68HC16, 68K, ARM, C16x, M Core, ColdFire, H8, i960, MIPS, MPC8xx, PowerPC, SH, CR16, StrongARM, CR32, M16C, TMS320 and other TI DSPs, V800, x86 Protected Mode, x86 Real Mode	Assembly, C, C++, Java	<3	45	2	4	168 + (stack)			Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking, Proprietary		✓	✓	✓	✓	✓	✓
Aisys Inc., Santa Clara, CA, (408) 327-8820, www.aisysinc.com																	
DriveWay	MPC8xx, PowerPC, MPC8260	C, C++															
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																	
RAVEN	68K, PowerPC, x86 Real Mode	Ada								Rate Monotonic scheduling							
Applied Dynamics International, Ann Arbor, MI, (734) 973-1300, www.adi.com																	
RTexc	6800, 68336, 68040, PowerPC	Assembly, Other, C, Fortran								Fixed priority, Rate Monotonic scheduling					✓		
Avocet Systems Inc., Rockport, ME, (207) 236-9055, www.avocetsystems.com																	
AvSYS Real-Time Operating System	All processors for which an ANSI compiler is available	C	0.8	640	0.8	640				Time Slice, Fixed priority					✓	✓	✓
Berkeley Software Design Inc., Colorado Springs, CO, (719) 535-8400, www.bsdi.com/esp																	
e/BSD	SPARC, 486, Pentium, Intel 386	Ada, Assembly, C, C++, Forth, Fortran, Java	2,048	2,048	2,048	2,048				Round Robin, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking		✓	✓	✓	✓	✓	✓
Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com																	
Blackhawk OS	TMS320 and other TI DSPs	C					varies			Round Robin, Time Slice, Tasks can dynamically alter priorities, Fixed priority			✓	✓	✓	✓	✓
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com																	
TargetOS	68K, MIPS, MPC8xx, PowerPC	Assembly, C	40		12		25			Round Robin, Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking			✓	✓	✓		

POSIX compliant	TCP/IP support available Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Technical Support						Price	Comments	
										Days of free phone support	885/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
3L Ltd., Edinburgh, United Kingdom, 44-131-662-4333																		
	✓		✓				3,000	TI C6000 Code Composer	TI C6000 C code generation tools	90	U	\$		\$	\$	\$3,500	Simplifies code development for high-performance, multi-processor DSP systems. During design, the functional components or an application are mapped to logical tasks independent of hardware topology.	
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com																		
	✓	✓						Nucleus UDB, SDS, CAD-UL, MetaWare, GHS, Hitachi	Diab Data, GNU, ARM, SDS, GHS, Hitachi, MetWare, CAD-UL	180	\$	\$	\$	\$	\$	\$9,995 to \$12,995	Portable embedded GUI.	
	✓	✓						ARM, SDS, Microsoft	ARM, Diab Data, Microsoft	180	\$	\$	\$	\$				Customers will have access to the complete, native Nucleus PLUS interface.
	✓	✓						TASKING	TASKING							\$29,000	Nucleus OSEK is Accelerated Technology's OSEK-compliant operating system.	
✓	✓	✓			✓		2,300	Nucleus UDB, SDS, EST VisionCLICK, MetaWare, SSI, Paradigm, CAD-UL, CodeWarrior	GNU, ARM, Diab Data, SDS, MetaWare, Watcom, Borland, IAR, CAD-UL, Microsoft, SSI, TASKING	180	\$	\$	\$	\$	\$	\$7,495 to \$12,495		
Aisys Inc., Santa Clara, CA, (408) 327-8820, www.aisysinc.com																		
									Diab Data, GNU C, Green Hills, Microtec									
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																		
		✓	✓					ObjectAda	ObjectAda	90	\$	\$	\$	\$	\$	\$15,000		
Applied Dynamics International, Ann Arbor, MI, (734) 973-1300, www.adi.com																		
	✓	✓																
Avocet Systems Inc., Rockport, ME, (207) 236-9055, www.avocetsystems.com																		
	✓	✓								365	U	\$	\$	\$	\$		Royalty-free. Fully scalable and modular. Footprint starts below 1K, yet designed for full-scale systems.	
Berkeley Software Design Inc., Colorado Springs, CO, (719) 535-8400, www.bsdi.com/esp																		
✓	✓	✓	✓	✓		✓	80,000+ servers			60	\$	\$	\$	\$	\$			
Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com																		
✓	✓		✓	✓				Code Composer	Code Composer	365	U	\$	\$	\$	\$	\$4,995		
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com																		
	✓	✓	✓					CodeWarrior	CodeWarrior	365	U	U		U	\$	\$5,000	Extensive MPC8xx and MC68360/MC68302 driver support. Other Components: TCP/IP stack, Flash File System, and LAPB stack.	

U - Unlimited free \$ - paid

REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPU supported	Languages supported	Typical ROM req'd, min in 1,000's of bytes	Typical ROM: max in 1,000's of bytes	Typical RAM req'd, min in 1,000's of bytes	Typical RAM req'd, max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in clock cycles	MMU support	Modbus link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
Caldera Thin Clients Inc., Lindon, UT, (801) 426-5001, www.caldera.com														
DR-DOS 7.03	x86 Protected Mode, x86 Real Mode	Ada, Assembly, C, C++, Forth, Fortran, Java	32		128		64	Time Slice, Tasks can dynamically alter priorities					✓	
CMX Systems Inc., Framingham, MA, (508) 872-7675, www.cmx.com														
CMX-RTX	Most	Assembly, C, C++	1	5	0.2		0.028	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary	varies	✓	✓	✓	✓	✓
CodeGen Inc., San Francisco, CA, (415) 834-9111, www.codegen.com														
SmartFirmware	Alpha, ARM, i960, PowerPC, MPC8xx, SH, SPARC, x86 Protected Mode	C, Forth	256	512	256	1024				✓				✓
Datalight, Bothell, WA, (425) 951-8086, www.datalight.com														
ROM-DOS	x86 Real Mode	Assembly, C, C++, Forth, Fortran, Java	48	70	54	80	1							
WinLight	x86 Protected Mode	C, C++	470	1,024	512	1,024		Cooperative multitasking						
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com														
DDC-I Ada Compiler Systems (DACS)	MIPS, SPARC, x86 Protected Mode, x86 Flat Mode, x86 Real Mode	Ada	4	25	.27			Round Robin, Time Slice, Rate Monotonic scheduling	400	✓	✓		✓	
DDC-I JOVIAL Compiler Systems (DJCS)	1750A, Z8002	JOVIAL								✓	✓			
DDC-I SCORE Development Environment	PowerPC, SPARC	Ada, C, Assembly	39	116	1404	12	23	Round Robin, Rate Monotonic scheduling		✓	✓		✓	
DDC-I Tartan Ada Development System (TADS)	1750A, 68K, i960	Ada, Assembly	16	16	.116	6		Round Robin, Time Slice, Fixed priority			✓			
DSPealists, Berlin, Germany, +49-30-467 805-0, www.dspealists.de														
DSPios	DSP56300 family	Ada, Assembly, C, C++, Forth, Fortran, Java	<1	<1	0	0	0	Proprietary			✓			
EBSnet Inc., Grafton, MA, (978) 448-9340, www.ebsnetinc.com														
RTKernelisc	ARM, MPC8xx, PowerPC, MPC82xx	Assembly, C, C++	20	32	1024	8	12	Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking					✓	
Echelon Corp., Palo Alto, CA, (650) 855-7400, www.echelon.com														
	MC3150 3120 Neuron Chip	C	10K	64K	1K	64K	varies	Round Robin	900					

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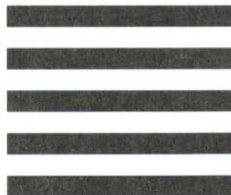
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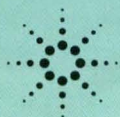
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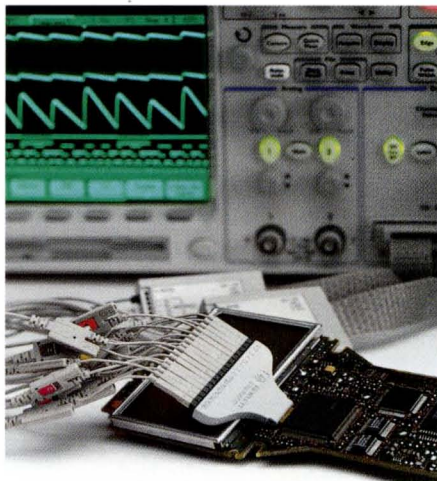


	54621A	54621D	54622A	54622D	54624A
Channels	2	2+16 logic	2	2+16 logic	4
Scope					
Bandwidth	60 MHz	60 MHz	100 MHz	100 MHz	100 MHz
Sample rate	200 MSa/s				
Memory depth	2 MB/ch MEGAZoom				
Logic					
Max sample rate	n/a	400 MSa/s	n/a	400 MSa/s	n/a
Max memory depth	n/a	4 MB/ch	n/a	4 MB/ch	n/a
Display	High definition with 32 levels gray scale; 1,000-point horizontal resolution				
Display update rate	Up to 25,000,000 vectors/sec per channel				
Timebase (per division)	5 ns to 50 s				
Triggering	Edge, pulse width, pattern, I ² C, TV, sequence, duration				
Peak detect	5 ns				
Measurements	Peak, average, RMS, max, min, frequency, period, pulse width, rise/fall time, duty cycle				
Waveform math	Subtraction, multiplication, FFT, integration, differentiation				
Storage	Built-in 1.4 M floppy disk				
Connectivity	RS-232, parallel standard; optional GPIB; optional integrated printer				
Built-in help	In 9 languages				
Warranty	3 years standard, optional increase to 5 years				
Price	\$2,295	\$3,795	\$2,995	\$4,495	\$4,495

Find out what's really going on inside those mixed analog-digital circuits

Have the internal workings of your increasingly complex circuits become impossible to see? The new Agilent 54600 Series scopes combine the channel count, memory depth and display definition you need to see what's really happening.

With a unique 2+16 configuration that combines a pair of scope channels with 16 logic channels, the Agilent 54621D and 54622D will show you analog and digital signals simultaneously. Other models offer a choice of two or four analog channels, and all give you the exclusive Agilent MegaZoom® Deep Memory and high-definition display system.



Easily capture long, complex signals with **MEGAZoom®** Deep Memory

All models in the Agilent 54600 Series offer the exclusive Agilent MegaZoom Deep Memory technology with fast, responsive displays and 2 million samples of memory for every channel. MegaZoom shines in the toughest debugging situations:

- Capturing high-speed digital control signals and slower analog signals
- Viewing details of a single-shot event, such as a system power-up
- Analyzing signals when you're not sure where to trigger

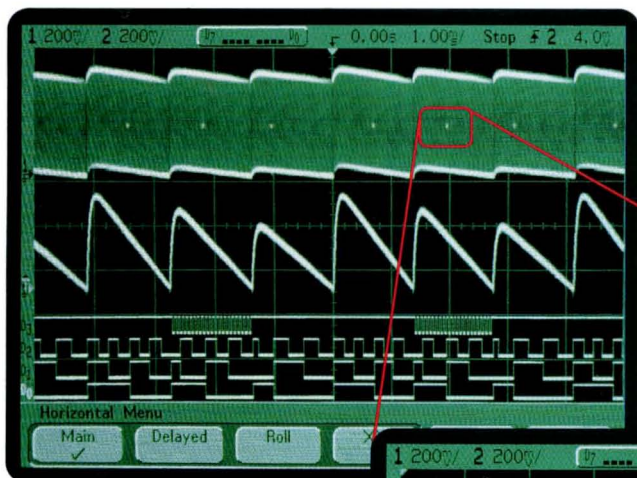
With MegaZoom, you automatically avoid the age-old digital scope dilemma of choosing between a long time capture or detailed resolution. MegaZoom gives you both, with a single measurement. You can collect 10 milliseconds of data and still view 5 nanosecond details, using familiar scope controls.

Capturing those signals is easier than ever, too, with the powerful triggering in the Agilent 54600 Series. Trigger on edges, pulse widths, patterns and even I²C signals common in mixed analog and digital designs.

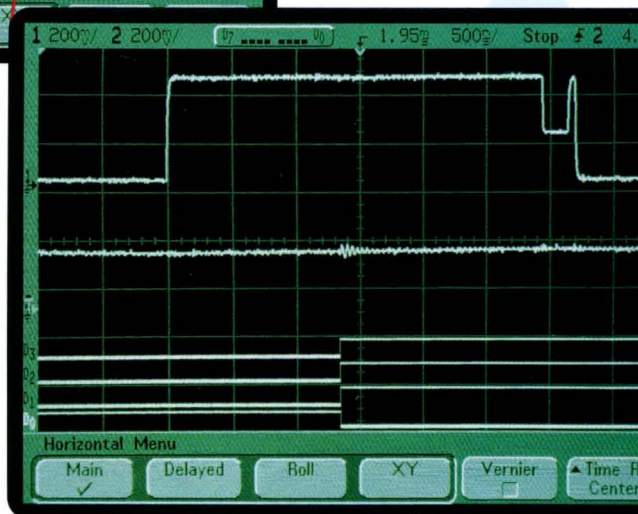
High-definition displays uncover details that you can't even see on other scopes

With nearly twice the horizontal resolution of any digital scope on the market, the patented new display technology in the Agilent 54600 Series oscilloscopes opens a new window into circuit behavior. You'll see subtle details in ways never before possible, from narrow transients to distorted edges to intermittent defects, with greater fidelity than you've probably ever seen in any digital scope.

By combining this high-resolution display with MegaZoom Deep Memory (2MB/ch) and a signal processing system that's up to 25 times faster than other digital scopes, the Agilent 54600 Series scopes add a unique viewing dimension to your measurements that maps the deep memory into 32 levels of gray scale. Now it's easy to see where you need to zoom in for a closer look.



The bright dot on the high-definition display is a distortion in 1 of the 1,500 pulses captured in this single shot measurement. Simply dial in for a closer look using MegaZoom pan and zoom, and you'll see the details that would've escaped other digital scopes, such as the distortion on this square wave. This deep-memory and display system is not a complex special mode, either. It is available on every measurement pass at full speed.



Helping you meet the analog and digital design challenge



The Agilent 54600 Series scopes solve three of the toughest problems designers face today with mixed analog and digital circuits: you can't see all the signals of interest at once, you can't find important details, and you can't see how analog and digital signals interact. With the channel count you need, MegaZoom Deep Memory and the unique high-definition display, you'll finally have that window to see inside your circuits.

As the worldwide leader in test and measurement, we're working hard to help engineers like you meet the analog and digital challenge. Whether your work is predominantly digital, predominantly analog, or somewhere in the middle, our experienced engineers can help you select the ideal debugging solution.



*Timothy Montague
BSEE, United States
Coast Guard Academy*

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Every scope user knows that the real test is how well the instrument performs in your environment, with your design. Call Agilent Technologies to arrange a free demo that'll give you and your team plenty of time to try the new Agilent 54600 Series scopes.

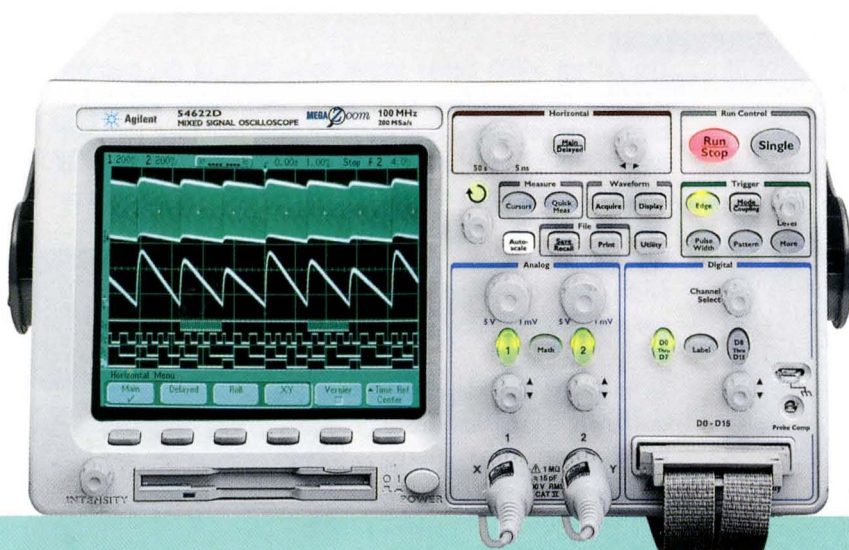
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POSIX-compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Technical Support						Price	Comments
											Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		
Caldera Thin Clients Inc., Lindon, UT, (801) 426-5001, www.caldera.com																		
✓	✓	✓	✓		✓			20 million+	Any DOS-compatible debugger	Any DOS-compatible compilers		U	\$	\$	U	\$	\$39	DR-DOS is a proven, embedded O.S. that includes multitasking, networking, Y2K compliance, and is ROMable and capable of running in FLASH memory.
CMX Systems Inc., Framingham, MA, (508) 872-7675, www.cmx.com																		
✓	✓	✓	✓					3,000+	Most and CMX CMXBug, CMXTracker, others	most	180	\$	\$	\$	\$	\$	\$1,500	Kernel aware to many emulators.
CodeGen Inc., San Francisco, CA, (415) 834-9111, www.codegen.com																		
✓	✓		✓		✓						365	U	\$	\$	\$	\$	\$10,000	
Datalight, Bothell, WA, (425) 951-8086, www.datalight.com																		
✓					✓	✓		three million	All DOS Debuggers	All DOS Compilers	U	U	U		U	\$	\$7.50/\$1,000	Compact, flexible. New utilities for specific embedded markets. Latest version includes disk utilities such as BACKUP, RESTORE, and DEFRAG.
✓		✓			✓	✓		20,000			U	U	U	U	U		\$7.50/\$1,000	Windows ver. 3.11 work-alike including GUI, multitasking and protected mode. Many new features and additional API calls in this version.
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com																		
	✓				✓	✓			DDC-I Ada Symbolic Debugger	DDC-I Ada Compiler Systems (DACS)	0	\$	\$	\$	\$	\$		
	✓	✓			✓	✓			DDC-I JOVIAL Debugger	DDC-I JOVIAL Compiler Systems (DJCS)	0	\$	\$	\$	\$	\$		
	✓				✓	✓			DDC-I SCORE Multi-Language Debugger	DDC-I SCORE Ada Compiler System and DDC-I SCORE C Compiler System	0	\$	\$	\$	\$	\$		
✓	✓	✓			✓	✓			Tartan AdaScope	Tartan Ada Development System	0	\$	\$	\$	\$	\$		
DSPealists, Berlin, Germany, +49-30-467 805-0, www.dspealists.de																		
		✓						100,000	Motorola, Domain, others	TASKING C, Motorola		U	U	\$	\$	\$		Initialization of the DSP and peripherals, system test, separation of system and app software, stand-alone operation of DSP system.
EBSnet Inc., Groton, MA, (978) 448-9340, www.ebsnetinc.com																		
✓		✓	✓	✓				5000	Metrowerks, Diab/SDS	Metrowerks, Diab/SDS	180	\$	\$	\$	\$	\$		RTKernelisc is EBSnet's port of On Time's RTKernel-32 RTOS to risc platforms. It is optimized for Motorola's MPC8XX processors.
Echelon Corp., Palo Alto, CA, (650) 855-7400, www.echelon.com																		
✓	✓	✓						10 million	Neuron C Debugger	Neuron C	45	U	\$	\$	\$	\$		

REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPUs supported	Languages supported	Typical ROM req'd, min in 1,000's of bytes	Typical ROM: max in 1,000's of bytes	Typical RAM req'd, min in 1,000's of bytes	Typical RAM req'd, max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in clock cycles	MMU support	Modular link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
EMAC Inc., Carbondale, IL, (618) 529-4525, www.emacinc.com														
		C, C++, Java	4	22	8	32		Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities		✓	✓	✓	✓	✓
Enea OSE Systems Inc., Dallas, TX, (214) 346-9339, www.enea.com														
OSE Real-Time Operating System	Can be ported to any CPU	Assembly, Verilog, Corba IDL, RTOS target code generation, C, C++, Java, SDL	60		300	20	20	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking, Proprietary	57s	✓	✓		✓	✓
Eonic Systems, Aarschot, Belgium, +32 16 621 585, www.eonic.com														
Virtuoso														
e-SIM Inc., Pasadena, CA, (626) 584-7810, www.e-sim.com														
RapidPLUS Embedded Development System	All processors for which an ANSI compiler is available, All CPUs supporting a JVM	C, Java	12-22				3 - 3						✓	✓
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com														
lbed	68K, ARM, ColdFire, MIPS, PowerPC	Assembly, C, Java	10	611	10	0.28	300	Round Robin, Time Slice, Proprietary				✓	✓	
Express Logic Inc., San Diego, CA, (619) 674-6684, www.expresslogic.com														
ThreadX/Express Logic	68HC11, 68HC12, 68HC16, 68K, ARM, ColdFire, H8, i960, MIPS, MPC8xx, PowerPC, ARC, SH, SPARC, TMS320 and other TI DSPs, V800, x86 Protected Mode, x86 Real Mode	Assembly, C, C++	2	15	1	1	120	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking, Proprietary	96	✓	✓	✓	✓	
Eyring Corp., Midvale, UT, (801) 561-1111, www.eyring.com														
Eyrx	x86 Protected Mode	Assembly, C	32	128	64	2048	2048	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary	214		✓	✓	✓	
PDOS	68K	Assembly, C, C++						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities						
FS FORTH-SYSTEME GmbH, Breisach, Germany, +49 7667 908 0, www.fsforth.de														
Windows CE Quick Load Package with compression support	ARM													
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com														
G-OS	68K, ARM, H8, SH, V800	C	12	15			1	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling			✓		✓	

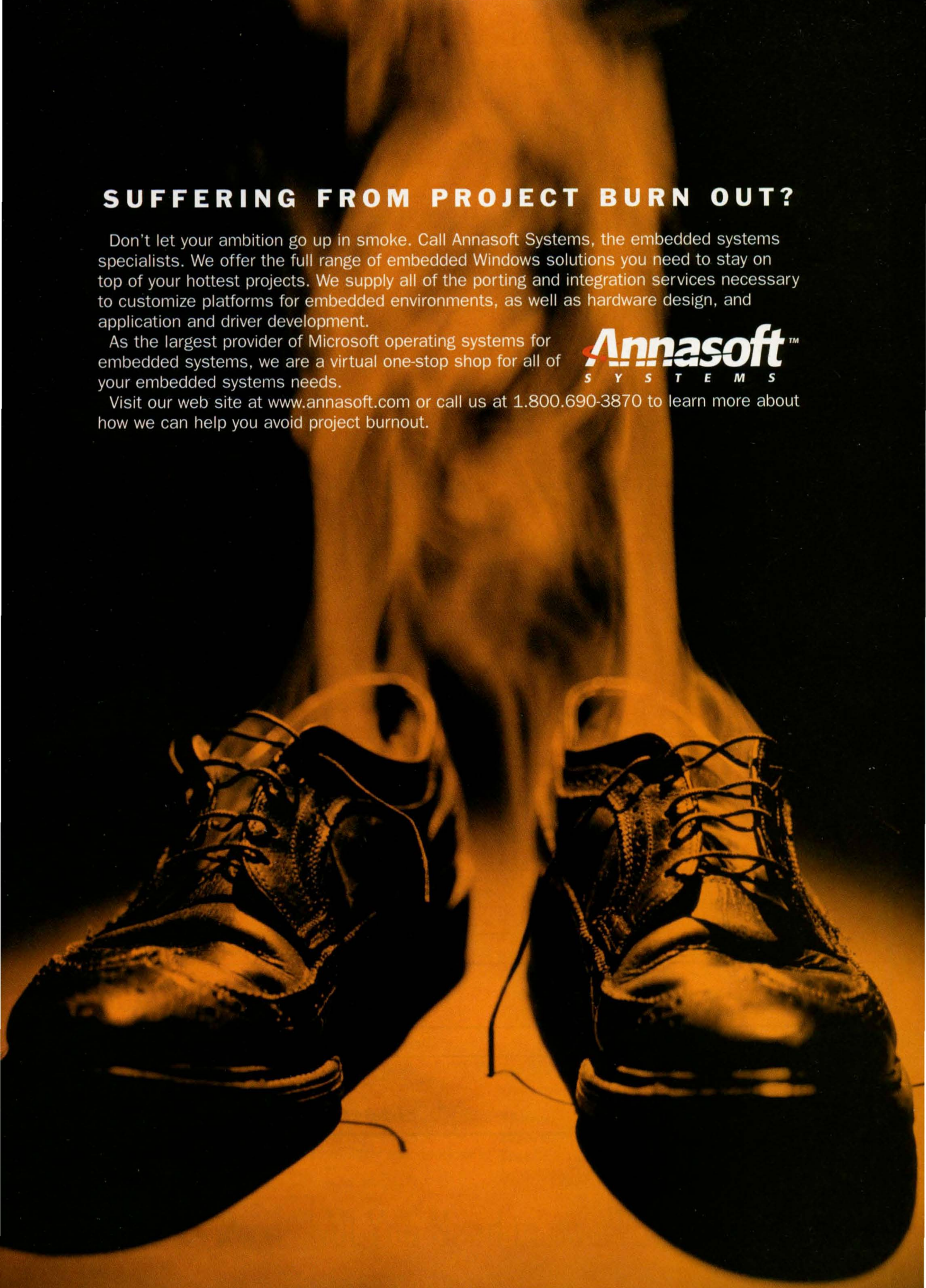
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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

										Technical Support							Comments	
POSIX-compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		Price
EMAC Inc., Carbondale, IL, (618) 529-4525, www.emacinc.com																		
✓	✓	✓	✓	✓			✓		GDB									Embedded Linux and Extensions. Boots from Flash.
Enea OSE Systems Inc., Dallas, TX, (214) 346-9339, www.enea.com																		
✓	✓	✓	✓			✓	✓	20,000+	SingleStep Debugging Solutions Green Hills Multi 2000 Mentor Graphics - XRay	Green Hills Optimizing C/C++ compilers, SDS/Diab Data's FASTJ, D-C++ & D-CC	\$	\$	\$	\$	\$			It was designed with a message-based architecture that enables developers to build realtime applications that require runtime maintenance, hot swapping, memory protection, and error recovery.
Eonic Systems, Aarschot, Belgium, +32 16 621 585, www.eonic.com																		
e-SIM Inc., Pasadena, CA, (626) 584-7810, www.e-sim.com																		
	✓	✓		✓	✓	✓			Any ANSI(C), JDK compliant	Any ANSI(C), JDK compliant	30							
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com																		
	✓	✓	✓			✓	✓	50	Proprietary, included.	Any Java bytecode compiler. Bytecode or native compiler included.	365	U	\$	U	U	\$		Earliest deadline first scheduling with admission testing.
Express Logic Inc., San Diego, CA, (619) 674-6684, www.expresslogic.com																		
	✓	✓	✓	✓	✓		✓	1,000	MULTI, SeeCode, SingleStep, CodeWarrior, APEX, XRAY	Green Hills Software, MetaWare, Diab Data, Metrowerks, GNU, others	180	\$	\$	\$	\$	\$	\$6,000 to \$12,500	Features: Picokernel Architecture, preemption-threshold, fast software timers, full source code, no royalties, portable embedded graphics, embedded file system, full TCP/IP support, full JAVA support.
Eyring Corp., Midvale, UT, (801) 561-1111, www.eyring.com																		
✓		✓	✓				✓			Visual C 4.1, 5.0, 6.0	180	U	\$	\$	\$	\$	495	Develop and test on Windows-NT host or target. 32-bit protected mode. Boot from ROM, flash, disk, or MS-DOS prompt. Synchronous message passing, shared memory, semaphores. High precision clock.
	✓	✓	✓			✓			InSpector, PXray, XRAY/MTD	Microtec C - C++, GNU	365	U	\$	\$	\$	\$	\$769	
FS FORTH-SYSTEME GmbH, Breisach, Germany, +49 7667 908 0, www.fsforth.de																		
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com																		
	✓		✓	✓					GAIO Open Plus	GAIO Open Plus	0		\$		\$	\$		A real-time multitasking OS based on the ultron 3.0 specifications with extended level implementation. G-OS features.

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- IDT RC3081, RC4640/50, R5000, RC32364
- LSI LR 33000, 40xx, 410x, 64008, Lexra 4180, NEC 41xx, 4300, 5000, NKK 4650, Toshiba TX3904, 3927
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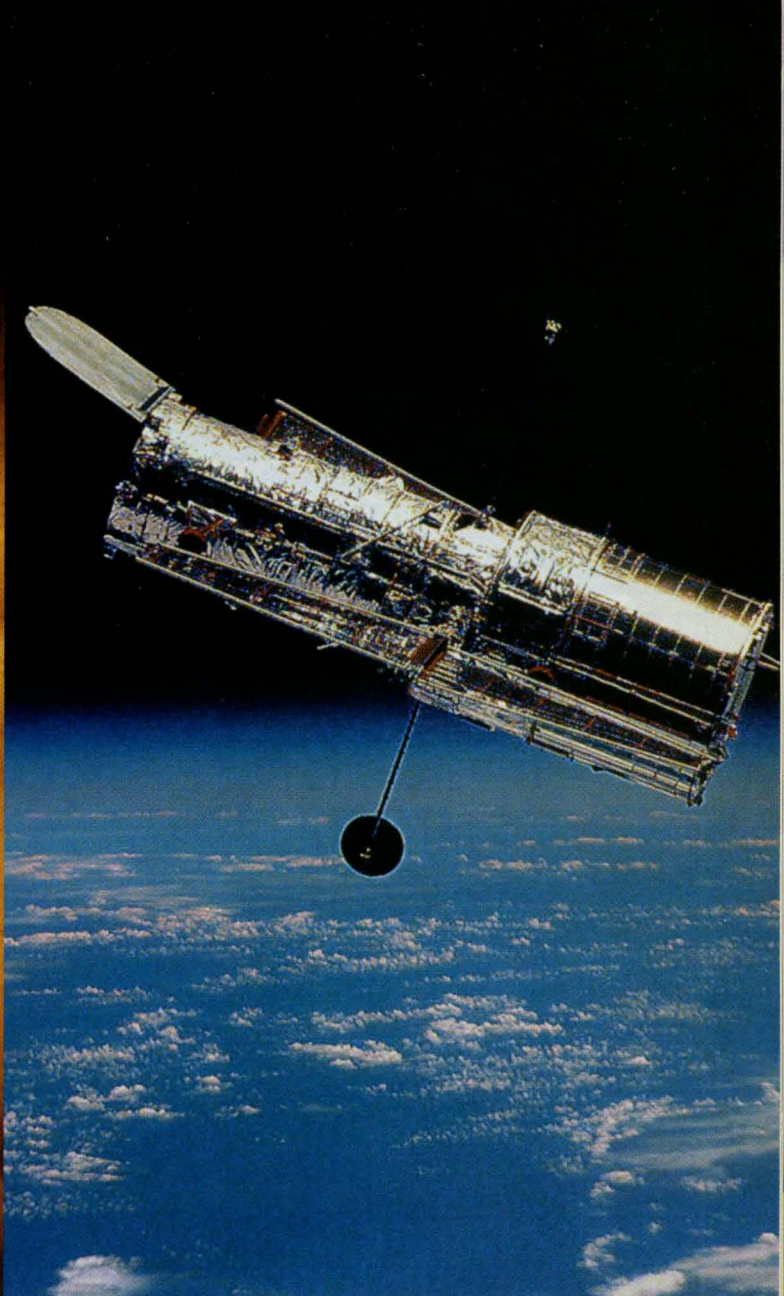
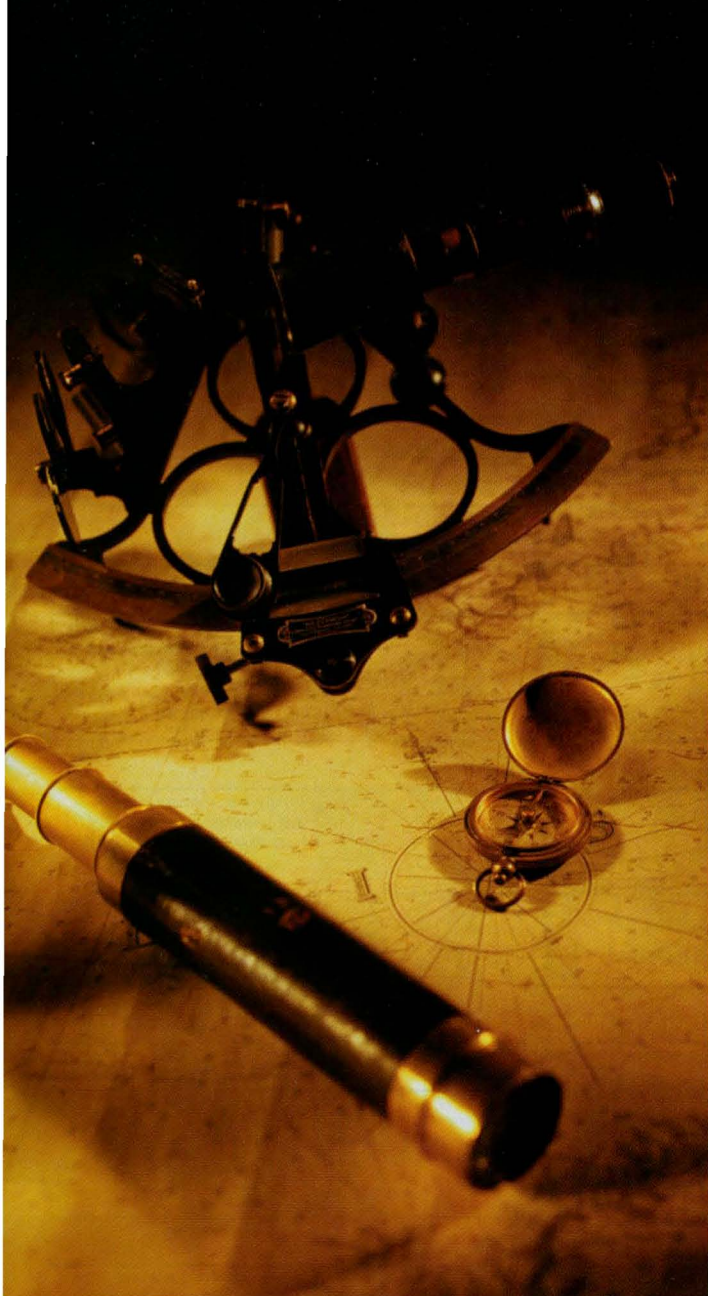
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Product name	Target CPUs supported	Language supported	Typical ROM req'd: min in 1,000's of bytes	Typical ROM: max in 1,000's of bytes	Typical RAM req'd: min in 1,000's of bytes	Typical RAM req'd: max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time in clock cycles	MMU support	Module link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
General Software Inc., Bellevue, WA, (425) 454-5755, www.gensw.com														
Embedded BIOS 4.2 Adaptation Kit	x86 Protected Mode, x86 Real Mode	Ada, Assembly, C, C++, Forth, Fortran, Other, Java	16	256	256	4194	304			✓	✓			
Gespac Inc., Mesa, AZ, (480) 962-5559, www.gespac.com														
	68K, Pentium, PowerPC, TMS320 and other TI DSPs	C												
GoAhead Software Inc., Bellevue, WA, (425) 453-1900, www.goahead.com														
GoAhead HighAvailability														
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com														
INTEGRITY	PowerPC	Ada, Assembly, C, C++						Round Robin, Time Slice, Tasks can dynamically alter priorities, Proprietary	50-100	✓	✓	✓	✓	✓
ThreadX/Green Hills Software	68K, ARM, ColdFire, i960, MIPS, MPC8xx, PowerPC, SH, SPARC, V800, x86 Protected Mode	C, C++	2	15	1	1	120	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking, Proprietary	340	✓	✓	✓	✓	
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com														
PXROS	68K, ST10, TriCore, C16x, PowerPC, x86 Protected Mode	Assembly, C, C++	6		0,05		0,2	Round Robin, Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking		✓		✓	✓	✓
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com														
SOOM-System	68HC11, 68HC16, 68K, H8	Assembly, Other, C	1	12	0.6	5	0.16	Round Robin, Fixed priority, Cooperative multitasking	180		✓	✓	✓	
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com														
Hypersignal RIDE	TMS320 and other TI DSPs, ADSP2181, ADSP2106x, 56K	Assembly, C, C++						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking		✓	✓	✓	✓	✓
Inferno Network Software, Murray Hill, NJ, (908) 582-6489, www.lucent-inferno.com														
Inferno Operating System	ARM, PowerPC, x86 Protected Mode, 1100, StrongARM 110, x86 Real Mode	C, Other	512	1,024	512	1,024		Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities	715		✓	✓	✓	✓
Integrated Chipware, Reston, VA, (703) 736-3500, www.chipware.com														
icWORKSHOP	68K, ARM, ColdFire, MIPS, PowerPC	Ada, Assembly, C, C++, Java						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary		✓	✓	✓	✓	✓



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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

PC/AT compatible	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Technical Support							Price	Comments
											Days of free phone support	BBS/Web FAQs	Jug labs, other	Phone support, standard	Phone support, 24-hour response	Product updates			
General Software Inc., Bellevue, WA, (425) 454-5755, www.gensw.com																			
✓	✓	✓	✓	✓					Built-in BIOS-level target-side debugger	Borland TASM, Microsoft MASM	30							\$10,000	Version 4.2 further extends support for the latest embedded evaluation boards including: Pentium, K6, Elan SC300/400, Am486PCICDP, Cyrix's MediaGXm; STMicroelectronics' STPC, more.
Gespac Inc., Mesa, AZ, (480) 962-5559, www.gespac.com																			
✓	✓	✓									365	U				\$	\$		
GoAhead Software Inc., Bellevue, WA, (425) 453-1900, www.goahead.com																			
																			Through a system-based approach, the SW monitors HW, apps, and OSes through configuration management, heartbeating, checkpointing, fault management.
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com																			
✓	✓	✓	✓	✓			500		MULTI Source-Level Debugger	Green Hills Optimizing Compilers	90	\$	\$	\$	\$	\$			Royalty-free, memory protection, fault tolerance, high availability, event analyzer, and ISIM simulator.
✓	✓	✓	✓				300+		MULTI Source-Level Debugger	Green Hills Optimizing Compilers	180	\$	\$	\$	\$	\$			Automatic scaling, highly optimized software timers, small footprint.
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																			
✓	✓	✓		✓					TGDB, fastview	GNU, Tasking	365	\$	\$	\$	\$	\$		DM5.90 0,00	
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com																			
	✓		✓					Most			180	\$	\$	\$	\$	\$			Service and object-oriented system
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com																			
✓	✓	✓	✓								U	U	U	\$	\$		\$3,995	Provides direct real-time support for a variety of DSPs via a block diagram interface and provides additional development features such as code profiling, application export, source code generation, target memory map control, and more.	
Inferno Network Software, Murray Hill, NJ, (908) 582-6489, www.lucent-inferno.com																			
✓	✓	✓	✓	✓	✓		15,000		GDB, ACID	Inferno, GCC	90	U	\$	\$	\$	\$	0		A network OS designed to be network independent and deliver services through various networks.
Integrated Chipware, Reston, VA, (703) 736-3500, www.chipware.com																			
✓	✓	✓	✓	✓	✓			Most	Most		U	U	U	U	U	\$	\$50,000		A components based tool for building application-specific RTOSeS. The only tool supplying Software IP for Hardware IP.



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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPUs supported	Languages supported	Typical ROM req'd min in 1,000's of bytes	Typical ROM req'd max in 1,000's of bytes	Typical RAM req'd min in 1,000's of bytes	Typical RAM req'd max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in clock cycles	MMIO support	Modular link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com														
eRTOS	x86 Real Mode	Assembly, C, C++	512	16	256	1,096		Round Robin, Time Slice, Tasks can dynamically alter priorities		✓		✓		
JMI Software Systems Inc., Dover, NH, (408) 287-7090, www.jmi.com														
C Executive	Can be ported to any CPU	Assembly, C	5	22	1	2	0.3	Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	50	✓	✓	✓		
PSX	Can be ported to any CPU	Assembly, C	25	45	2	4	0.3	Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	50	✓	✓	✓		
Jovian Systems Inc., Woburn, MA, (781) 937-6300, www.jovian.com														
Pegasus Graphical DSP OS Application Development Environment	ADSP2106x, C67x, C62x	Assembly, C	6	10	1.2	6	5.7 for C6x, 1.2 for Sharc	Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	30	✓		✓	✓	
KADAK Products Ltd., Vancouver, BC, (604) 734-2796, www.kadak.com														
AMX	29K, 68K, ARM, ColdFire, i960, MIPS, MPC8xx, PowerPC, x86 Protected Mode, x86 Real Mode, Z80/Z180	Assembly, C, C++						Time Slice, Fixed priority, Tasks can dynamically alter priorities		✓	✓	✓		
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com														
RTX/Keil Software	80251, 8051 and derivatives, C166	Assembly, C	8	16	11	16	11	Round Robin, Time Slice, Tasks can dynamically alter priorities	100			✓		
LinuxWorks, San Jose, CA, (408) 879-3900, www.linuxworks.com														
LynxOS Full-Featured RTOS	MIPS, MPC8xx, PowerPC, MPC8260, SH, SPARC, x86 Protected Mode	Ada, Assembly, C, C++, Other, Fortran, Java	37	263	11	32	8	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling		✓	✓	✓	✓	✓
Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded														
VRTX	68K, ARM, MPC8xx, PowerPC, x86 Protected Mode, x86 Real Mode, M Core	Assembly, C, C++, Java						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities		✓	✓	✓	✓	
Micrium Inc., Weston, FL, (954) 217-2036, www.micrium.com														
MicroC/OS-II	Most	Assembly, C, C++	4	8	3	5	500	Fixed priority, Tasks can dynamically alter priorities	10	✓	✓	✓		
Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com														
smx/smx++	ColdFire, PowerPC, x86 Protected Mode, x86 Real Mode, Portable version	Assembly, C, C++	8.7	30.5	12		1,000	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	600	✓	✓	✓		

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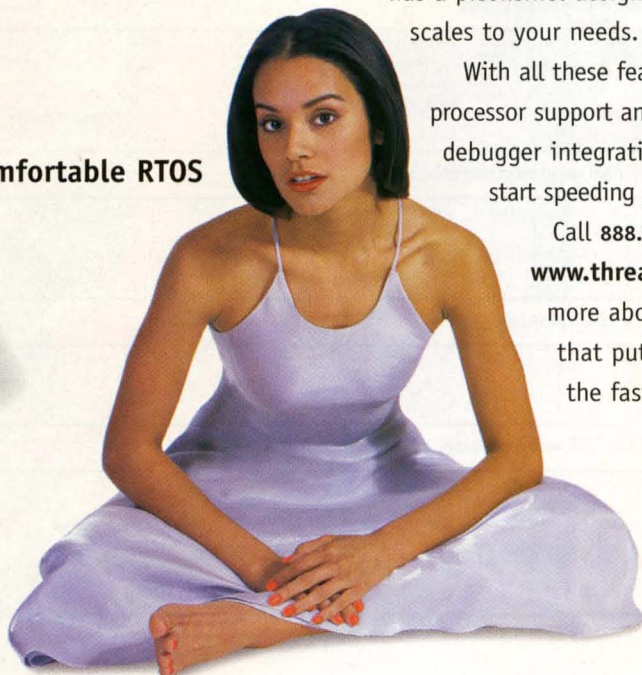
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										Technical Support							Comments		
POSIX compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debugger supported	Compilers supported	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		Price	
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com																			
✓	✓	✓	✓						Borland Remote Turbo Debugger	Borland C/C++	120	U						\$795	
JMI Software Systems Inc., Dover, NH, (408) 287-7090, www.jmi.com																			
✓		✓	✓	✓				50 million+	SoftScope, SingleStep	Cygnus, Matcom, Green Hills, Borland, SDS, Diab Data, Intel	365	\$	\$	\$	\$	\$	\$	\$2,500	
✓	✓	✓	✓	✓				50 customers, 1.5 million installs	SoftScope, SingleStep	Diab Data, Cygnus, Green Hills, Matcom, Intel, SDS	365	\$	\$	\$	\$	\$	\$	\$3,750	Single user, single group. Subset of POSIX.1.
Jovian Systems Inc., Woburn, MA, (781) 937-6300, www.jovian.com																			
		✓	✓	✓					Most	TI C compilers and ADI C compilers.	90	U	\$	\$	\$	\$		17,000	Provides a graphical front-end and code-generation that targets a real-time DSP OS. Whole apps are produced, including DSP and user interface and DSP server code for a host.
KADAK Products Ltd., Vancouver, BC, (604) 734-2796, www.kadak.com																			
✓		✓	✓	✓				1,700	Most	Most	365	U	\$	\$	\$				A Windows app to specify the characteristics of AMX apps. Only those options required in your system are included by the builder.
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com																			
		✓	✓	✓					dScope		365	\$	\$	U	\$	U			
LinuxWorks, San Jose, CA, (408) 879-3900, www.linuxworks.com																			
✓	✓	✓	✓	✓	✓	✓	✓		TotalView, TimeScan, Insure++, Total/db, gdb, skdb		0	U	\$	\$	\$	\$			
Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded																			
✓	✓	✓	✓	✓	✓	✓	✓	50,000	XRAY Debugger		0	\$	\$	\$	\$	\$		\$1,000	
Micrium Inc., Weston, FL, (954) 217-2036, www.micrium.com																			
✓		✓	✓	✓	✓			2,000		All ANSI-compatible compilers.	1	U	\$	U	\$			\$50	MicroC/OS-II is a portable, ROMable, preemptive real-time kernel.
Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com																			
✓	✓	✓	✓	✓	✓	✓	✓	300	Soft-Scope, VisualProbe, Paradigm, Single Step, Code Warrior	Borland, Diab, High, Visual, Watcom, C/C++, Code Warrior	180	U	\$	\$	\$	\$		\$4,000 to \$6,000	Provides real-time multitasking services. It features extensive error management, high performance, and efficient memory utilization. smx++ adds a C++ interface and support.



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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPUs supported	Languages supported	Typical ROM req'd, min in 1,000's of bytes	Typical ROM req'd, max in 1,000's of bytes	Typical RAM req'd, min in 1,000's of bytes	Typical RAM req'd, max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in task cycles	MMIO support	Modbus link	Resource lockings	Semaphores, mutexes, and queues	Multiprocessor support
Microsoft Corp., Redmond, WA, (425) 882-8080, www.microsoft.com/windows/embedded														
Windows CE and Platform Builder 3.0	80196, 80251, ARM, MIPS, PowerPC, SH, x86 Protected Mode	Assembly, VB, C, C++						Round Robin, Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking		✓	✓	✓	✓	
Windows NT Embedded and Target Designer	Pentium, Pentium II III Slot 1 processors, Pentium II, Pentium III, Pentium II III Xeon processors, Pentium Pro processor	C, C++, Basic, Java						Round Robin, Cooperative multitasking, Tasks can dynamically alter priorities, Time Slice		✓		✓	✓	✓
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com														
OS-9	68K, ARM, PowerPC, SH, x86 Protected Mode, StrongARM	Assembly, C, C++, Java	128	6	128	16	about 2,000	Round Robin, Time Slice, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary	100	✓	✓	✓	✓	
MODCOMP Inc., Fort Lauderdale, FL, (954) 974-1380, www.modcomp.com														
REAL/IX PX	Pentium	C, C++, Fortran						Round Robin, Fixed priority, Tasks can dynamically alter priorities		✓			✓	✓
MoJo Designs Inc., Boulder, CO, (303) 443-6035, www.mojodesigns.com														
Eyelet GUI	68K, ARM, MIPS, StrongARM, MPC8xx, PowerPC, x86 Protected Mode	C, C++	128	512	128	512								
NETsilicon Inc., Waltham, MA, (781) 647-1234, www.netsilicon.com														
NET+OS/NET+Works Development Environment														
NSI Com, Or-Yehuda, Israel, 11-972-3533-1976, www.nsicom.com														
JSCP - Software Co-Processor for Java	68K, ARM, i960, MIPS, PowerPC, SH, SPARC, Philips TriMedia, x86 Protected Mode, x86 Real Mode	Java										✓		✓
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com														
On Time RTOS-32	x86 Protected Mode	Assembly, C, Delphi, C++, Java, Other	8	256	1024	0.5 (512 bytes)	256	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	100	✓	✓	✓	✓	
RT Kernel-C	x86 Real Mode	C, C++	12	16	4	6	0.5	Round Robin, Cooperative multitasking, Tasks can dynamically alter priorities, Time Slice				✓	✓	

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REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

										Technical Support									
POSIX-compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Days of free phone support	885/Week FAXs	Log Jct's, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Comments
Microsoft Corp., Redmond, WA, (425) 882-8080, www.microsoft.com/windows/embedded																			
✓	✓	✓	✓	✓	✓	✓			Kernal Debugger, Application Debugger		U	\$	\$		\$				Windows CE is a compact, modular OS that combines Windows with real-time processing support. Windows CE powers a wide range of purpose-specific devices.
✓		✓			✓	✓					U	\$	\$		\$				Windows NT Embedded provides networking capabilities for medium and high-end intelligent appliance designs. The OS is designed for devices that are interconnected, based on the PC architecture.
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com																			
✓	✓	✓	✓			✓	three million	Hawk		UCC + GCC	30	\$	\$	\$	\$	\$			Provides a complete software base-line with advanced networking, multimedia I/O, and power management facilities. The strong run-time architecture of OS-9 prevents accidental or malicious system corruption.
MODCOMP Inc., Fort Lauderdale, FL, (954) 974-1380, www.modcomp.com																			
✓	✓	✓	✓		✓						90		\$		\$	\$		\$2,990	
MoJo Designs Inc., Boulder, CO, (303) 443-6035, www.mojodesigns.com																			
		✓	✓					SDS, Metrowerks, ARM, Cygnus	Diab, Metrowerks, ARM, Cygnus		365	\$	\$	\$	\$	\$		\$12,000	The Eyelet GUI provides powerful tools to create custom GUIs that reflect a product's personality. The Eyelet GUI is an embedded GUI that is portable across multiple processors, RTOSSs, and hardware.
NETsilicon Inc., Waltham, MA, (781) 647-1234, www.netsilicon.com																			
											365							\$19,995	
NSI Com, Or-Yehuda, Israel, 11-972-3533-1976, www.nsicom.com																			
✓	✓	✓	✓	✓	✓	✓					180	\$	\$	\$	\$	\$			Enables optimized and immediate implementation of Java on Embedded Devices. Compared to regular JVM porting, JSCP offers its customers important advantages: high robustness, low footprint, improved determinism, maintainability and performance.
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com																			
✓	✓	✓	✓	✓	✓		5,000	Microsoft Visual Studio integrated debugger, RTD-32	Any other compiler that produces a PE file	U	U	U	U	\$	\$			1,700	Windows NT subset kernel implements a Win32 subset API for source and bindary compatible with Windows NT. Develop completely inside Microsoft Visual Studio or with Borland C, Delphi or Watcom C.
✓	✓	✓	✓				5000+	Borland, Microsoft, Paradigm	Borland and Microsoft C (16-bit compilers)	U	U	U	U	\$	\$			\$550	RTKernel-C is a high-performance real-time multitasking kernel for MS-DOS and real-mode x86 embedded systems.

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Product name	Target CPUs supported	Languages supported	Typical ROM req'd, min in 1,000's of bytes	Typical ROM req'd, max in 1,000's of bytes	Typical RAM req'd, min in 1,000's of bytes	Typical RAM req'd, max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in clock cycles	MMU support	Modular link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
RTKernel	x86 Real Mode	Assembly, C, C++, Pascal	10	16	512	6	8	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	100		✓	✓	✓	
PC Engines, Sunnyvale, CA, (408) 733-3901, www.pcengines.com														
tinyBIOS	x86 Protected Mode, x86 Real Mode	Assembly	16	32										
Phar Lap Software Inc., Cambridge, MA, (617) 661-1510, www.pharlap.com														
TNT Embedded ToolSuite, Realtime Edition	x86 Protected Mode	Ada, C, C++	48	600	17	540	10	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking			✓	✓	✓	
Phoenix Technologies, San Jose, (408) 570-1000, www.phoenix.com														
Phoenix BIOS/Award BIOS	x86 Protected Mode	Assembly, C, C++, Java												
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.psti.com														
Precise/MQX	Can be ported to any CPU	Assembly, C, C++	3	40	128	1.5		Round Robin, Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking, Proprietary		✓		✓	✓	✓
QNX Software Systems Ltd., Kanata, ON, Canada, (613) 591-0931, www.qnx.com														
QNX realtime OS	MIPS, PowerPC, x86 Protected Mode, x86 Real Mode	C, C++	32	64	8	32	0.2 per thread	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Proprietary	1.95 msec	✓		✓	✓	✓
RadiSys Corp., Hillsboro, OR, (503) 615-1100, www.radisys.com														
	x86 Protected Mode, x86 Real Mode	Assembly, C, C++			4MG	U		Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	20µs	✓	✓	✓	✓	
SEGGER Microcontroller System GmbH, Germany, www.segger.com														
embOS	78K series, 8051 and derivatives, MELPS 7700, M16C, V850, V800, x86 Real Mode, Other	Assembly, C, C++	1.3	5	250	500	30	Round Robin, Time Slice, Tasks can dynamically alter priorities				✓	✓	
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com														
SKYmpx	i860, PowerPC, SH	Assembly, C, C++	0	0	20	500	1,024	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities		✓			✓	✓



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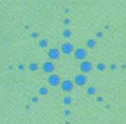
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											Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
✓	✓	✓	✓	✓	✓	✓	✓	5,000	Paradigm Debug, Turbo Debugger, Codeview, Borland/Microsoft integrated debuggers	Microsoft C/C++, Borland C/C++, Borland Pascal	U	U	U	U	\$	\$	\$550	Hard real-time multitasking under DOS or Paradigm tools.	
PC Engines, Sunnyvale, CA, (408) 733-3901, www.pcengines.com																			
✓	✓	✓	✓	✓	✓	✓	✓				90	\$	\$	\$	\$	\$	\$1,995		
Phar Lap Software Inc., Cambridge, MA, (617) 661-1510, www.pharlap.com																			
✓	✓	✓	✓	✓	✓	✓	✓	5,000	Microsoft Developer Studio IDE	Microsoft Visual C/C++ Compiler	U	U	U	U	\$	\$	\$4,995	Hard real-time deterministic RTOS based on Win32 API. Multithreaded, multitasking, preemptable, ROMable kernel, small memory footprint, Windows development hosts, TCP/IP based on WinSock API, Web ready with ETS MicroWeb Server, GUI, SNMP target file system.	
Phoenix Technologies, San Jose, (408) 570-1000, www.phoenix.com																			
✓	✓	✓	✓	✓	✓	✓	✓		PHDEBUG—provides ICE-like debugging in ISA, PCI or USB environments.	Microsoft ASM			\$	\$	\$	\$		Provides system firmware capabilities for embedded desktops, notebooks, servers and information apps. Features include power management, console redirection, USB Boot capabilities.	
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.psiti.com																			
✓	✓	✓	✓	✓	✓	✓	✓	500	Most	Most	90	\$	\$	\$	\$	\$	12,500	The modularity of Precise/MQX lets the user control the size and functionality of this comprehensive and full-featured RTOS.	
QNX Software Systems Ltd., Kanata, ON, Canada, (613) 591-0931, www.qnx.com																			
✓	✓	✓	✓	✓	✓	✓	✓	1,000,000	CodeWarrior IDE for QNX Neutrino, GNU GDB, Watcom C/C++	GNU GCC C/C++, Watcom C/C++	U	\$	\$	\$	\$			A scalable, fault-tolerant RTOS. Its advanced UPM architecture enables you to reduce development time, re-compile and retest without changing the kernel, create custom drivers using source-level tools, while relying on full MMU protection.	
RadiSys Corp., Hillsboro, OR, (503) 615-1100, www.radisys.com																			
✓	✓	✓	✓	✓	✓	✓	✓		Soft-Scope, System Debug Monitor, Microsoft Visual Debugger	Microsoft Visual C/C++									
SEGGER Microcontroller System GmbH, Germany, www.segger.com																			
✓	✓	✓	✓	✓	✓	✓	✓	250	Lauterbach, Ashling, Mitsubishi	IAR, Tasking, Mitsubishi, Green Hills	90	\$	\$	\$	\$	\$	DM 2500+	Easily portable to any 8/16/32 bit CPU; small kernel; preemptive multitasking; fully interruptable kernel.	
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com																			
✓	✓	✓	✓	✓	✓	✓	✓		Uniprocessor debugger included, optional multi-processor debugger available	C, C++	90	\$	\$	\$	\$			Supports thousands of processors.	



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Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com														
QuickTask	Z80/Z180	Assembly, C	1	3	1	2	1	Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking		✓	✓			
TurboTask	Z80/Z180, Other	Assembly, C	1	2.5	.5	2	.1	Round Robin, Time Slice, Cooperative multitasking, Tasks can dynamically alter priorities		✓	✓		✓	
Spectrum Signal Processing, Burnaby, BC, (604) 421-5422, www.spectrumsignal.com														
Diamond	Alpha, SHARC, TMS320 and other TI DSPs	Assembly, C			12	36	0.25	Round Robin, Cooperative multitasking, Tasks can dynamically alter priorities, Time Slice	102		✓		✓	✓
Sun Microsystems Inc., Palo Alto, CA, (800) 786-0404, www.java.sun.com														
ChorusOS	ARM, MPC8xx, PowerPC, SPARC, x86 Real Mode	Assembly, C, C++, Java						Round Robin, Time Slice, Tasks can dynamically alter priorities		✓			✓	✓
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com														
Nucleus PLUS/TASKING	C16x, MPC8xx, PowerPC, TriCore	Assembly, C, C++, Java						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Cooperative multitasking	620 micro seconds		✓	✓	✓	
Precise	68K, MIPS, MPC8xx, PowerPC	Assembly, C, C++	4	40	5		0.15	Round Robin, Time Slice, Tasks can dynamically alter priorities			✓	✓	✓	✓
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com														
Real-Time Mach	x86 Protected Mode	Ada, Assembly, C, C++, Fortran, Java			16			Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Proprietary			✓	✓	✓	
Trillium Digital Systems Inc., Los Angeles, CA, (310) 442-9222, www.trillium.com														
	ARM, MIPS, MPC8xx, PowerPC, SPARC, Z8, Z80/Z180	C						Round Robin						
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com														
SuperTask!	Most	C	7	25	6	30	<1k	Round Robin, Time Slice, Tasks can dynamically alter priorities, Cooperative multitasking	5 - 10 ms		✓	✓	✓	
TronTask! 3.0	ARM, ColdFire, M Core, MPC8xx, CR16, SH, x86 Protected Mode, x86 Real Mode	C	8	20	6	30	<1K	Round Robin, Tasks can dynamically alter priorities, Cooperative multitasking	5 - 10 ms		✓	✓	✓	

PDSIX compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Technical Support					Price	Comments
											Days of free phone support	BBS/Web FAQ, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates		
Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com																	
			✓						Most	Most	90	U	\$	\$	\$	\$399	
		✓		✓							90		\$		\$	499	Can enable/disable device interrupts when queues empty or fill. Most function support finite or infinite delays, supports banked switched programs, has statically allocated resources to lower overhead.
Spectrum Signal Processing, Burnaby, BC, (604) 421-5422, www.spectrumsignal.com																	
		✓						3,000	Code Composer	TI, Analog Devices	365	\$	\$	\$	\$	\$	Simplifies code development for high-performance, multi-processor DSP systems. During design, the functional components of an application are mapped to logical tasks independently of hardware topology.
Sun Microsystems Inc., Palo Alto, CA, (800) 786-0404, www.java.sun.com																	
✓	✓	✓	✓			✓	✓					\$	\$	\$	\$	\$	
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com																	
	✓		✓	✓			✓	100	CrossView Pro	TASKING C and C++	90	U	\$		\$	\$	\$12,500
✓	✓		✓	✓				2,000	CrossView Pro	TASKING C and C++	90	U	\$		\$	\$	\$12,500
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com																	
✓	✓	✓	✓	✓			✓				0	U	\$	\$	\$	\$	Real-Time Mach is publicly available.
Trillium Digital Systems Inc., Los Angeles, CA, (310) 442-9222, www.trillium.com																	
			✓							Compiler-independent	60		\$		\$	\$	
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com																	
	✓		✓	✓				2,300	SingleStep, CAD-UL, Metrowerks, Green Hills	Most	90		\$		\$	\$	Multitasking RTOS using a kernel containing over 70 system calls. Source code is included, no royalties.
	✓		✓	✓					SingleStep, CAD-UL, Metrowerks, Green Hills	Diab Data, Green Hills, Borland, Microsoft, GNU, Hitachi	90		\$		\$	\$	Powerful multitasking kernel based on the µITRON 3.0 specification.

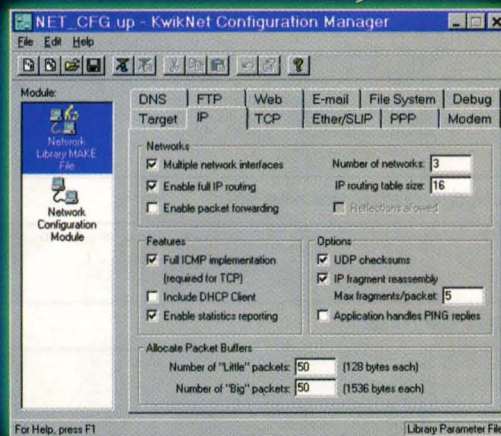
REAL-TIME OPERATING SYSTEMS/KERNELS/EXECUTIVES

Product name	Target CPUs supported	Language supported	Typical ROM req'd: min in 1,000's of bytes	Typical ROM req'd: max in 1,000's of bytes	Typical RAM req'd: min in 1,000's of bytes	Typical RAM req'd: max in 1,000's of bytes	Min. RAM req'd per task in bytes	Multitasking strategy	Typical context switch time, in clock cycles	MMU support	Modular link	Resource lockings	Semaphores, mailboxes, and queues	Multiprocessor support
VenturCom Inc., Cambridge, MA, (617) 661-1230, www.vci.com														
RTX for Windows NT and Windows CE	x86 Real Mode	C, C++, Java						Round Robin, Time Slice, Fixed priority, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary		✓	✓	✓	✓	✓
Viosoft Corp., Campbell, CA, (408) 341-1015, www.viosoft.com														
OnLinux														
Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com														
Tornado	68K, ARM, C16x, M Core, ColdFire, RAD6K, CPU32, i960, MIPS, PowerPC, SH, SPARC, x86 Protected Mode	Assembly, C, C++, Java	15	5				Round Robin, Time Slice, Tasks can dynamically alter priorities, Rate Monotonic scheduling, Cooperative multitasking, Proprietary	10 s	✓	✓	✓	✓	✓
World Computers Ltd., London, United Kingdom, +44 - 7785 - 362 319, www.wrldcomp.com														
Front End Module - Services Layer	All processors for which an ANSI compiler is available	C, C++	46	92	2	2	2	Cooperative multitasking, Proprietary						

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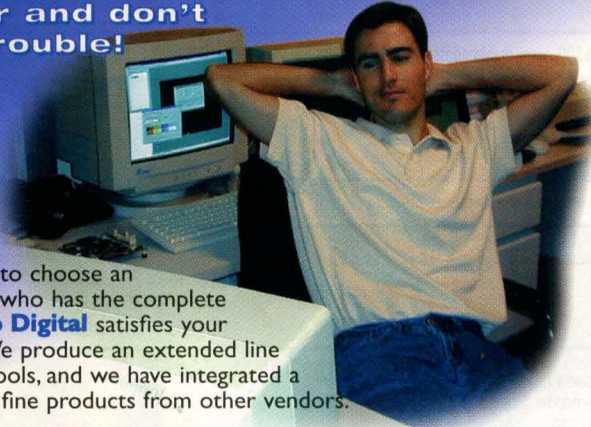
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										Technical Support							Comments	
POSIX compliant	TCP/IP support available	Includes a debugger	Includes sample programs	Source code included	Source code optional if not included	Royalty payments	Java available	Approx. installed base	Debuggers supported	Compilers supported	Days of free phone support	BBS/Web FIDO, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		Price
VenturCom Inc., Cambridge, MA, (617) 661-1230, www.vci.com																		
✓		✓	✓	✓	✓				Standard C++ debuggers, includes Microsoft's WinDbg, NuMega's SoftICE	Microsoft's Visual C/C++ 5.0 or 6.0	90	\$	\$	\$	\$	\$		
Viosoft Corp., Campbell, CA, (408) 341-1015, www.viosoft.com																		
											30	U	\$	\$	\$	\$		
Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com																		
✓	✓	✓			✓	✓			7,000 design wins	cross compiler and source level debugger included		\$	U	U	U	U	\$16,500	
World Computers Ltd., London, United Kingdom, +44 - 7785 - 362 319, www.wrldcomp.com																		
		✓	✓							Supplied in ANSI C. Suitable for all C compilers.	365	\$		U			10,000	The Front End Module is a services layer module. It is written in ANSI C and is platform-independent.

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Product name	Target CPU supported	Platforms supported	Product type	Languages supported	IDF available that interfaces to debugger	Assembler included	ANSI compliant	Target CPU-specific extensions included	Produces reentrant code	Includes floating point emulation package	Standard Template Library-compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
Algorithmics Ltd., London, England, UK, +44 171 700 3301, www.algor.co.uk																		
SDE-MIPS	MIPS	Windows 3.1/95/98/NT, BSD/OS, Linux, HP-UX, Solaris	Cross compiler	C, C++	✓	✓	✓	✓	✓					✓	✓	✓	✓	
Allen Systems, Columbus, OH, (614) 488-7122, http://members.aol.com/allensys																		
CB-11	68HC11	DOS, Windows 3.1/95/98/NT	Inter-preter	Other			✓	✓							✓			
CB-196	80196	DOS, Windows 3.1/95/98/NT	Inter-preter	Other			✓								✓			
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																		
ObjectAda	68K, PowerPC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Solaris, AIX, HP-UX	Cross compiler	Ada, Assembly, C, Java, Other	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ObjectJava	PowerPC, x86 Real Mode	Windows 3.1/95/98/NT, Solaris		Ada, Java, C++, C	✓	✓		✓	✓	✓			✓	✓		✓	✓	
AppForge, Inc., Atlanta, GA, (678) 686-9000, www.appforge.com																		
AppForge Embedded Toolkit for Visual Basic	68K, ARM, M Core	Windows 3.1/95/98/NT	Cross compiler	VB	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Archelon Inc., Waterloo, ON, Canada, (519) 746-7925, www.archelon.com																		
User Retargetable Development Tools	Can be ported to any CPU	Windows 3.1/95/98/NT, Windows 2000, SCO Unixware, Sun/SPARC, Solaris, SunOS		Assembly, C	✓	✓		✓	✓					✓	✓	✓	✓	
Archimedes Software, Kirkland, WA, (425) 822-6300, www.archimedessoftware.com																		
C/C++ Integrated Development Environment	68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 80251, 8051 and derivatives, 8051XA, C16x	Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Avocet Systems Inc., Rockport, (207) 236-9055, www.avocetsystems.com																		
2500AD C Compiler (ADC)	65816, 68HC11, 68HC16, 68K, 8051 and derivatives, Z8, Z80/Z180	DOS, Windows 3.1/95/98/NT, SCO, Windows 2000, UNIX, HP, Solaris	Cross compiler	Assembly, C	✓			✓	✓	✓		✓			✓			
2500AD Macro Assembler (ADA)	65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 80196, 8051 and derivatives, 175PICOA, C16x, H8, PIC, TMS320 and other TI DSPs, Z8, Z80/Z180	DOS, Windows 2000, Windows 3.1/95/98/NT, Solaris	Cross compiler	Assembly	✓										✓			
Avocet C Compiler (AVC)	68HC11, 68K, 8051 and derivatives, Z80/Z180	DOS, Windows 3.1/95/98/NT, Windows 2000	Cross compiler	Assembly, C	✓	✓	✓	✓	✓			✓			✓	✓	✓	
Avocet Macro Assembler (AVA)	65816, 6800, 68HC05, 68HC08, 68HC11, 68HC16, 68K, 80196, 8051 and derivatives, H8, PIC, 175PICOA, TMS320 and other TI DSPs, Z8, Z80/Z180	DOS, Windows 3.1/95/98/NT, Windows 2000	Cross compiler	Assembly	✓										✓			

Approx. installed base		Application-specific libraries available	Debuggers supported	RTOSes supported	Technical Support						Price	Comments
					Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		
Algorithmics Ltd., London, England, UK, +44 171 700 3301, www.algor.co.uk												
500			Remote debug support for the common prom monitors, supplied with remote debug stub source for rommable code.	AlgRTX, ATI Nucleus	60	U	\$	\$	\$	\$		The package includes all the low-level source code that you need for power-on initialization.
Allen Systems, Columbus, OH, (614) 488-7122, http://members.aol.com/allensys												
					U	U		U	U	U		A BASIC interpreter for the 68HC11. Supports floating-point operations and has a number of control oriented commands built in.
					U	U	U	U	U	U		A BASIC interpreter for the 80C196 microcontroller. Supports floating-point, as well as, control oriented commands.
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com												
1,000				RAVEN, ETS, VxWorks, LynxOS	0	\$	\$	\$	\$	\$		
	JVM and Java RT		Debugging environment provided.	VxWorks, LynxOS, Linux.	90	U	U	U	U	U	\$10,000	This is modeled after the Microsoft developer studio environment to provide a common look and feel for developers.
AppForge, Inc., Atlanta, GA, (678) 686-9000, www.appforge.com												
	TCP/IP, IrDA, database, FLEX paging, SMTP, POP3, HTTP, HTML, FTP, TELNET, IRC, more.			AppForge RTOS	90	U	\$	\$	\$	\$		Enables Visual Basic developers on non-PC information appliances. Includes VB Compiler, ActiveX controls, and utilities.
Archelon Inc., Waterloo, ON, Canada, (519) 746-7925, www.archelon.com												
					365	U	U		\$	\$	\$4,995	Archelon's User Retargetable Development Tools allows you to implement a complete set of software tools for any programmable device. The package includes a C compiler, compactor, meta-assembler, linker, librarian, and instruction scheduler.
Archimedes Software, Kirkland, WA, (425) 822-6300, www.archimedessoftware.com												
			BDM, MMEVS, EVB, EVM, SDI		90	\$	\$	\$	\$			
Avocet Systems Inc., Rockport, (207) 236-9055, www.avocetsystems.com												
					365	U	\$	\$	\$	\$		Includes ADWIDE Windows IDE, 248 levels of nested conditions, generates relocatable code, linker supports 32-bit addressing.
			Fourteen types of debug formats are directly generated from the Linker		365	U	\$	\$	\$	\$		Includes ADWIDE integrated development environment, including full-color editor with standard C language color-contexting, font select, bookmarks, and so on.
					365	U	\$	\$	\$	\$		Manufacturer's standard mnemonics and operand syntax for all chips produces listing, cross-reference, and relocatable object files.
					365	U	\$	\$	\$	\$		Avocet's tool pack includes C compiler, macro assembler, simulator, RTOS, universal programmer, and in-circuit emulator.

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COMPILERS/LANGUAGE PRODUCTS

Product name	Target CPU supported	Platform supported	Product type	Language supported	IDE available that interfaces to debugger	Assembler included	ANSI compliant	Target CPU-specific extensions included	Produces reentrant code	Includes floating-point emulation package	Standard Template Library compatible	Support generation of GDB	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
Axiom Manufacturing, Richardson, TX, (972) 994-9676, www.axman.com																		
ImageCraft C Compilers	68HC11, 68HC12, 175PowerPC0A, 8051XA	DOS, Windows 3.1/95/98/NT	Interpreter	Assembly, C, C++	✓						✓				✓			
Blue Earth Research LLC, Mankato, MN, (507) 387-4001, www.BlueEarthResearch.com																		
Basikit	8051 and derivatives	DOS		Assembly, Basic	✓										✓	✓	✓	
BEC-51	8051 and derivatives	DOS		Assembly, Basic	✓		✓								✓			
Byte Craft Ltd., Waterloo, ON, Canada, (519) 888-6911, www.bytecraft.com																		
Code Development Systems	68HC05, 68HC08, PIC, Z8, National Semiconductor COP8, Scenix SX, Mitsubishi MELPS740 series	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C, Any compiler that generates COD format	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓
CAD-UL, Inc., Scottsdale, AZ, (480) 945-8188, www.cadul.com																		
CAD-UL C/C++ Compiler for x86 Real and Protected Mode	68K, TriCore, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Linux, HP-UX, Solaris	Cross compiler	Assembly, EC++, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ceibo Inc/Ceibo Ltd., Florissant, MO, (314) 830-4084, www.ceibo.com																		
PantaSoft XA Compiler	8051XA	Windows 3.1/95/98/NT	Cross compiler	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CMX Systems Inc., Framingham, MA, (508) 872-7675, www.cmx.com																		
Compilers	Most	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
COSMIC Software Inc., Woburn, MA, (781) 932-2556, www.cosmic-software.com																		
COSMIC C Cross Compilers	68HC05, 68HC08, 68HC11, 68332, ST7, 68HC12, 68HC16	Windows 3.1/95/98/NT, HP-UX, Windows 2000, Sun/SPARC, Linux	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Crossware Products, Herts, United Kingdom, 0 11 44 1763 853500, www.crossware.com																		
680X0 C Compiler for Windows 9x/NT 4.0	68K	Windows 3.1/95/98/NT	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
8051 C Compiler for Windows 9x/NT 4.0	8051 and derivatives	Windows 3.1/95/98/NT	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
ColdFire C Compiler for Windows 9x/NT 4.0	ColdFire	Windows 3.1/95/98/NT	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
Cygnus Solutions, Sunnyvale, CA, (408) 542-9600, www.cygnus.com																		
Cygnus Solutions/Compilers	29K, 68K, Alpha, ARM, ColdFire, i960, MIPS, MPC8xx, PowerPC, SH, SPARC, x86 Protected Mode	Windows 3.1/95/98/NT, Linux, Solaris	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

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COMPILERS/LANGUAGE PRODUCTS

Approx. installed base		Application-specific libraries available		Debuggers supported		RTOSes supported		Days of free phone support		8051/8086/8088, bug lists, other		Phone support, standard		Phone support, 24-hour response		Product updates		Training		Price		Comments	
Axiom Manufacturing, Richardson, TX, (972) 994-9676, www.axman.com																							
Blue Earth Research LLC, Mankato, MN, (507) 387-4001, www.BlueEarthResearch.com																							
Byte Craft Ltd., Waterloo, ON, Canada, (519) 888-6911, www.bytecraft.com																							

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Mitsubishi	M16C/60/20, MC80, 740
Motorola	6811, 6812, 6816
National	COP8, CR16
NEC	V850, 78K0, 78K4
Sharp	SM6000, SM8500
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COMPILERS/LANGUAGE PRODUCTS

Product name	Target CPUs supported	Platforms supported	Product type	Languages supported	IDC available that interfaces to debugger	Assembler included	ANSI compliant	Target CPU-specific extensions included	Produces reentrant code	Includes floating point emulation package	Standard Template Library-compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com																		
DDC-I Ada Compiler Systems (DACS)	MIPS, SPARC, x86 Flat Mode, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Solaris, Lynx, VAX/VMS	Cross compiler	Ada, Assembly	✓	✓	✓	✓					✓		✓	✓	✓	✓
DDC-I JOVIAL Compiler System (DJCS)	1750A, Z8002	Solaris, VAX/VMS, HP-UX	Cross compiler	JOVIAL		✓		✓					✓		✓	✓	✓	✓
DDC-I SCORE Development Environment	PowerPC, SPARC	Windows 3.1/95/98/NT, Solaris, Sun/SPARC		Ada, C	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓
Tartan Ada Development System (TADS)	1750A, 68K, i960	Solaris, HP-UX, VAX/VMS	Cross compiler	Ada, Assembly		✓	✓		✓	✓			✓		✓	✓	✓	✓
Dinkumware Ltd., Concord, MA, (978) 371-2773, www.dinkumware.com																		
Dinkum C++ Library for GCC/Linux	Alpha, x86 Real Mode, PowerPC, x86 Protected Mode	DOS, Linux		C, C++			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DSPeSpecialists, Berlin, Germany, +49-30-467 805-0, www.dspspecialists.de																		
Mepee	DSP56300 family, Motorola	DOS, UNIX, Windows 3.1/95/98/NT	Cross compiler	Assembly	✓	✓		✓	✓				✓	✓	✓	✓	✓	✓
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com																		
CCE4K	MIPS	DOS, Windows 3.1/95/98/NT, Solaris	Cross compiler	Assembly, C, C++		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaiotech.com																		
XCC-V	68HC05, 68HC11, 68HC16, 68K, 78K series, ARM, H8, MELPS 7700, M16C, FR30, F2MC 16, M32R, MPC8xx, PowerPC, SH, TLCS90/900, V800, Z80/Z180	Windows 3.1/95/98/NT, HP-UX 9x, Solaris	Cross compiler	C, C++	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓
Gimpel Software, Collegeville, PA, (610) 584-4261, www.gimpel.com																		
PC-lint/FlexeLint for C/C++	65816, 6800, 68HC05, 68HC11, 68HC12, 68HC16, 68K, 80196, 80251, 8051 and derivatives, 8051XA, i960, MIPS, SPARC, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT, Linux, Solaris, UNIX	Source code checker for C/C++															
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com																		
Green Hills Optimizing C, C++/EC++, Ada 95, FORTRAN	68K, Alpha, ARM, ColdFire, i960, MIPS, MPC8xx, RAD6000, RH32, StrongARM, TriCore, CPU 32, M Core, PowerPC, SH, MIPS16, Thumb, SPARC, V800, x86 Protected Mode	Windows 3.1/95/98/NT, Solaris	Native compiler	Ada, Assembly, Embedded C++, C, C++, Fortran	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																		
GNU C/C++	68K, C16x, ST10, GNU support, TriCore, H8, PowerPC, x86 Protected Mode	Windows 3.1/95/98/NT, Solaris, Windows 2000, Linux	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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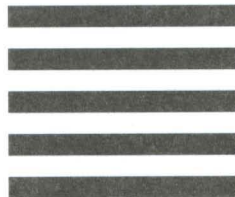
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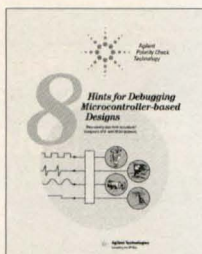
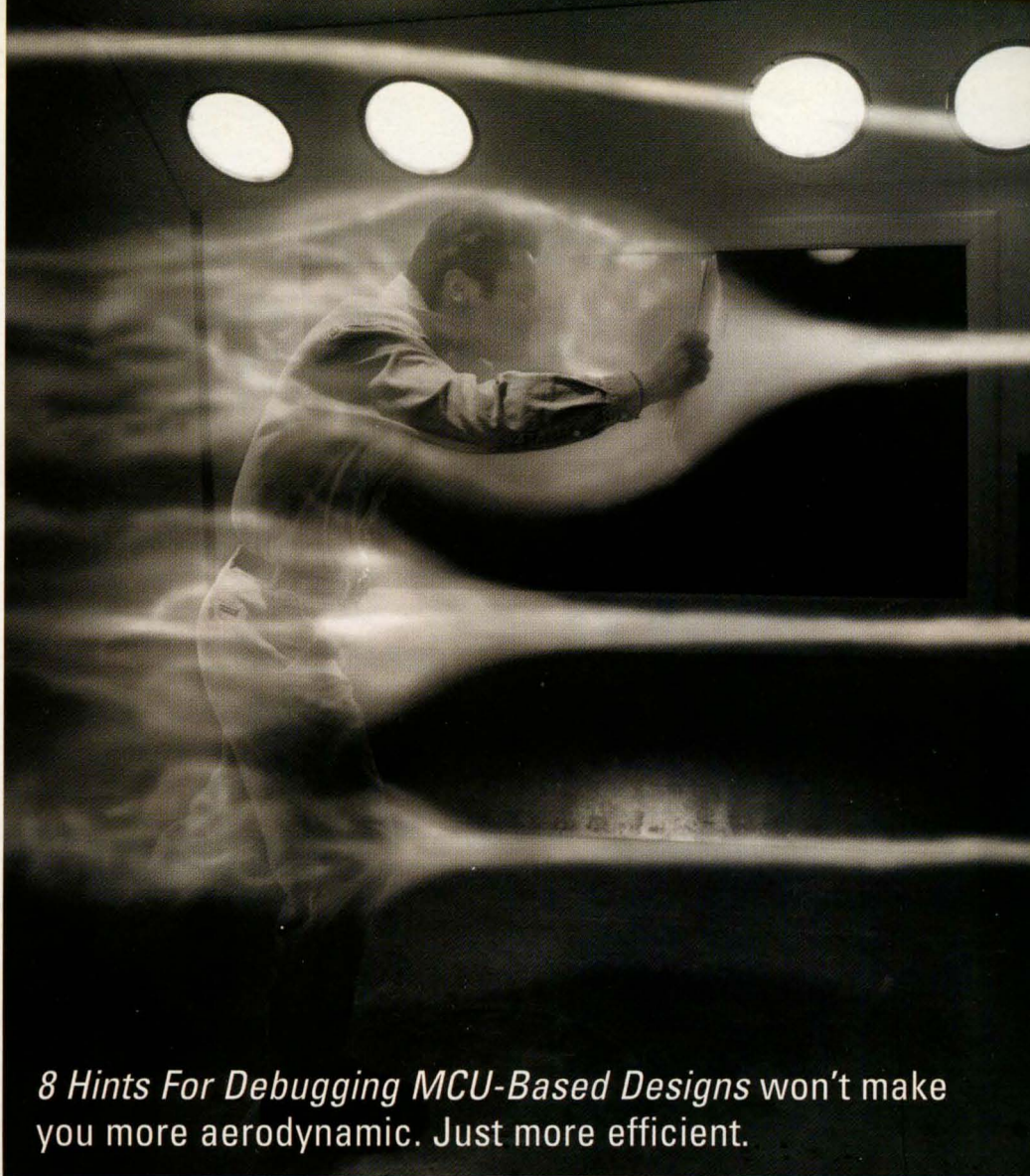
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DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com																							
	Multibus II, Intel 386EX Programming, Rate Monotonic Scheduling	DDC-I Ada Symbolic Debugger	DDC-I Ada Compiler Systems (DACs)	0	\$	\$	\$	\$	\$														
	DDC-I JOVIAL Compiler Systems (DJCS)	DDC-I JOVIAL Debugger	DJCS	0	\$	\$	\$	\$	\$														
	DDC-I SCORE Run-Time System			0	\$	\$	\$	\$	\$														
	Tartan Ada Development Systems (TADS)	Tartan AdaScope	Tartan Ada Development Systems (TADS)	0	\$	\$	\$	\$	\$														
Dinkumware Ltd., Concord, MA, (978) 371-2773, www.dinkumware.com																							
	Dinkum C Library and Dinkum C++ Library			30	U	U														\$90		The Dinkum C++ Library for GCC/Linux includes our Dinkum C Library and our Dinkum C++ Library for use with the GCC V2.95.2 compiler under Linux.	
DSPealists, Berlin, Germany, +49-30-467 805-0, www.dspealists.de																							
	various drivers (RS 232, PCI, USB), IO Handler, math libraries	Motorola, others	DSPios		U	U	\$	\$	\$														Enables assembler performance using a high-level language approach, high-reliability of code, easy I/O handling, enables parallel work on a project, reduces development time.
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com																							
	yes	debuggers that allow Elf format output	most		\$	\$	\$	\$	\$											\$3,995			
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com																							
6,000		GAIO Open Plus	Fujitsu REALOS, G-OS, Hitachi H-1 Series, Hitachi SH-7, REALOS	90	\$	\$		\$	\$														The GAIO Open Plus compiler, assembler, and linker are based on a general purpose platform, which can be upgraded.
Gimpel Software, Collegeville, PA, (610) 584-4261, www.gimpel.com																							
50,000+				30+	U	U		\$												\$239+			The Gimpel Software lint products provide source code checking for C/C++ programs. PC-lint runs on Windows, DOS, and OS/2. FlexLint runs on all variations of UNIX, VMS, Mac, OS-9, etc.
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com																							
		MULTI Source-Level Debugger	INTEGRITY, ThreadX, VxWorks/Tornado, ENEA OSE, Nucleus PLUS	90	\$	\$	\$	\$	\$											\$4,400+			Includes advanced optimizations, macro assembler, and linker.
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																							
	yes	TGDB, fastview	PXROS		\$	\$	\$	\$												DM150 0,00			

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COMPILERS/LANGUAGE PRODUCTS

Product name	Target CPUs supported	Platforms supported	Product type	Languages supported	IDT available: has interface to debugger	Assembler included	ATK3 compliant	Target CPU-specific extensions included	Produces reentrant code	Includes floating point emulation package	Standard template library compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
HI-TECH Software, Melbourne, FL, (800) 735-5715, www.htsoft.com																		
HI-TECH C	68HC05, 68HC11, 68K, 8051 and derivatives, 8051XA, H8, PIC, V800, x86 Real Mode, Z80/Z180	DOS, Linux, Solaris, HP-UX, Windows 3.1/95/98/NT	Cross compiler	C	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com																		
HI-CROSS+	68HC05, ST7, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 8051XA, PowerPC, M Core, ST19	Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com																		
OORVL	TMS320 and other TI DSPs, ADSP2106x	Windows 3.1/95/98/NT	Native compiler	Assembly, C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IAR Systems, San Francisco, CA, (415) 765-5500, www.iar.com																		
IAR Embedded Workbench	78K series, 80196, 8051 and derivatives, SM6000, 7700, 740, AVR, M16C, H8, PIC, TLCS90/900, Atmel 89C series, COP8, MSP 430, SM8500, V800, Z80/Z180	DOS, Windows 3.1/95/98/NT, Solaris	Cross compiler	Assembly, C, EC++, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IBM, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc/																		
High C/C++ Compiler	175PowerPC0A	DOS, Windows 3.1/95/98/NT, UNIX		Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Introl Corp., Milwaukee, WI, (414) 273-6100, www.introl.com																		
Introl-CODE	6800, 68HC05, 68HC08, 68HC11, 6801, 6301, 6809, 68HC12, 68HC16, 68K, ColdFire	DOS, Solaris, Windows 3.1/95/98/NT, HP-UX, Linux,	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com																		
Borland C/C++ V.4.52	x86 Real Mode	Windows 3.1/95/98/NT	Native compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com																		
A166, A251, A51, CA166, CA251, CA51, DK251, DK51, PK161, PK166, PK51	80251	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C	✓	✓	✓	✓	✓	✓						✓	✓	✓
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz																		
Mod51	8051 and derivatives	DOS, Windows 3.1/95/98/NT	Cross compiler		✓	✓		✓	✓				✓	✓	✓	✓	✓	✓
Mod51/IEC1131	8051 and derivatives	DOS, Windows 3.1/95/98/NT	Cross compiler		✓	✓		✓	✓				✓	✓	✓	✓	✓	✓
Mango Computers Ltd., Jerusalem, Israel, 972-2-532-8706, www.mangocom.com																		
	TMS320 and other TI DSPs, ADSP2106x, TigerSHARC	Windows 3.1/95/98/NT	Native compiler	C, C++, Other	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MathWorks Inc., The, Natick, MA, (508) 647-7000, www.mathworks.com																		
MATLAB Compiler Suite		DOS, HP, IBM AIX, SGI, Windows 3.1/95/98/NT, Solaris, Linux		C, C++	✓		✓						✓	✓	✓	✓		



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COMPILERS/LANGUAGE PRODUCTS

Approx. installed base		Application-specific libraries available		Debuggers supported	RTOSes supported	Technical Support						Price	Comments		
						Days of free phone support		BBS/Web FAQs, bug lists, other		Phone support, standard				Phone support, 24-hour response	
HI-TECH Software, Melbourne, FL, (800) 735-5715, www.htsoft.com															
15,000			Most ICEs	CMX, RTXC, µCos	90	U	U	\$	\$	\$	\$850	Highly efficient code generation, can produce assembler code, library source code included, remote debugger included, linker/librarian included, command line and GUI interfaces.			
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com															
	Explicit ANSI library function inlining, floating-point libraries	Most		SOOM-System, HIWARE	180	\$	\$	\$	\$	\$	\$1,155	ANSI-C, EC++, compactC++ and C++ compilers. Supports EC++ full 32-bit applications, graphical user interface and console versions, direct link to any editor, full control over all messages with configurable message output.			
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com															
						U	U	U	\$	\$	\$1,495				
IAR Systems, San Francisco, CA, (415) 765-5500, www.iar.com															
		IAR C-SPY debugger, Atmel AVR studio		CMX	U	U	U	\$	\$	\$	\$2,000-\$2,995	Includes a chip specific optimizer that generates highly optimized code.			
IBM, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc/															
		Supports most PowerPC EABI debuggers				U	U	U	U	U	\$4,000 to \$5,000				
Introl Corp., Milwaukee, WI, (414) 273-6100, www.introl.com															
	CREX real-time executive for the 68HC11, 68HC12, 68Hc16, 68332/68K families	Included		Included	365	U	U	\$	\$		\$2,000	Support and simulators for all processors included.			
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com															
	TCP/IP	Borland Remote Debugger		DOS Based Real Time Extensions	120						\$49				
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com															
		dScope			365	U	\$	\$	U	\$	\$1,795				
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz															
	Yes, Large Resource	DbgX51, all that import OMF51				U			\$	\$		A 'best fit' language on the C51 core. Smallest program is 14 bytes, suits all C51s from 1K-128K.			
	Yes	DbgX51, all that import OMF51				U			\$	\$		Structured text language for PLCs (Programmable Logic Controllers).			
Mango Computers Ltd., Jerusalem, Israel, 972-2-532-8706, www.mangocom.com															
					30	U	U	\$	\$	\$					
MathWorks Inc., The, Natick, MA, (508) 647-7000, www.mathworks.com															
	Math and graphics libraries included in the Compiler Suite.	Converts MATLAB code to C/C++ code, offers debugging tools.			365	U			\$	\$	\$1,890				



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COMPILERS/LANGUAGE PRODUCTS

Product name	Target CPUs supported	Platforms supported	Product type	Languages supported	IDE available that interfaces to debugger	Assembler included	ANSI compliant	Target CPU-specific extensions included	Produces relocatable code	Includes floating-point emulation package	Standard template library compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
MDL Labs, Columbus, OH, (614) 431-2675, www.mdlabs.com																		
BASIKIT/MDL-BASIC	8051 and derivatives	DOS	Interpreter	Other	✓		✓	✓	✓						✓			
VARLIST	8051 and derivatives	DOS	Interpreter	Other			✓											
VARNAME	8051 and derivatives	DOS	Interpreter	Other			✓	✓										
Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded																		
Microtec C and C++	68K, ColdFire, i960, MELPS 7700, MPC8xx, PowerPC, TLCS90/900, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, HP-UX, Solaris	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MetaWare Inc., Santa Cruz, CA, (831) 429-6382, www.metaware.com																		
High C/C++ Compiler	ARM, PowerPC, x86 Protected Mode, x86 Real Mode, 1100, ARC	DOS, Linux, Solaris, Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Metrowerks Corp., Austin, TX, (512) 997-4700, www.metrowerks.com																		
CodeWarrior	ColdFire, Philips TriMedia TM1XX, Motorola 568xx, M Core, MIPS, MPC8xx, PowerPC, V800	Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++, Other	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com																		
MPLAB-C17/ MPLAB-C18	PIC	DOS, Windows 3.1/95/98/NT		Assembly, C	✓	✓	✓	✓	✓		✓				✓		✓	
Microsoft Corp., Redmond, WA, (425) 882-8080, www.microsoft.com/windows/embedded																		
Windows CE Toolkits	ARM, MIPS, SH, x86 Protected Mode	Windows 3.1/95/98/NT	Native compiler	C, C++, VB	✓				✓		✓	✓	✓	✓	✓	✓	✓	✓
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com																		
	68K, ARM, PowerPC, SH, x86 Protected Mode	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National Instruments, Austin, TX, (800) 433-3488, www.natinst.com																		
LabVIEW RT	x86 processor on RT Series data acquisition board	Windows 3.1/95/98/NT	Native compiler	LabVIEW-graphical		✓			✓		✓			✓	✓			
Object Software Inc., White Rock, BC, (604) 502-2544, www.objsw.com																		
Micro Framework	68K, ColdFire, MPC8xx, PowerPC, SH	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Approx. installed base		Application-specific libraries available	Debuggers supported	RTOSes supported	Technical Support					Training	Price	Comments			
					Days of free phone support	BBS/Web FAQs, bug bds, other support	Phone support, standard	Phone support, 24-hour response	Product updates						
MDL Labs, Columbus, OH, (614) 431-2675, www.mdllabs.com															
200+					U	U	U		\$		\$25+	IDE for BASIC-52. Write BASIC programs with labels, not line numbers. Hex utilities and easy interfacing with assembly routines. Full screen editor. IDE tailored to support MDL-BASIC-D for the Dallas DS87C520. Write programs with labels, not line numbers. Full screen editor. Easy interfacing with assembly routines. Load and save hex files. Fast code development.			
1,000+					U	U	U		\$		\$40	Profiler for BASIC programs. Identifies unused variables, erroneous variable names, syntax errors, variable frequency, and memory usage.			
1,000+					U	U	U		\$		\$30	Utility to convert variable names to two or three letter names. Reduces memory requirements and increases execution speed.			
Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded															
50,000		XRAY, others supporting standard OMF	VRTX, pSOSystem /pRISM+, most distributed as source code	0	\$	\$	\$	\$	\$	\$	\$2,000				
MetaWare Inc., Santa Cruz, CA, (831) 429-6382, www.metaware.com															
		Most	Most	90	\$	\$		\$	\$			MetaWare's C/C++ development tools for embedded systems development include the customizable SeeCode debugger. The tools are robust, stable, reliable, and well-documented, with complete hypertext on-line docs.			
Metrowerks Corp., Austin, TX, (512) 997-4700, www.metrowerks.com															
130,000+		CodeWarrior, SDS, Philips	Nucleus Plus, VxWorks, MQX, QNX,	90	U	\$	\$	U	\$		\$2,500	Integrated development environment, optimizing compilers, graphical project management, code browser, search engine, differential engine, integrated debugger.			
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com															
	Yes	MPLAB		U	U	U		U	U		\$495	Runs under Microchip's MPLAB-IDE. Allows users to write, debug, and optimize PICmicro applications for firmware product designs.			
Microsoft Corp., Redmond, WA, (425) 882-8080, www.microsoft.com/windows/embedded															
Over 3 million		Microsoft Visual Basic and Visual C++ debuggers	Windows CE		U	\$	\$	U	\$						
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com															
			OS-9 provides a complete software baseline with advanced networking, multimedia I/O, and power management facilities.	30	\$	\$	\$	\$	\$			Simplifies and automates the tasks of creating, debugging, analyzing and managing complex real-time software development projects.			
National Instruments, Austin, TX, (800) 433 3488, www.natinst.com															
	PID/Fuzzy, Numerous Toolsets Available	Native LabVIEW Debugging Support	Has own RT engine—no need to program	U	U	U	\$	\$	\$		\$3,495	Provides real-time data acquisition and control.			
Object Software Inc., White Rock, BC, (604) 502-2544, www.objsw.com															
10,000		Gnu GDB	RTEMS	180	U	\$	\$	\$	\$			Windows-based IDE driving the Gnu CC toolchain.			

COMPILERS/LANGUAGE PRODUCTS

Product name	Target CPUs supported	Platforms supported	Product type	Languages supported	IDE available (API interfaces to debugger)	Assembler included	AT&T compliant	Target CPU-specific extensions included	Produces reentrant code	Includes floating-point emulation package	Standard template library compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size
Objective Interface, Reston, VA, (703) 295-6500, www.ois.com																		
ORBExpress	68K, Alpha, MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, VxWorks, PSOS, HP, OSE, Lynx, SGI, Linux, Solaris, DEC UNIX, VMS	Cross compiler	Ada, C++			✓	✓				✓		✓	✓	✓	✓	✓
Paradigm Systems, Endwell, NY, (607) 748-5966, www.devtools.com																		
Paradigm C++	x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT	Native compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com																		
MCC-96	80196	Windows 3.1/95/98/NT		Assembly, C	✓	✓	✓		✓	✓								✓
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com																		
SKYvec	i860, PowerPC	Windows 3.1/95/98/NT, Solaris	Cross compiler	C, C++, Fortran		✓	✓			✓				✓				
Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com																		
Control Cross C		Windows 3.1/95/98/NT		Assembly	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
Softools Control Cross C/WinIDE	Z80/Z180	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C		✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com																		
VeriLogger Pro																		
Target Compiler Technologies, Leuven, Belgium, +32-16-40 81 14, www.retarget.com																		
Chess	Retargetable to application specific DSPs	Linux, Solaris, HP-UX	Native compiler	C		✓		✓					✓		✓	✓	✓	✓
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com																		
TASKING C/C++/EC++ Compiler	80196, 80251, 8051 and derivatives, 8051XA, ARM, C16x, MIPS, MPC8xx, PowerPC, DSP56K, Carmel, M16C, TriCore, TLCS90/900	Windows 3.1/95/98/NT, Solaris	Cross compiler	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com																		
CVASM16	PIC	DOS, Windows 3.1/95/98/NT, Windows 2000	Cross compiler	Assembly	✓	✓								✓	✓			
Wellston Technologies, Warner Robins, GA, (912) 953-1907, www.wellston.com/xtools																		
X-TOOLS	65816, 68HC11, 68K, ARM, ColdFire, H8, i960, MIPS, PowerPC, SH, SPARC	Windows 3.1/95/98/NT, Solaris, Linux		C, C++	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com																		
C Compiler/Optimizer	65816, 65C02	DOS, Windows 3.1/95/98/NT	Cross compiler	Assembly, C		✓	✓	✓					✓		✓		✓	

Approx. installed base		Application-specific libraries available	Debuggers supported	RTOSes supported	Technical Support							Price	Comments		
					Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training					
Objective Interface, Reston, VA, (703) 295-6500, www.ois.com															
2,000 seats			VxWorks, Lynx, OSE, Concurrent, Mercury, QNX, Linux	365	\$	\$	\$	\$	\$	\$	\$5,000	Objective Interface provides software developers tools for building reliable, mission-critical systems. These tools include Object Request Brokers, training and support.			
Paradigm Systems, Endwell, NY, (607) 748-5966, www.devtools.com															
		Paradigm DEBUG integrated in Paradigm C++ IDE	Borland C++	90	U	\$	\$	\$			\$995	Borland C++ 5.02 compatible.			
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com															
150		Phyton PDS-96 software simulator, PICE-196 in-circuit emulator	Any RTOS supplied in form of standard C source	365							\$795	Supports banked memory layout, fast floating-point arithmetic, 120+ standard C functions, standard C heap, ordered startup routines, etc.			
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com															
	Standard Math Library Vector Processing	TimeScan, uni- and multi-processor symbolic debuggers	Solaris, Windows NT	90			\$	\$	\$		\$15,000	Handles processor development optimizations, reducing application development time, enhancing portability.			
Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com															
1000+	Processor peripheral	Softools ICE-Cube and target source debugger	Softools TurboTask for the Z80/Z180 and Rabbit 2000	90		\$		\$			\$749	Can produce large banked switched programs without source code changes and banked programs can be in assembly and/or C source. Supports far pointers and far data for accessing the full address space of the CPU for code and data.			
	Z180 chip peripheral	Most	Most	90	U	\$	\$	\$			\$699	Bank-switching support included, far pointers and data, safe inline asm, fast long/float math. OEM licensing available.			
SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com															
				U	U		U	\$			\$2,950				
Target Compiler Technologies, Leuven, Belgium, +32-16-40 81 14, www.retarget.com															
		Interfaces with Checkers retargetable instruction-set simulator/debugger		180	\$	\$	\$	\$				Retargetable, optimizing C-compiler for application-specific DSPs. Part of the Chess/Checkers retargetable DSP support environment.			
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com															
20,000		TASKING CrossView Pro	CMX, RTX, Precise/MQX, Nucleus PLUS	90	U	\$	\$	\$	\$						
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com															
16,000		Full symbolic debugging with TechTools' TDE/ClearView and Mathias.		U	U	U		U			\$99	Accepts Microchip opcodes and our own 8051-like opcodes. Generates HEX files for all Microchip 12 and 14-bit core devices. Includes TDE, a fully integrated Windows IDE for code development and (optionally) debugging with our Debugger and ICE, ClearView and Mathias.			
Wellston Technologies, Warner Robins, GA, (912) 953-1907, www.wellston.com/xtools															
Thousands	GPS, Display, Telecomm Coming	GCB GNU Debugger v4.18, Cygnus Insight Debugger v1.0	Custom bindings available		U	\$	\$	\$	\$		\$99.95	This starter kit is a pre-compiled distribution of GNU GCC v2.8 compiler, assembler, linker, debugger, and utilities for 19 popular 32-bit target CPUs.			
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com															
54		WDC Debugger			U	U		U				Available with WDC's W65C02 or W65C816 software development system.			

DEBUGGERS

Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	ROM/JTAG units	Simulator	Languages supported	Kb of RAM needed in target	Kb of ROM needed in target	IDF provides unified edit/compile/download	Displays ILL source w/ disassembled code	Can display nested structures	Can display CPUIDs	Removes out of scope variables	Show decoded call stack	Supports objects	Includes a class browser
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com																		
Intelligent System Software (iSys)	Can be ported to any CPU	Linux, Windows CE	✓		✓			Assembly, Internet languages, EC++		✓		✓						
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com																		
Nucleus UDB	68K, ARM, ColdFire, i960, MIPS, MPC8xx, PowerPC, SH, M Core	Windows 3.1/95/98/NT			✓	✓		Assembly, C, C++, Java	Varies	Varies	✓	✓		✓	✓	✓	✓	✓
Allant Software Corp., Walnut Creek, CA, (925) 944-9690, www.allant.com																		
ASPEX IDE/Debugger	ARM, TMS320 and other TI DSPs, ADSP 2116x, LSI Logic CoreWare, TeakliteDSPCore, OakDSPCore, SHARC, StrongARM, C67x, C62x, ADSP2106x	Windows 3.1/95/98/NT, Solaris	✓	✓		✓	✓	Ada, Assembly, C, C++			✓	✓	✓	✓	✓	✓	✓	✓
Allen Systems, Columbus, OH, (614) 488-7122, http://members.aol.com/allensys																		
DB-51	8051 and derivatives	DOS, Windows 3.1/95/98/NT						Assembly, C	0.5	16								
American Arium, Tustin, CA, (714) 731-1661, www.arium.com																		
WDB-HP	Pentium II, Pentium III	Windows 3.1/95/98/NT				✓		Assembly, C			✓	✓			✓			
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																		
AdaWORLD	68K, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, HP-UX, Solaris,	✓		✓	✓		Ada, Assembly	64	64	✓		✓	✓		✓	✓	
ObjectAda Real-Time	68K, PowerPC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Solaris, HP-UX,	✓		✓	✓	✓	Ada, Assembly, C, C++	64	64	✓		✓	✓		✓	✓	✓
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com																		
MWX-ICE	ColdFire, MPC8xx, PowerPC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, SunOS, Solaris, HP-UX			✓	✓		Assembly, C, C++				✓	✓	✓	✓	✓	✓	
Archimedes Software, Kirkland, WA, (425) 822-6300, www.archimedessoftware.com																		
SimCASE Simulator/Debugger	6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 80251, 8051 and derivatives, 8051XA, C16x	Windows 3.1/95/98/NT	✓			✓	✓	Assembly, C, C++			✓	✓	✓	✓		✓		
Ashling Microsystems, Sunnyvale, CA, (408) 732-6490, www.ashling.com																		
Path Finder-Plus	68HC05, 68HC08, 68HC11, 8051 and derivatives, 8051XA, Oki66K, C5xx, TriCore, MELPS 7700	DOS, Windows 3.1/95/98/NT			✓			Assembly, C, C++				✓		✓	✓	✓		✓
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com																		
AVR Studio	AVR 8 bit Risc Flash Controller	Windows 3.1/95/98/NT			✓		✓	Assembly, C, Pascal, Basic, Forth				✓	✓					

Task aware debugging available Shows RTOS source/data structures in high-level form Shows CPU peripherals in detailed high-level form Profiler available Measures time between events Break on data value matches Break on </> conditions Pass counter Multi-level breakpoints Compiler supported										Technical Support Free days of phone support BBS/Web FAQ, bug lists, other Phone support, standard Phone support, 24-hour response Product updates Training Price Comments									
Accelerel Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com																			
										Windows CE, Linux							The iSyS solution allows hardware designs to communicate with the OS and consists of a core system software, accelBIOS; a configuration SDK, accelTool; and a system management tool, accelSys.		
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com																			
										GNU, ARM, DDI, Hitachi, Metaware, CodeWarrior, GHS	Nucleus PLUS	180	\$	\$	\$	\$	\$2,495	Nucleus UDB is designed from the ground up to take advantage of the capabilities of the Microsoft Windows operating system and shorten the learning curve.	
Allant Software Corp., Walnut Creek, CA, (925) 944-9690, www.allant.com																			
										ARM Ltd., Analog Devices, DSP Group, MetaWare, Texas	Virtuoso, ThreadX	90	\$	\$	\$	\$	\$2,000	SoC and Extended Target Visibility, Mixed Core Debugging: ARM + DSP, Multiple Processor Synchronized Debugging, Trace/Analysis and Profiling, Thread/Task-Aware Debugging, Custom RTOS Support Available	
Allen Systems, Columbus, OH, (614) 488-7122, http://members.aol.com/allensys																			
												U	U	U		U	U	\$49	
American Arium, Tustin, CA, (714) 731-1661, www.arium.com																			
										Microsoft, Watcom, Borland, Metaware, GNU		365	U	\$	\$	\$	\$	\$10,000	
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																			
										AdaWORLD, ActivAda	ARTK, LynxOS, HP-RT, VxWORKS	0	\$	\$	\$	\$	\$	\$15,000	
										ObjectAda, Visual C++	VxWorks, LynxOS, Phar Lap ETS	0	\$	\$	\$	\$	\$	\$10,000	
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com																			
										Most	VxWorks, pSOS+, Vrtx	0	\$	\$	\$	\$	\$		
Archimedes Software, Kirkland, WA, (425) 822-6300, www.archimedessoftware.com																			
										Most		90	\$	\$	\$	\$			
Ashling Microsystems, Sunnyvale, CA, (408) 732-6490, www.ashling.com																			
										Cosmic, TASK-ING, Intel, IAR, GreenHills, Introl, Byte Craft, Hi-Tech, HIWARE, Keil	CMX, Keil-RTX, Nucleus Plus	365	U	U	U	\$	\$	\$750	PathFinder-Plus is a source-level debugger and software test environment for embedded control applications.
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com																			
										Most		30	U	U		U		Free	

U - Unlimited free \$ - paid

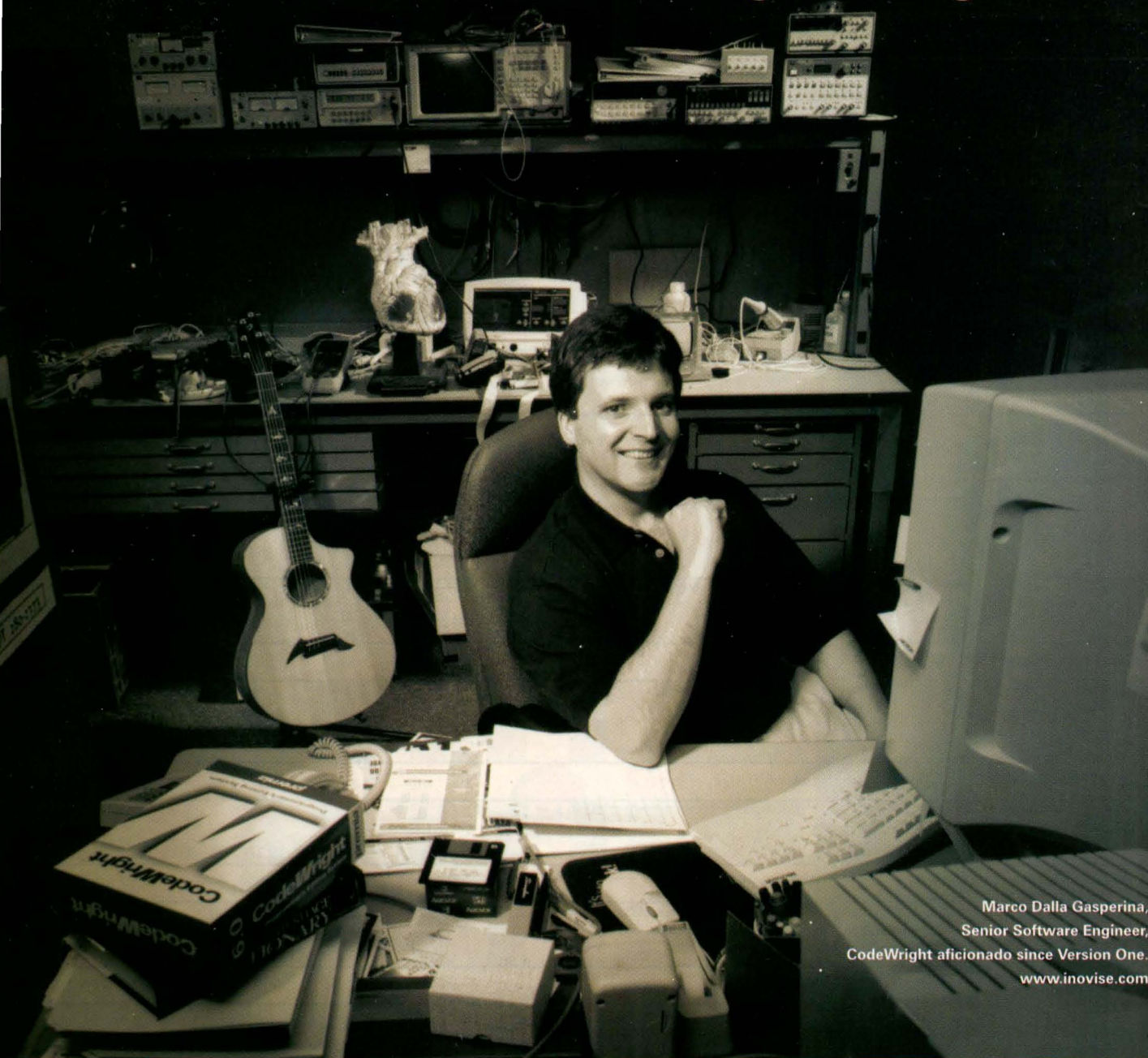
DEBUGGERS

Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	BDM/JTAG units	Simulator	Languages supported	Kb of RAM needed in target	Kb of ROM needed in target	IDF provides unified adb/compile/download	Displays HLL source w/ disassembled code	Can display nested structures	Can display CPUID	Removes out of scope variables	Show disassembled call stack	Supports objects	Includes a class browser
Avocet Systems Inc., Rockport, ME, (207) 236-9055, www.avocetsystems.com																		
2500AD Simulator/Debugger (ADS)	65816, 6800, 68HC05, 68HC11, 68HC16, Other, 68K, 8051 and derivatives	DOS, Windows 3.1/95/98/NT, Windows 2000					✓	Assembly, C										
Avocet Simulator/Debugger (AVS)	68K, 8051 and derivatives	DOS, Windows 2000, Windows 3.1/95/98/NT					✓	Assembly, C				✓	✓	✓				
Axiom Manufacturing, Richardson, TX, (972) 994-9676, www.axman.com																		
AX-BDM12	68HC11, 68HC12, 68K, 8051XA, PowerPC	DOS, Windows 3.1/95/98/NT						C, C++										
CAD-UL, Inc., Scottsdale, AZ, (480) 945-8188, www.cadul.com																		
CAD-UL XDB ROM Monitor, RTOS-aware, Emulator Interface	68K, x86 Protected Mode, x86 Real Mode, TriCore	HP-UX, UNIX, VAX/VMS, Windows 3.1/95/98/NT, Linux, Solaris	✓	✓	✓	✓	✓	EC++, Assembly, C, C++	8	12	✓	✓	✓	✓	✓	✓	✓	✓
ChipTools Inc., Mississauga, ON, Canada, (905) 274-6244, www.chiptools.com																		
ChipView-196	80196	DOS	✓	✓			✓	Assembly, C	24 bytes	0.6	✓	✓	✓	✓	✓			
ChipView-51	8051 and derivatives	DOS	✓	✓	✓		✓	Assembly, C	0	0.7	✓	✓	✓	✓	✓			
ChipView-x51	8051 and derivatives	Windows 3.1/95/98/NT			✓		✓	Assembly, C			✓	✓	✓	✓	✓			
ChipView-x96	80196	Windows 3.1/95/98/NT	✓	✓	✓		✓	Assembly, C	24 bytes	0.6	✓	✓	✓	✓	✓			
COSMIC Software Inc., Woburn, MA, (781) 932-2556, www.cosmic-software.com																		
ZAP BDM debugger	68HC16, 68332	Windows 3.1/95/98/NT, Windows 2000				✓		Assembly, C			✓	✓	✓	✓	✓	✓		
ZAP BDM Debugger (ICD)	68HC12	Windows 3.1/95/98/NT, Windows 2000				✓		Assembly, C			✓	✓	✓	✓	✓	✓		
ZAP MMDS/MMEVS Debugger	68HC05, 68HC08	Windows 3.1/95/98/NT, Windows 2000			✓			Assembly, C			✓	✓	✓	✓	✓	✓	✓	
ZAP ROM Monitor debugger	68HC11	Windows 3.1/95/98/NT, Windows 2000		✓				Assembly, C	.05 (50 bytes)	.5 (500 bytes)	✓	✓	✓	✓	✓	✓	✓	
ZAP Simulator Debugger	68HC05, 68HC08, 68HC11, 68332, ST7, 68HC12, 68HC16	Windows 3.1/95/98/NT, OSF Motif, Windows 2000					✓	Assembly, C			✓	✓	✓	✓	✓	✓		
Crossware Products, Herts, United Kingdom, 0 11 44 1763 853500, www.crossware.com																		
8051 Virtual Workshop/Debugger	8051 and derivatives	Windows 3.1/95/98/NT	✓				✓	Assembly, C	0-1	2	✓	✓	✓	✓	✓	✓		

Task aware debugging available Shows RTOS stack/data structures in high-level form Shows CPU peripherals in decoded high-profile form Measures time between events Break on data value matches Break on </> conditions Post counter Multi-level breakpoints Compilers supported									Technical Support Free days of phone support BBS/Web FAQs, bug lists, other Phone support, standard Phone support, 24-hour response Product updates Training Price Comments								
Avocet Systems Inc., Rockport, ME, (207) 236-9055, www.avocetsystems.com																	
				✓	✓		✓		2500AD		365	U	\$	\$	\$	\$	Includes disassembler
	✓	✓	✓	✓	✓	✓	✓		Keil, IAR, Avocet		365	U	\$	\$	\$	\$	Highly configurable interface
Axiom Manufacturing, Richardson, TX, (972) 994-9676, www.axman.com																	
											30						
CAD-UL, Inc., Scottsdale, AZ, (480) 945-8188, www.cadul.com																	
✓	✓	✓		✓	✓	✓	✓	✓	CAD-UL, Microsoft, Borland, Watcom, GNU, Metaware, Intel	pSOS, Nucleus+, RMOS, RMX, ThreadX, VRTX, Linux/RTLinux, SuperTask!	0	\$	\$	\$	\$	\$	\$2,800 Debuggers are available in Native, Simulator, ICE-specific, Universal Debug Interface, JTAG-specific, CoreDump, ROM Monitor and RTOS-specific flavors.
ChipTools Inc., Mississauga, ON, Canada, (905) 274-6244, www.chiptools.com																	
	✓				✓	✓	✓		TASKING, IAR, Intel		365	U	\$		\$		\$795
	✓				✓	✓	✓	✓	Archimedes, Franklin, Keil, IAR, Intel, TASKING		365	U	\$		\$		\$595
✓	✓	✓			✓	✓	✓	✓	Archimedes, Franklin, Keil, IAR, Intel, TASKING	RTX51, CMX	90	U	\$		\$		\$695
✓	✓	✓			✓	✓	✓	✓	TASKING, IAR, Intel	CMX	90	U	\$		\$		\$995
COSMIC Software Inc., Woburn, MA, (781) 932-2556, www.cosmic-software.com																	
✓	✓			✓	✓	✓		✓	COSMIC	CMX, RTX, uC/os-II, SuperTask	365	U	U	U	U	\$	\$1,500+
✓	✓			✓	✓	✓		✓	COSMIC	MX, RTX, uC/os-II	365	U	U	U	U	\$	\$1500+ ZAP 6812 ICD debugger uses P&E's Cable12 parallel to BDM interface cable to provide a fast, real-time ANSI C and assembly source level target debugger. ZAP ICD includes flash programming, bank switching, hardware breakpoints and real-time monitors
✓	✓			✓	✓	✓		✓	COSMIC	CMX, RTX, uC/os-II	365	U	U	U	U	\$	\$990+
✓	✓			✓	✓	✓		✓	COSMIC	CMX, RTX, uC/os-II, SuperTask	365	U	U		U	\$	\$1,500
✓	✓			✓	✓	✓		✓	COSMIC	CMX, RTX, uC/os-II, SuperTask	365	U	U	U	U	\$	\$990+ Integrates a C and assembly source debugger with an instruction simulator to provide a standalone debugging/execution environment on the host workstation. Includes interrupts, timers, code coverage, performance analysis.
Crossware Products, Herts, United Kingdom, 0 11 44 1763 853500, www.crossware.com																	
	✓	✓	✓	✓	✓	✓	✓	✓	Crossware C8051INT		365	U	\$	\$	\$		\$950

Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	ROM/TMC units	Simulator	Language supported	Kb of RAM needed in target	Kb of ROM needed in target	IDE provides unified edit/compile/download	Displays HLL source w/ decompiled code	Can display nested structures	Can display DMMs	Removes out of scope variables	Shows decoded call stack	Supports objects	Includes a class browser
ColdFire Debugger	ColdFire	Windows 3.1/95/98/NT			✓	✓		Assembly, C		✓	✓	✓	✓	✓	✓			
Cygnus Solutions, Sunnyvale, CA, (408) 542-9600, www.cygnus.com																		
	29K, 68K, ARM, ColdFire, i960, MIPS, PowerPC, SH, SPARC	Windows 3.1/95/98/NT, Linux, Solaris		✓	✓	✓	✓	Assembly, C, C++		✓	✓	✓	✓	✓		✓	✓	
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com																		
DDC-I Ada Debugger	MIPS, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Solaris, Lynx	✓	✓	✓			Ada	13	50	✓	✓	✓	✓	✓	✓	✓	
DDC-I JOVIAL Debugger	1750A, Z8002	Solaris, VAX/VMS, HP-UX					✓	JOVIAL				✓	✓	✓		✓		
DDC-I SCORE Multi-Language Debugger	PowerPC, SPARC	Windows 3.1/95/98/NT, Solaris, Sun/SPARC	✓					Ada, Assembly, C	22	30								
Tartan AdaScope	1750A, 68K, i960	Solaris, VAX/VMS, HP-UX	✓		✓		✓	Ada, Assembly		16		✓	✓	✓	✓	✓		
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com																		
EDB	MIPS, Nec, QED, LEXRA, NKK, IDT	DOS, Solaris, Windows 3.1/95/98/NT, UNIX	✓		✓		✓	Ada, Assembly, C, C++	0	25		✓	✓		✓	✓		
Enea OSE Systems Inc., Dallas, TX, (214) 346-9339, www.enea.com																		
OSE Illuminator	68K, ARM, MPC8xx, PowerPC	Windows 3.1/95/98/NT, UNIX						C, C++				✓	✓	✓		✓	✓	
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com																		
visionCLICK /visionXD	68K, ColdFire, PowerPC	Windows 3.1/95/98/NT, HP-UX, SunOS,	✓		✓	✓	✓	C, C++			✓	✓	✓		✓	✓	✓	✓
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gaio.com																		
XDEB, XDOI-V	68HC05, 68HC11, 68HC16, 68K, 78K series, ARM, H8, MELPS 7700, MIPS, MPC8xx, PowerPC, SPC900, M16C, FR30, F2MC 16, M32R, SH, TLC590/900, V800, Z8, Z80/Z180	Windows 3.1/95/98/NT, Solaris, HP-UX 9x			✓	✓	✓	C, C++			✓	✓	✓	✓	✓	✓		
Geodesic Systems, Chicago, IL, (312) 832-1221, www.geodesic.com																		
Great Circle Enterprise	Alpha, MIPS, PowerPC, SPARC, x86 Protected Mode	Windows 3.1/95/98/NT, UNIX, AIX, IBM AIX, Digital Unix, Linux, Solaris, SGI, HP-UX						C, C++										
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com																		
MULTI 2000 IDE	68K, Alpha, ARM, ColdFire, i960, MIPS, PowerPC, SH, SPARC, V800, x86 Protected Mode, MIPS16, Thumb, RAD6000, RH32, CPU32, StrongARM, TriCore, M Core	Windows 3.1/95/98/NT, Solaris	✓	✓	✓	✓	✓	Ada, Embedded C++, Assembly, C, C++, Pascal,	5	25	✓	✓	✓	✓	✓	✓	✓	✓

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DEBUGGERS

Task aware debugging available Shows RTOS state/data structures in high-level form Shows CPU peripherals in decoded high-level form Profiler available Measures time between events Break on data value matches Break on </> conditions Pass counter Multi-level breakpoints Compilers supported									Technical Support Commercial RTOSes supported Free days of phone support BBS/Web FAE, bug lists, other Phone support, standard Phone support, 24-hour response Product updates Training Price Comments								
✓		✓	✓	✓	✓	✓	✓	Crossware		365	U	\$	\$	\$	\$	\$950	
Cygnus Solutions, Sunnyvale, CA, (408) 542-9600, www.cygnus.com																	
✓					✓		✓	GNUPro gcc/g++	eCos	30	U	\$	\$	\$	\$		
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com																	
✓	✓				✓	✓	✓	DDC-I Ada Compiler Systems	DACS								
					✓	✓	✓	DDC-I Jovial Compiler Systems (DJCS)	DJCS								
								DDC-I SCORE Ada and C Compiler Systems	DDC-I SCORE	0	\$	\$	\$	\$	\$		
✓			✓	✓	✓	✓	✓	Tartan Ada Development Systems (TADS)	TADS								
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com																	
		✓	✓	✓	✓	✓	✓	all with ELF output genera- tion	most	30	\$	\$	\$	\$	\$	\$2,300	
Enea OSE Systems Inc., Dallas, TX, (214) 346-9339, www.enea.com																	
✓	✓	✓	✓	✓	✓		✓	Diab Data	OSE	90	\$	\$	\$	\$	\$		
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com																	
✓	✓		✓	✓	✓	✓	✓	Most	Nucleus, pSOS, VxWorks, OSE	90	U	\$		U	\$	\$995/ \$2,995	
GAIO Technology Inc., Sunnyvale, CA, (408) 752-0268, www.gao.com																	
✓	✓		✓	✓	✓	✓	✓	GAIO C com- piler -XCC-V	µITRON vari- ants including G-OS, REA- LOS, Hitachi- SH7	90	\$	\$		\$	\$		
Geodesic Systems, Chicago, IL, (312) 832-1221, www.geodesic.com																	
								Visual C++, Visual Age, Visual Workshop, Digital C++, HP ANSI C++, Green Hills C, IBM CSet, MIPS Pro		90	\$	\$	\$	\$	\$	\$695	
Green Hills Software, Santa Barbara, CA, (805) 965-6044, www.ghs.com																	
✓	✓	✓	✓	✓	✓	✓	✓	Green Hills op- timizing com- pilers	INTEGRITY, ThreadX, VxWorks/Torna do, Enea OSE, Nucleus PLUS	90	\$	\$	\$	\$	\$	4,400+	Fully integrated IDE including source-level de- bugger, execution profiler, run-time error checking, text editor, program builder, project control, and version control system.

Embedded Systems Conferences

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Moscone Center

April

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conference: July 9 - 11, 2001
exhibits: July 10 - 11, 2001
Navy Pier

July

ESC Boston

conference: Sept. 4 - 7, 2001
exhibits: Sept. 5 - 7, 2001
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September

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conference: Nov. 7 - 9, 2000
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Maastricht, Netherlands

November

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Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	ROM/TIAG units	Simulator	Languages supported	Kb of ROM needed in target	Kb of ROM needed in target	IDE provides unified edit/compile/download	Displays HLL source w/ decompiled code	Can display nested structures	Can display CPU/IOs	Removes out of scope variables	Shows declared call stack	Supports objects	Includes a class browser
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																		
TGDB	68K, C16x, H8, ST10, TriCore, PowerPC, x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000, Linux, Solaris	✓		✓	✓		Assembly, C, C++	1	2	✓	✓	✓	✓	✓	✓		
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com																		
HI-WAVE	68HC05, 68HC08, 68HC11, 68HC12, 68HC16, M Core, ST19, ST7, 68K, 8051XA, PowerPC	Windows 3.1/95/98/NT	✓	✓	✓	✓	✓	Assembly, C, Modula 2 Language, C++	0.3	✓	✓	✓	✓	✓	✓	✓		
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com																		
SourceGate BDM / ICE Interface	68HC11, 68HC12, 68HC16, 68K, 80196, 8085, IBM PPC4xx, 6809, 8051 and derivatives, ColdFire, PowerPC, Z80/Z180	DOS, Windows 3.1/95/98/NT, HP, Sun/SPARC, Sun 4, Solaris		✓	✓	✓		Ada, Assembly, C, C++		✓	✓	✓	✓	✓	✓	✓	✓	
SourceGate Simulator	683xx, 68340, 680x0, 68360, 68349	Windows 3.1/95/98/NT, HP, Sun/SPARC, Sun 4				✓		Assembly, C		✓		✓	✓	✓				
IAR Systems, San Francisco, CA, (415) 765-5500, www.iar.com																		
IAR C-SPY	68HC11, 68HC12, 68HC16, 78K series, 80196, 80251, 8051 and derivatives, H8, MELPS 7700, PIC, SH, SM6000, 740, MC80, 80296, AT89, AT90S AVR MEGA, M16C, Compact RISC, COP8, MSP 430, SM8500, TLC590/900, V800, Z80/Z180	DOS, Solaris, Windows 3.1/95/98/NT	✓			✓		Assembly, C, C++, EC++	3-4	✓	✓	✓	✓	✓	✓	✓	✓	
IBM, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc/																		
RISCWatch								Assembly, C, C++										
Introl Corp., Milwaukee, WI, (414) 273-6100, www.introl.com																		
Introl-CODE	6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 6801, 6301, 6809, 68K, ColdFire	Windows 3.1/95/98/NT, HP-UX, NetBSD, Solaris, Linux	✓	✓	✓	✓		Assembly, C	0.25	1	✓	✓	✓	✓	✓			
Irvine Compiler Corp., Irvine, CA, (949) 609-4650, www.irvine.com																		
ICC 83/95 Ada Debugger for i960MC,KB, MX,PowerP C,X-86,TI-DSP and ADI-DSP	1100				✓					✓								
J&M Microtek Inc., West Orange, NJ, (973) 325-1892, www.jm-micro.com																		
Universal Micro-processor Simulator/Debugger	6800, 68HC05, 6303, 6502, 8048, 8085, 6801, 6809, 65C02, 68HC11, 8051 and derivatives, Z8, Z80/Z180	DOS		✓				Assembly										
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com																		
dScope	80251, C166, 8051 and derivatives	DOS, Windows 3.1/95/98/NT	✓	✓	✓		✓	Assembly, C	4	32								

										Technical Support							Comments	
Task aware debugging available	Shows RTOS state/data structures in high-level form	Shows CPU peripherals in decoded high-level form	Profiler available	Measure time between events	Break on data value matches	Break on </> conditions	Post counter	Multi-level breakpoints	Compilers supported	Commercial RTOSes supported	Free days of phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		Price
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																		
✓	✓	✓		✓	✓	✓	✓		GNU C/C++	PXROS	0	\$	\$	\$	\$	\$	DM 1.500,0	
HIWARE, Austin, TX, (512) 301 4500, www.hiware.com																		
✓	✓	✓	✓	✓	✓	✓	✓	✓	HI-CROSS+, all supporting ELF/DWARF object file format	SOOM-System, RTEK	180	\$	\$	\$	\$	\$	\$1,650	Debuggers and simulators can be customized to the user's needs. It contains tools for debugging, visualization, CPU simulation and I/O device simulation. On-chip flash programming available.
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com																		
✓	✓	✓	✓	✓	✓	✓	✓	✓	All major Compilers	VxWorks,	180	U	\$	\$	\$	\$		
			✓	✓	✓	✓	✓		All major Compilers		365	U	\$	\$	\$	\$		
IAR Systems, San Francisco, CA, (415) 765-5500, www.iar.com																		
✓	✓	✓	✓	✓	✓	✓	✓	✓	IAR C compilers		U	U	U		\$	\$	\$1,200	
IBM, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc/																		
												U	U	U				
Introl Corp., Milwaukee, WI, (414) 273-6100, www.introl.com																		
✓	✓	✓	✓	✓	✓	✓	✓		Introl-CODE	CREX included.	365	U	U	\$	\$		\$2,000	
Irvine Compiler Corp., Irvine, CA, (949) 609-4650, www.irvine.com																		
J&M Microtek Inc., West Orange, NJ, (973) 325-1892, www.jm-micro.com																		
											U	U		\$	\$		\$100	
Keil Software, Dallas, TX, (800) 348-8051, www.keil.com																		
											365	U	\$	\$	\$	\$		

Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	BDM/JTAG units	Simulator	Languages supported	Kb of RAM needed in target	Kb of ROM needed in target	IDE provides unified edit/compile/download	Displays full source w/ disassembled code	Can display nested structures	Can display enums	Removes out of scope variables	Shows decoded call stack	Supports objects	Includes a class browser
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com																		
TRACE32-PowerView	68HC05, 68K, C16x, MPC8xx, Z80/Z180, PowerPC, EGOLD, H8S, H8/300H, H8/300L, MPC8260, TriCore, CPU 32, 683xx, ColdFire, MPC82xx, C166CBC, 64180, Qualcomm MSM3000, 680x0, IBM PPC4xx, ST10, SH2, ARM, 68HC16, 68HC08, 68HC12, 68HC11	Windows 3.1/95/98/NT, Other, Solaris, Windows 2000, HP-UX, Linux	✓	✓	✓	✓	✓	Ada, C, Java, Embedded C++, C++, Assembly										
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz																		
DbgX51	8051 and derivatives	DOS, Windows 3.1/95/98/NT			✓			Assembly, IEC1131, C, Pascal		✓	✓							
Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded																		
XRAY Debugger	68K, ARM, ColdFire, i960, MELPS 7700, MPC8xx, PowerPC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Solaris, HP-UX	✓	✓	✓	✓	✓	Assembly, C, C++, Java		✓	✓	✓	✓	✓	✓	✓	✓	✓
MetaWare Inc., Santa Cruz, CA, (831) 429-6382, www.metaware.com																		
SeeCode Debugger	ARM, ARC, PowerPC	Windows 3.1/95/98/NT, Solaris	✓		✓	✓	✓	Assembly, C, C++		✓	✓	✓	✓		✓	✓		
Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com																		
DEBUG/sm	x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT						C, C++										
smxAware	ColdFire, PowerPC, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT	✓	✓	✓	✓	✓	Assembly, C, C++										
smxProbe	ColdFire, PowerPC, x86 Protected Mode, x86 Real Mode	Smx	✓	✓	✓	✓		Assembly, C, C++	2	50								
WinBase	x86 Protected Mode	Windows 3.1/95/98/NT	✓					C, C++		✓								
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com																		
MPLAB-ICD PIC		Windows 3.1/95/98/NT				✓		Assembly, C		✓	✓					✓		
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com																		
Hawk IDE	68K, ARM, StrongARM, PowerPC, SH, x86 Protected Mode	Windows 3.1/95/98/NT	✓					Assembly, C, C++		✓	✓	✓			✓			
Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com																		
Flex	65816, 6800, 68HC12, 68K, ColdFire, MPC8xx, PowerPC, x86 Real Mode, Z80/Z180	Windows 3.1/95/98/NT		✓	✓	✓		Assembly, C, C++		✓	✓	✓	✓	✓	✓	✓		
Object Software Inc., White Rock, BC, (604) 502-2544, www.objsw.com																		
Micro Framework	68K, ColdFire, MPC8xx, PowerPC, SH	Windows 3.1/95/98/NT	✓	✓	✓	✓	✓	Assembly, C, C++	1	4	✓	✓	✓	✓	✓	✓	✓	

Task aware debugging available
Shows RTOS state/data structures in high-level form
Shows CPU peripherals in decoded high-level form
Profilers available
Measures time between events
Break on data value matches
Break on </> conditions
Perc counter
Multi-level breakpoints
Compilers supported

Commercial RTOSs supported

Technical Support

Free days of phone support
BBS/Web RTOS, bug lists, other
Phone support, standard
Phone support, 24-hour response
Product updates
Training
Price
Comments

Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com

U U U \$ \$

Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz

All compilers
producing Intel
OMF51 files

Free
with ICE

Mentor Graphics, San Jose, CA, (408) 487-7000, www.mentor.com/embedded

Microtec C,
C++, GNU,
others support-
ing standard
OMFs

VRTX,
Windows CE,
pSOSystem /
pRISM+,
ChorusOS,
JavaOS

0 \$ \$ \$ \$ \$ \$ \$2,300

MetaWare Inc., Santa Cruz, CA, (831) 429-6382, www.metaware.com

Most

90 \$ \$ \$ \$ \$ \$

SeeCode can debug multiple processes and multiple processors simultaneously. The SeeCode APIs include RTOS API, Semantic API, HostLink, and others.

Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com

VC++, BC++

smx

180 \$ \$ \$ \$ \$ \$ \$495

Borland, Diab
Data, Visual,
Watcom,
C/C++,
CodeWarrior

smx

180 U \$ \$ \$ \$ \$ \$500

Borland C/C++,
Microsoft
C/C++

smx

180 \$ \$ \$ \$ \$ \$ \$1,000

VC++, BC++

smx

1 hour \$ \$ \$ \$ \$ \$ \$495

Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com

IAR, Hi-Tech,
CCS, Byte Craft

U U U U U \$159

Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com

Ultra C

OS-9, OS-9000

30 \$ \$ \$ \$ \$ \$

Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com

Most

365 \$ \$ \$ \$ \$ \$ \$1,695

Object Software Inc., White Rock, BC, (604) 502-2544, www.objsw.com

Gnu CC, others
generating ELF
object files

180 U \$ \$ \$ \$ \$

Product name	Target CPUs supported	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	ROM/JTAG units	Simulator	Language supported	Kb of RAM needed in target	Kb of ROM needed in target	IDF provides unified edit/compile/download	Displays HLL source w/ disassembled code	Can display nested structures	Can display EBUs	Removes out of scope variables	Shows threaded call stack	Supports objects	Includes a disassembler
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com																		
On Time RTOS-32 (includes debugger)	x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000, On Time Embedded RTOS	✓	✓				Assembly, C++, C, Delphi	3	10	✓	✓	✓	✓	✓	✓	✓	✓
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com																		
microVIEW-G	Most	Windows 3.1/95/98/NT, HP-UX, Solaris			✓	✓		C, C++				✓	✓	✓	✓	✓		
SingleStep/ICE	68K	Windows 3.1/95/98/NT			✓			C				✓	✓	✓		✓		
P & E Microcomputer Systems Inc., Woburn, MA, (617) 353-9206, www.pemicro.com																		
	68HC12, 68HC16, ColdFire, 683xx	DOS, Windows 3.1/95/98/NT				✓		Assembly, C										
Paradigm Systems, Endwell, NY, (607) 748-5966, www.devtools.com																		
Paradigm C++	x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT	✓	✓	✓	✓		Assembly, C, C++	8	16	✓	✓	✓	✓	✓	✓	✓	✓
Pathfinder Solutions Inc., Wrentham, MA, (888) 662-7284, www.pathfindersol.com																		
Instrumented Execution model-level debugger	Works with a variety of CPUs	Windows 3.1/95/98/NT	✓				✓	Ada, Assembly, C, C++, Fort, Fortran,				✓	✓	✓		✓	✓	
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com																		
PDS	80196, 8051 and derivatives, PIC	Windows 3.1/95/98/NT			✓		✓	Assembly			✓	✓	✓	✓	✓	✓	✓	
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com																		
fast-view66	C16x, TriCore, ST10	Windows 3.1/95/98/NT	✓		✓	✓	✓	Assembly, C, C++	0.1	3	✓	✓	✓	✓	✓			✓
Real-Time Innovations Inc., Sunnyvale, CA, (408) 734-4200, www.rti.com																		
ProfileScope/MemScope/PerformancePak	68K, C16x, i860, i960, MIPS, MPC8xx, SPARC, x86 Protected Mode	Windows 3.1/95/98/NT, HP, UNIX, VxWorks, Solaris						Ada, C, C++, Fortran			✓							
StethoScope/TraceScope/ScopePak	68K, C16x, i860, i960, MIPS, MPC8xx, SPARC, x86 Protected Mode	DOS, VxWorks, Windows 3.1/95/98/NT, Solaris, HP						Ada, C, C++, Fortran			✓							
Sid Price's Software Tools for Embedded Systems, Tijeras, (505) 281-2705, www.softtools.com/tools/																		
StingRay BDM12	68HC05, 68HC08, 68HC11, 68HC12, 8051 and derivatives	Windows 3.1/95/98/NT	✓		✓	✓		Assembly, C			✓	✓	✓	✓	✓	✓		

										Technical Support								
Task aware debugging available	Shows RTOS state/data structures in high-level form	Shows CPU peripherals in decoded high-level form	Profiler available	Measures time between events	Break on data value matches	Break on </> conditions	Pass counter	Multi-level breakpoints	Compilers supported	Commercial RTOSes supported	Free days of phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Comments
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com																		
✓				✓	✓	✓			Microsoft Visual C++, Borland C/C++, Borland C++ Builder, Borland Delphi, Watcom	On Time RTOS-32	U	U	U	U	\$	\$	\$1,700	On Time RTOS-32 allows development and debugging entirely within Visual Studio using the Visual Studio integrated debugger.
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com																		
✓	✓	✓	✓	✓	✓	✓	✓	✓	Most	Nucleus Plus, pSOS, HI-SH, THREAD-X		U	U		\$	\$		
✓				✓	✓	✓	✓	✓	SDS, Diab Data, Microtek			U	U		\$	\$		
P & E Microcomputer Systems Inc., Woburn, MA, (617) 353-9206, www.pemicro.com																		
												U	U		U			
Paradigm Systems, Endwell, NY, (607) 748-5966, www.devtools.com																		
✓	✓	✓		✓	✓	✓	✓		Paradigm C++, Borland C++, Microsoft C/C++		90	U	\$	\$	\$		\$1,495	PDREMOTE/ROM, Paradigm DEBUG and Paradigm LOCATE are integrated into Paradigm C++. Integrated version control support of Microsoft SourceSafe and Component Software RCS is available.
Pathfinder Solutions Inc., Wrentham, MA, (888) 662-7284, www.pathfindersol.com																		
									Works in any environment supporting EC++	any supporting EC++	90	U	\$	\$	\$	\$	\$3,000	
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com																		
	✓	✓	✓	✓	✓	✓	✓		Hi-Tech, IAR, MPLAB, C, Byte Craft, CCS, Phytion		365	U	U		U		395+	IDE. Precise simulation of the PIC12/16/17/18 internal structure, including on-chip peripherals. Symbolic debugging for variables, structures, unions, and arrays. Backward program execution with full context restoring. Precise counter and performance analyzer. Automation of routing operations.
pls Programmierbare Logik & Systeme GmbH, Lauta, Germany, 49-35722-384-0, www.pls-mc.com																		
✓	✓	✓		✓			✓	✓	TASKING, Keil, GNU	PXROS, RTX, CMX-RTX, OSE, Nucleus	365	\$	\$	\$	\$	\$	\$1,500	
Real-Time Innovations Inc., Sunnyvale, CA, (408) 734-4200, www.rti.com																		
		✓							VxWorks, Tornado		90	U	\$	\$	\$	\$	5,000	It shows you where your program is spending time, how the processor is executing your program, and why the system performs poorly. ScopeProfile is now bundled with MemScope and sold as PerformancePak.
		✓							VxWorks, Tornado, IRIX/React		190	U	\$	\$	\$	\$	5,000	Allows you to analyze your real-time application while it is running and track down performance problems, glitches, and program errors with minimal intrusion. StethoScope is bundled with TraceScope and sold as ScopePak.
Sid Price's Software Tools for Embedded Systems, Tijeras, (505) 281-2705, www.softtools.com/tools/																		
✓				✓	✓	✓			IAR, Cosmic, Introl, HiTech		365	U	U		U			

DEBUGGERS

Product name	Target (PDKs supported)	Platforms supported	Small kernel in ROM (ROM monitor)	ROM emulators	In-circuit emulators	BDM/TAP units	Simulator	Languages supported	Kb of RAM needed in target	Kb of ROM needed in target	IDE provides unified edit/compile/download	Displays HLL source w/ disassembled code	Can display nested structures	Can display CHROMs	Removes out of scope variables	Shows decoded call stack	Supports objects	Includes a class browser
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com																		
Chameleon Multi-Core Debugger	68K, 80196, 8051 and derivatives, ARM, 8085, C5xx, CR16, CR32, 80C186, Compact RISC, TriCore, CPU 32, 80188, 80186, Atmel 89C series, C500, C504, 683xx, TMS320 and other TI DSPs, Z8	Windows 3.1/95/98/NT	✓	✓	✓	✓	✓	Assembly, C, C++	0.02	4	✓	✓	✓	✓	✓	✓		
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com																		
TimeScan	i860, PowerPC	Windows 3.1/95/98/NT, VxWorks, Solaris						C, C++			✓				✓			
Softchip Ltd., Jerusalem, Israel, +972 2 5864086, www.softchip.com																		
Sim6805	68HC05	Windows 3.1/95/98/NT					✓	Assembly, C			✓				✓			
Target Compiler Technologies, Leuven, Belgium, +32-16-40 81 14, www.retarget.com																		
Checkers	Retargetable to application specific DSPs	Linux, Solaris, HP-UX					✓	C			✓				✓			
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com																		
TASKING CrossView Pro	68K, 80196, 80251, DSP56K, Carmel, M16C, TriCore, 8051 and derivatives, 8051XA, ARM, C16x, MIPS, MPC8xx, PowerPC, TLCS90/900	Windows 3.1/95/98/NT, Solaris	✓	✓	✓	✓	✓	Assembly, C, C++			✓	✓	✓	✓	✓	✓		
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com																		
ClearView	PIC	Windows 3.1/95/98/NT, Windows 2000			✓			Assembly, C			✓	✓			✓	✓		
TERN Inc., Davis, CA, (530) 758-0180, www.tern.com																		
C/C++ Evaluation/Dev. Kit	x86 Real Mode, V25		✓				✓	Assembly, C, C++	128	8K	✓	✓	✓		✓	✓	✓	✓
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com																		
TimeTrace	RTOS specific	Windows 3.1/95/98/NT																
Virtual Micro Design, Bidart, France, +33 559.438.458, www.vmdesign.com																		
UMPS	68HC05, 68HC08, 68HC11, AVR 8 bit Risc Flash Controller Family, ST6, Scenix SX, COP8, AT89, ST7, 8051 and derivatives, PIC	Windows 3.1/95/98/NT					✓	Assembly			✓	✓						
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com																		
Simulator/Debugger	65816, 65C02	DOS, Windows 3.1/95/98/NT	✓	✓	✓			Assembly, C	0.1	1.5	✓					✓		

Task aware debugging available Shows RTOS status/data structures in high-level form Shows CPU peripherals in decoded high-level form Profiler available Measures time between events Break on data value matches Break on </> conditions Pass counter Multi-level breakpoints Compilers supported										Technical Support Commercial RTOSes supported Free days of phone support BBS/Web FAQs, bug lists, other Phone support, standard Phone support, 24-hour response Product updates Training Price Comments									
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com																			
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Most	VxWorks, Nucleus	365	U	\$	\$	\$	\$	950	Supports multi-core embedded systems with one IDE. Supports ICEs, JTAG/BDM emulators connected to local workstation or distributed over TCP/IP networks.
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com																			
✓			✓	✓						SKYvec C/C++	Solaris, VxWorks, Windows NT	90			\$	\$	\$	\$7,500	
Softchip Ltd., Jerusalem, Israel, +972 2 5864086, www.softchip.com																			
			✓					✓		Byte Craft C6805, other soon		30	U	U		\$			
Target Compiler Technologies, Leuven, Belgium, +32-16-40 81 14, www.retarget.com																			
			✓							Interfaces with Chess retargetable C compiler		180	\$	\$	\$	\$			
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com																			
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	TASKING C/C++/EC Compiler	Nucleus PLUS, Precise MQX, CMS, RTX	90	U	\$		\$	\$		test
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com																			
		✓		✓	✓					Most		U	U	U		U			ClearView includes TDE (TechTools Development Environment), a full project oriented IDE. ClearView and TDE are included with our PIC ICE - Mathias.
TERN Inc., Davis, CA, (530) 758-0180, www.tern.com																			
✓		✓			✓	✓				Borland C/C++ 3.1		U	U	U	U	U	U	\$299	
TimeSys Corp., Pittsburgh, PA, (412) 681-6899, www.timesys.com																			
	✓		✓	✓						Windows NT, Windows CE, Real Time		60	U	\$	\$	\$	\$		
Virtual Micro Design, Bidart, France, +33 559.438.458, www.vmdesign.com																			
		✓	✓	✓		✓				Hitech, Microchip, Cosmic, Imagecraft, Embedded PASCAL			U	U	U	\$	\$	\$990	UMPS simulates a full CPU including all peripherals
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com																			
													U	U		U			

Product name	Target CPUs supported	Platforms supported	Technical Support							Price	Comments
			Days of free phone support	855/Web FAX, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com											
Intelligent System Software (iSys)	Can be ported to any CPU	Linux, Windows CE									The iSys solution provides low level system software that allows hardware designs to communicate with the OS and consists of a core system software, accelBIOS; a configuration SDK, accelTool; and a system management tool, accelSys.
Annasoft Systems, Poway, CA, (858) 391-5600, www.annasoft.com											
Jump Start 2.11 Platform Library Kit	x86 Protected Mode, x86 Real Mode	Windows CE	60	U	U	\$	\$	\$	\$4,995	A ready-to-run board support package that enables PC-compatible H/W to run Windows CE. The PLK comes with a full set of PC drivers (incl. floppy, HDD, CD-ROM), the CE Launcher boot loader, and a build tree.	
Jump Start 2.11 Platform Library Kit for SC400	AMD Elan SC400	Windows CE	60	U	U	\$	\$	\$	\$4,995	A S/W suite that supports the integration of Windows CE with a SC400-based H/W platform, particularly rev. 3 of the AMD evaluation platform. It includes AMD's bootloader, drivers, and a build tree for image creation.	
Jump Start 2.11 Platform Library Kit for the SA-1100	ARM, Intel StrongARM SA 1100	Windows CE	60	U	U	\$	\$	\$	\$4,995	A kit that supports the integration of Windows CE with a StrongARM-based H/W platform, especially the Brutus evaluation platform. Included is an OAL adaptation, boot loader, driver suite, and build tree.	
Video Driver Kit for CHIPS 69000	CHIPS 69000 Video Controller	Windows CE	60	U	U	\$	\$	\$	\$995	Contains the driver for the chip as well as software tools for adapting the driver to support different resolutions, cursor shapes and color depths.	
Video Driver Kit for the CHIPS 65550/54	CHIPS 655xx Video Controllers	Windows CE	60	U	U	\$	\$	\$	\$995	Contains the driver for the chip as well as software tools for adapting the driver to support different resolutions, cursor shapes and color depths.	
Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com											
Blackhawk	TMS320 and other TI DSPs		0	U	\$	\$	\$	\$		Blackhawk libraries are free, open source, and can be called from applications running on the Blackhawk OS. Current library functions include extensive math and FFT routines.	
BlueWater Systems Inc., Edmonds, WA, (425) 771-3610, www.bluewatersystems.com											
Driver Developer Kit	Alpha, x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000	180	U	\$	\$	\$	\$	\$1,250	Provides a complete set of driver development tools including one copy of WinDK, WinRT and WinRT-VB at significant savings when compared to individual purchases.	
Driver Development Suite	Alpha, x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000	360	U	\$	\$	\$	\$	\$1,995	Includes one copy of WinDK with Source Code, WinRT and WinRT-VB. Subscription support for WinDK and WinRT, and the assurances of remaining updates on the latest bus architectures and operating systems.	
Time Critical Extension (TCX)	MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode	Windows CE	90	U	\$	\$	\$	\$	\$995	A time critical extension to Windows CE. Allows very low latency interrupts and timers on Windows CE. Solves the problems of long and non-deterministic IST latencies that developers face in developing device drivers for Windows CE.	
WinDK	Alpha, x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000	180	U	\$	\$	\$	\$	\$995	Adds new components for complete support of new Windows 2000/NT 4.0 and Windows 98 Plug and Play and Power Management. This toolkit is for hard-core kernel driver creation.	
WinDK for Windows CE	ARM, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode	Windows CE	90	U	\$	\$	\$	\$	\$2,495	The first full-featured device driver development tool for embedded systems and industrial control developers using Windows CE. With WinDK for Windows CE developers can create high-performance device drivers for Windows CE.	
WinRT	x86 Protected Mode	Windows 3.1/95/98/NT	180	U	\$	\$	\$	\$	\$395	A versatile toolkit for Win32 hardware control and provides direct binary compatibility between Windows 95, Windows 98 and Windows NT. Access Port I/O, Memory I/O, interrupts, DMA and Kernel mode timers without using the DDK.	
WinRT-VB	x86 Protected Mode	Windows 3.1/95/98/NT	180	U	\$	\$	\$	\$	\$125	An integrated ActiveX control tool for developing memory I/O and port I/O hardware controls for Visual Basic 4.0 and 5.0 (32-bit) Windows applications.	
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com											
TargetFFS	68K, MIPS, MPC8xx, PowerPC	TargetOS	365	U	U			U	\$	\$5,000	Full implementation of Standard C and POSIX File API. Wear leveling. Power failure recovery. Minimum number of configurable parameters. Platform independent. Highly portable. Royalty free annual site license.

Product name	Target CPUs supported	Platforms supported	Technical Support						Price	Comments	
			Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com											
Time Critical Extension (TCX)	MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode	Windows CE	90	U				\$	\$	995	A time critical extension to Windows CE. Allows very low latency interrupts and timers on Windows CE. Solves the problems of long and non-deterministic IST latencies that developers face in developing device drivers for Windows CE.
Coreco, St. Laurent, Canada, (514) 333-1301, www.coreco.com											
eWIT	x86 Protected Mode	Windows 3.1/95/98/NT	520	U	U	U	U	\$		\$2,800	Offers a visual programming software package for imaging application development. WIT 5.3 for windows delivers a multi-threaded scheduler to drive execution on dual or quad Pentium systems of imaging dataflow graphs created in a CAD-I.
CrosStor Software, South Plainfield, NJ, (908) 226-0100, www.crosstor.com											
CrosStor Volume Manager	68K, ARM, i960, MIPS, PowerPC, x86 Protected Mode	Solaris, VxWorks, PSOS, Nucleus	0	\$	\$	\$	\$	\$			A software-based RAID alternative for OEMs requiring RAID or volume management or creating RAID-configured, dedicated storage appliances. Provides all traditional hardware RAID functions.
DC Micro Development, Lawrenceville, GA, (678) 442-1623, www.dcmicro.com											
Crusher! Data Compression Toolkit	29K, 68HC11, 68HC16, 68K, 80196, 8051 and derivatives, Alpha, ARM, ColdFire, i860, i960, MIPS, PowerPC, SH, SPARC, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode	Any platform that supports ANSI C compiler	60	U	U	\$	U	\$		349	High-performance, cross-platform data compression libraries with C source code. 45-function API provides buffer compression, file compression, archiving, encryption, self-extracting EXE's and more.
html++ Dynamic HTML Class Library	29K, 6800, 68HC11, 80196, 8051 and derivatives, Alpha, ARM, ColdFire, i860, i960, MELPS 7700, MIPS, PowerPC, SH, SPARC, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode, Z80/Z180	DOS, Windows 3.1/95/98/NT, Linux, Solaris, Mac, HP, AIX, UNIX, BSD/OS, Windows CE, Windows 2000, FreeBSD	60	U	U	\$	U	\$		\$349	Develop dynamic web pages using C++ objects instead of html tags. Features include multipart mime decoding (HTTP file uploads), ISAPI and CGI support, automatic encryption and decryption of hidden fields and URL-encoded data, session and state management, and more.
NetKit TCP/IP Class Library	29K, 78K series, 80196, Alpha, ARM, i860, i960, MELPS 7700, MIPS, PowerPC, SH, SPARC, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode, Z80/Z180	DOS, Windows 3.1/95/98/NT, Linux, Solaris, SGI, HP, AIX, UNIX, NetBSD, BSD/OS, Windows CE, Windows 2000, FreeBSD	60	U	U	\$	U	\$		\$349	Portable C++ class library providing advanced client and server objects for HTTP, POP3, SMTP, FTP, DNS, and more. Supports cookies, mime, http uploads, firewalls, proxy servers, authentication, plus many more features.
DDC-I, Phoenix, AZ, (602) 275-7172, www.ddci.com											
DDC-I Ada Compiler Systems (DACS)	1750A, 68K, i960	Solaris, HP-UX, VAS/VMS	0	\$	\$	\$	\$	\$			
DDC-I JOVIAL Compiler Systems (DJCS)	1750A, Z8002	Solaris, HP-UX, VAX/VMS	0	\$	\$	\$	\$	\$			
DDC-I SCORE Development Environment	PowerPC, SPARC	Windows 3.1/95/98/NT, Solaris, Sun/SPARC	0	\$	\$	\$	\$	\$			
Tartan Ada Development Systems	MIPS, SPARC, x86 Protected Mode, x86 Real Mode, x86 Flat Mode	Windows 3.1/95/98/NT, Solaris, Lynx, VAX/VMS	0	\$	\$	\$	\$	\$			
Dinkumware Ltd., Concord, MA, (978) 371-2773, www.dinkumware.com											
Dinkum C++ Library for GCC/Linux	Alpha, PowerPC, x86 Protected Mode, x86 Real Mode	Linux	30	U	U					\$90	The Dinkum C++ Library for GCC/Linux includes our Dinkum C Library and our Dinkum C++ Library for use with the GCC V2.95.2 compiler under Linux. The combination is compliant with the ISO/IEC C++ Standard 14882.
DSpecialists, Berlin, Germany, +49-30-467 805-0, www.dspecialists.de											
DSP-IO	DSP56300 family	Windows 3.1/95/98/NT		U	U	\$	\$	\$			Transparent DSP IO Handler for analog and digital data. Efficient data transfer at all DSP interfaces, simple communication between DSP and codecs. Minimal DSP usage during data transfers (<0.1%).

U - Unlimited free \$ - paid

Product name	Target CPUs supported	Platforms supported	Technical Support							Price	Comments
			Day of free phone support	BBS/Web FAQs	Bug lists, other	Phone support: standard	Phone support: 24-hour response	Product updates	Training		
Host Communication Driver	DSP56300 family	Windows 3.1/95/98/NT	U	U	\$	\$	\$	\$			Drivers for PCI, USB and RS232 Interfaces, simple and fast DSP-PC communication without programming effort, minimal use of the DSP for data transmission (<0.1 %).
various algorithm libraries	DSP56300 family	Windows 3.1/95/98/NT, UNIX	U	U				\$	\$		Optimized object orientated math and audio libraries, FIR/IIR, FFT, MPEG with standardized calling interface, framewise processing of data streams.
EBS Inc., Groton, MA, (978) 448-9340, www.ertfs.com											
CDFS	Portable source code	DOS, Windows 3.1/95/98/NT, Linux, Solaris, Mac	180	\$	\$	\$	\$	\$	\$	\$3,000	The CDFS file manager library provides access to files and directory entries on ISO9660 compatible CD-ROMS. Full source code is provided.
ERTFS	Any 16 bit or greater processor	DOS, Windows 3.1/95/98/NT, Linux, Solaris, Mac	180	\$	\$	\$	\$	\$	\$	\$4,500	ERTFS is a DOS compatible file manager proven in hundreds of applications since 1987. It provides a full featured file system for embedded applications. ERTFS devices include Floppy, IDE, Compact flash, ram disk. Supports LFN and FAT32. Ports to any CPU/Kernel.
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com											
Hypersignal Optional Libraries	68HC11, 68HC12, 68HC16, 56K, ADSP2181, ADSP2106x, 68K, Alpha, ARM, i860, i960, MIPS, PowerPC, SPARC, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT		U	U	U	\$	\$	\$	\$1,495	Provides a complete set of design and analysis functions for radio, wireline, and fiber transmission systems. Advanced Speech Processing and Image Processing libraries also available.
Inferno Network Software, Murray Hill, NJ, (908) 582-6489, www.lucent-inferno.com											
InfernoSpaces		Windows 3.1/95/98/NT, Solaris	90	U	\$	\$	U	\$	\$	Free	Provides a simple framework for building distributed computing applications on popular programming languages (C and Java) and operating systems (Windows and Solaris).
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz											
Mod51 Object LIB	8051 and derivatives	DOS, Windows 3.1/95/98/NT					\$	\$		Free with compiler	Includes i2c, SPI, Sw232, and ADC/DAC/PWM libraries, for uC.
MarshallSoft Computing Inc., Huntsville, AL, (256) 881-4630, www.marshallsoft.com											
Personal Communications Library for PowerBASIC	x86 Protected Mode, x86 Real Mode	DOS	365	U	U					\$85	Serial Communications Library for PowerBASIC running DOS.
Personal Communications Library for C/C++	x86 Protected Mode, x86 Real Mode	DOS	365	U	U					\$85	Serial Communications Library for C/C++ running DOS.
Personal Communications Library for Pascal	x86 Protected Mode, x86 Real Mode	DOS	365	U	U					\$85	Serial Communications Library for Pascal running DOS.
Personal Communications Library for Visual Basic / DOS	x86 Protected Mode, x86 Real Mode	DOS	365	U	U					\$85	Serial Communications Library for Visual Basic (VB DOS) running DOS.
MathWorks Inc., The, Natick, MA, (508) 647-7000, www.mathworks.com											
MATLAB		Windows 3.1/95/98/NT, Linux, SGI, HP, IBM AIX	365	U			\$	\$			Users can extend the capabilities of MATLAB, an integrated technical computing environment, with additional libraries for specialized applications. The following libraries, called Toolboxes, are available: Communications, Control System, and Signal Processing.
Simulink Libraries		Windows 3.1/95/98/NT, Linux, Solaris, SGI, HP, IBM AIX	365	U			\$	\$			Users can extend the capabilities of Simulink, a graphical modeling and simulation tool, with additional libraries for specialized applications. The following libraries, called Blocksets, are available: Power System, CDMA Reference, Fixed-Point, and Dials & Gauges.
Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com											
PEG Portable Embedded GUI	68K, ARM, C16x, ColdFire, PowerPC, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT, Smx	180	\$	\$	\$	\$	\$	\$	\$7,500	A professional quality graphical user interface library created to meet the needs of embedded system developers. PEG is small, fast, and easily ported to virtually any hardware configuration capable of supporting graphical output.

Product name	Target CPUs supported	Platforms supported		Technical Support					Price	Comments
				Days of free phone support	885/Mod 1000, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates		
pmEasy/unDOS	x86 Protected Mode	Smx	180	\$	\$	\$	\$	\$	\$2,000	Creates a protected mode environment and loads a protected mode executable. unDOS emulates DOS services in protected mode, making processor mode switching unnecessary.
smxFile/smxCDF5	ColdFire, PowerPC, x86 Protected Mode, x86 Real Mode	Smx	180	\$	\$	\$	\$	\$	\$5,000	A DOS-compatible file i/o system. IDE, floppy, PCMCIA ATA and flash, LS 120, Ultra DMA, DiskOnChip, and SCSI supported. smxCDF5 is a CD-ROM file system with ATAPI support.
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com										
PICmicro Plug-In Libraries	PIC	Windows 3.1/95/98/NT	U	U	U		U	U	Free	Assembly routines emulate the PIC12CXXX and PIC16C5X microcontroller peripherals and specialty functions in software.
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com										
RTFiles-32 (On Time RTOS-32 module)	x86 Protected Mode	Windows 3.1/95/98/NT, Windows 2000, On Time Embedded RTOS	U	U	U	U	\$	\$	\$1,700	File system for On Time RTOS-32. Supports DOS FAT/FAT-32 file systems on IDE, floppy, M-Systems DOC and flash media.
RTPEG-32 (On Time RTOS-32 module)	x86 Protected Mode	Windows 3.1/95/98/NT, On Time Embedded RTOS, Windows 2000	U	U	U	U	\$	\$	\$2,500	Win95 look-and-feel GUI for On Time RTOS-32.
Pathfinder Solutions Inc., Wrentham, MA, (888) 662-7284, www.pathfindersol.com										
Design templates and Components	Most	Windows 3.1/95/98/NT	365	U	\$	\$	\$	\$	\$20,000	A complete, high-performance, portable layer of Design Code Templates and Base Mechanisms to provide your project with a substantial head start. Work from a single thread of control for small embedded systems, or combine threads for larger systems.
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.psti.com										
Precise/C++ Class Libraries	Can be ported to any CPU	Other	90	\$	\$	\$	\$	\$	\$4,000	As an add-on component to the Precise/MQX RTOS, Precise/C++ Class Libraries provide a C++ class interface to the Precise/MQX API, thus providing an object-oriented interface to Precise/MQX.
Precise/MFS	Can be ported to any CPU	Other	90	\$	\$	\$	\$	\$	\$5,000	Precise/MFS is an implementation of the MS-DOS file system, providing a library of MS-DOS compatible file system functions for embedded applications. Precise/MFS has the capability to format, read, write, and exchange files with media from a computer running MS-DOS. Precise/MFS is re-entrant, scalable, optimized for use with Precise/MQX, and programmable into ROM.
SEGGER Microcontroller System GmbH, Germany, www.segger.com										
emWin b/w, emWin GSC	Can be ported to any CPU	DOS, Windows 3.1/95/98/NT	90	U	\$	\$	\$	\$	DM 9,800+	Written completely in ANSI C and works with any CPU, LCD and Controller. Available tools: bitmap converter, font converter, simulation and viewer.
Sid Price's Software Tools for Embedded Systems, Tijeras, (505) 281-2705, www.softtools.com/tools/										
COMM32	68HC12, 8051 and derivatives	Windows 3.1/95/98/NT		U	U		U			Interrupt driven serial port library for embedded systems.
SKY Computers Inc., Chelmsford, MA, (978) 250-1920, www.skycomputers.com										
SKYscl	i860, PowerPC	Windows 3.1/95/98/NT, Solaris	90					\$	\$5,000	A scalable communication library that handles the complex communication work so the developer can concentrate on the numerical algorithms, resulting in rapid software development in large, scalable, multiprocessor systems.
SKYsml	i860, PowerPC	Windows 3.1/95/98/NT, Solaris	90					\$		Employs intelligent software technology to achieve transparent portability, ease of use, and performance in a library of math, image, and signal processing functions.
Spectrum Signal Processing, Burnaby, BC, (604) 421-5422, www.spectrumsignal.com										
Math libraries and Digital Radio Libraries	TMS320 and other TI DSPs, ARC, SHARC	Windows 3.1/95/98/NT, Solaris	365	\$	U	U	U	\$		Math libraries to improve the performance of your DSP application. Digital Radio Libraries for control of digital down conversion and I/O.

Product name	Target CPUs supported	Platforms supported	Technical Support					Price	Comments	
			Days of free phone support	BBS/Web FAQs, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates			
Swell Software, Port Huron, MI, (810) 982-5955, www.swellsoftware.com										
PEG	29K, 68HC11, 68HC16, 68K, 80196, 80251, Alpha, ARM, C16x, ColdFire, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT, Linux	180	U	\$	\$	\$	\$	\$5,000	PEG is a small, fast, GUI library for embedded systems. Completely integrated with leading RTOS products and embedded compilers. Can be used with a variety of common LCD and VGA video controllers. Full source code, utilities, and more included.
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com										
GOFAST	68K, Nec, SPARC, ColdFire, i960, MIPS, SH, PowerPC				\$		\$	\$		Floating-Point Libraries and co-processor emulators to replace hardware FPU.
NetPeer	68K, ARM, C16x, ColdFire, MPC8xx, SH, SPARC, V800, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT, Linux, Solaris, JRE	90		\$		\$	\$		Libraries are built based on target CPU and compiler. Java class files delivered. NetPeer provides a distributed operating environment.
USFiles	68K, ARM, ColdFire, MIPS, PowerPC, SH, V800, StrongARM, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT	90		\$		\$	\$		Provides an ANSI C file I/O interface to access a DOS/Windows compatible file system. Long file names (VFAT) and Kanji characters are also supported. Designed reentrantly to insure operation with a multitasking executive.
USFiles Compact Flash	V800, x86 Real Mode	DOS, Windows 3.1/95/98/NT	90		\$		\$	\$		Supports CompactFlash Cards in ATA mode or True IDE mode, as well as ATA Flash Cards and initialization of PCMCIA controllers compatible with the Intel 82365.
USFiles for CD-ROM	x86 Real Mode	DOS, Windows 3.1/95/98/NT	90		\$		\$	\$		USFiles for CD-ROM is an add-on product for USFiles and includes CD File Manager and ATAPI CD-ROM driver.
USFiles-32	68K, PowerPC, V800, SH, StrongARM, Intel 386, x86, MIPS, ARM, ColdFire	DOS, Windows 3.1/95/98/NT			\$		\$	\$		The USFiles-32 add-on product to USFiles extends the capabilities of USFiles to support very large hard disks.
USNET Web Server	68K, ARM, C16x, ColdFire, i860, i960, MIPS, MPC8xx, PowerPC, SH, V800, x86	DOS, Windows, Linux, Solaris	90		\$		\$	\$		HTTP server optimized to run in 16/32-bit embedded environments. Independent of processor, TCP/IP stack and RTOS.
VisiCom, San Diego, CA, (619) 457-2111, www.visicom.com										
RTX-Windows	68K, i960, MIPS, PowerPC, SPARC	DOS, Windows, Solaris, HP-UX, SunOS	90	\$	\$	\$	\$			A scalable graphics package with an X API interface providing real-time performance for embedded applications. Based on the X Windows System, MOTIF.

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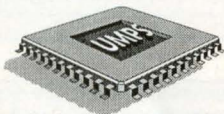
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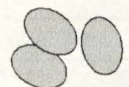
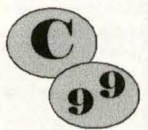
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ISO/IEC 9899:1999 Standard C Library.The Dinkum C99 Library has rich
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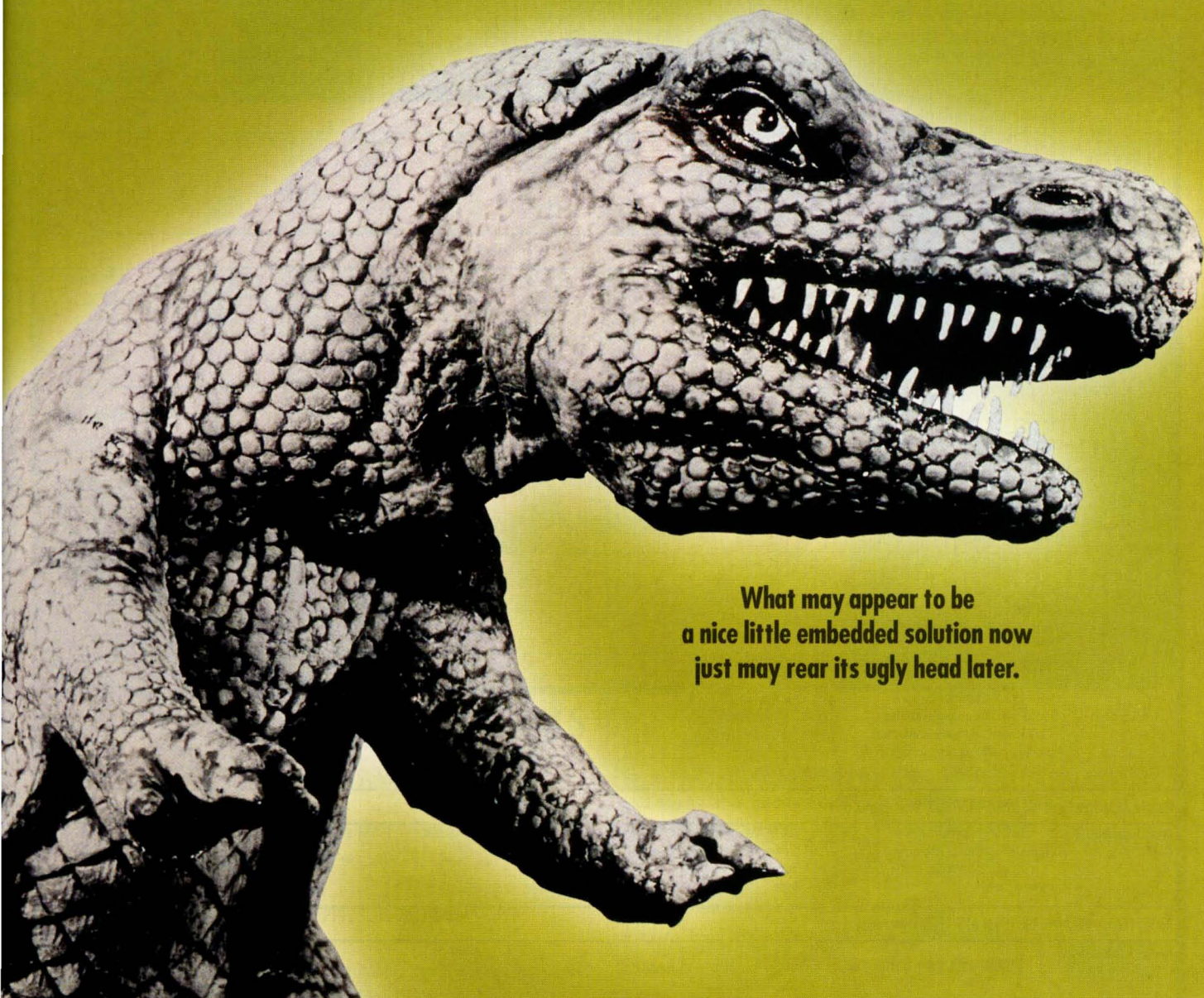
COMMUNICATIONS PACKAGES

Product name	Product description	Target CPU supported	Technical Support										Protocol (e.g. CAN)	Price
			Language supported	Package is ROMable	Package is reentrant	Source supplied all the time	Source optionally available	Package size (100's of L)	Days of free phone support	800/Web FAXs, bug lists, other	Phone support, standard	Phone support, 24-hour response		
Aztek Engineering Inc., Boulder, CO, (303) 786-9100, www.aztek-eng.com														
AR-303	Portable, modular and versatile embedded GR-303 LAPD & TMC for the RDT.	Other	C	✓	✓		300	365		\$	\$	\$	\$	Bellcore GR-303 (TMC and LAPD)
AV5	Portable, modular, versatile embedded V5 platform for Access Network equipment.	Other	C	✓	✓		1,300	365		\$	\$	\$	\$	ETSI V5.1, V5.2
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com														
TargetLAPB	ISO 7776 LAPB Protocol Stack and HDLC drivers.	68K, MIPS, MPC8xx, PowerPC	Assembly, C	✓	✓	✓	25	365	U	U		U	\$	LAPB \$5,000
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com														
CE Remote Updater	CE Remote Updater is an XML-based software and file update utility enabling remote Windows CE-based devices to call back to a server and receive updates in software applications, data, and device and operating system configuration.									\$	\$	\$	\$	
CE/2000 Wireless IP Router (WIPR)	Components linked with Windows CE and Windows 2000 applications to provide two-way IP-based wireless WAN communication.	ARM, MIPS, PowerPC, SH	C, C++	✓			90		\$	\$	\$	\$	\$	
Cimetrics Inc., Boston, MA, (617) 350-7550, www.cimetrics.com														
RS-485 Embedded Network	RS-485 networking using built-in microcontroller serial port.	68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 68332, 80196, AM186ES, 8051 and derivatives, H8, PIC, x86 Real Mode, Z80/Z180	C	✓	✓		2	365	U	U	\$	\$	\$	NSP \$1995
CounterPoint Systems Foundry, Corvallis, OR, (541) 758-6123, www.countersys.com														
JetBeam	Add reliable Infrared Data Association (IrDA) infrared communications to any embedded device. Delivered as a well documented, portable source code solution.	Other			✓		25,000							IrDA
EDS, Troy, MI, (877) 877-7671, www.eds.com/embeddedsystems/														
EST-100: KW-2000/CAN Diagnostic Service Tool	User friendly, KW-2000 over CAN, Windows/PC based tool for engineering and service personnel. Uses PCMCIA card.	6800, 68HC05, 68HC11, 68HC16, 68K, 8051 and derivatives, PowerPC, Z80/Z180, CAN interface to embedded target					45	U	\$	\$	\$	\$		\$3,600
EMBEDnet Inc., Beaverton, OR, (503) 645-4034, www.embednet.com														
IrPro	IrPro is an IrDA-compliant, royalty-free protocol software stack for embedded systems which supports TinyTP, IrOBEX, IrLAN, IrCOMM, IrMC, IrTranP, more.	68HC12, 68HC16, 68K, 8051 and derivatives, 8051XA, ARM, ColdFire, i960, MIPS, PIC, PowerPC, SH, SPARC, V800, x86 Protected Mode, x86 Real Mode	C	✓	✓	✓	10 to 20	90	U	U	U	U	\$	IrDA
Enea OSE Systems Inc., Dallas, TX, (214) 346-9339, www.enea.com														
	Versatile product, includes optimized one-copy TCP/IP standard sockets interface and optimized zero-copy asynchronous interface.	68K, ARM, MPC8xx, PowerPC	C, C++											
HiTech Equipment Corp., San Diego, CA, (619) 566-1892, www.hte.com														
NoWire Wireless Automated		8051 and derivatives							U	U	\$	U	\$	\$20
I+ME ACTIA US, Grand Junction, CO, (970) 244-1257, www.ime-actia.com														
CAN NetTest III+		C16x							U	U	U	U	\$	\$1,150

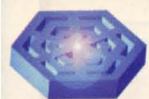
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COMMUNICATIONS PACKAGES

Product name	Product description	Target CPUs supported	Languages supported	Package is ROMable	Package is reentrant	Source supplied at the time	Source optionally available	Package size (1,000s of 1K)	Technical Support						Protocol (e.g. CAN)	Price
									Days of free phone support	800/Web FAX, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		
CAN PcInterfaces		C16x							U	U	U	U	\$			\$220+
CAN StarterKits		68HC11, 80196, C16x							U	U	U	U	\$			
CAN StartUp Kits		68HC11, 80196, C16x							U	U	U	U	\$			
CAN System Know-How									\$	\$	\$	\$	\$			
InduCAN104									U	U	U	U	\$			
LevelX									U	U	U	U	\$			
NetPorty II		C16x							U	U	U	U	\$			
PcCANControl									U	U	U	U	\$			
PCI-IntelliCAN		C16x							U	U	U	U	\$			
PCMCIA -Key		C16x							U	U	U	U	\$			
PcSlimLine		C16x							U	U	U	U	\$			
Inferno Network Software, Murray Hill, NJ, (908) 582-6489, www.lucent-inferno.com																
InfernoSpaces	Provides framework for building distributed computing applications.		C, Java			√		90	U	\$	\$	U	\$			Free
InterNiche Technologies Inc., San Jose, CA, (408) 257-8014, www.iniche.com																
RIP 1 and 2		68HC16, 68K, ARM, i960, MIPS, PowerPC, SH, ARC Cores, SPARC, x86 Protected Mode, x86 Real Mode	C	√	√	√		30	90	\$	\$		\$	\$	HTML	
Lantronix, Irvine, CA, (949) 453-3990, www.lantronix.com																
CoBox Mini Universal Thin Server		1750A, 29K, 65816, 6800, 68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 78K series, 80196, 80251, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, i860, i960, MELPS 7700, MIPS														\$200
Lightship Inc., Doylestown, PA, (215) 340-7790, www.lightshipinc.com																
PortView	Talk directly to modems, web servers, custom applications, telnet servers, and chat programs. PortView provides standard terminal capabilities with enhancements for people concerned about all transmitted and received information.	Pentium	Any					30	U			U				\$299
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz																
CANport	CAN V2.0B interface, on a PC parallel port.															\$250
Mercury Computer Systems Inc., Chelmsford, MA, (978) 256-1300, www.mc.com																
PAS (Parallel Acceleration System)	A multiprocessor communications library that has proven useful in development of RADAR, SONAR, image processing, and simulation applications on Mercury multiprocessor systems.	PowerPC	C, C++					500	90	U	\$	\$	\$	\$	DMA-based	9,000
RACE MPI/RT	RACE MPI/RT is a standards-based communications library for embedded real-time multiprocessor apps. RACE MPI/RT is a channels based architecture with support for flow control, and OO design.	PIC	C, C++		√			1000	90	U	\$	\$	\$	\$	DMA based	15,000



**What may appear to be
a nice little embedded solution now
just may rear its ugly head later.**

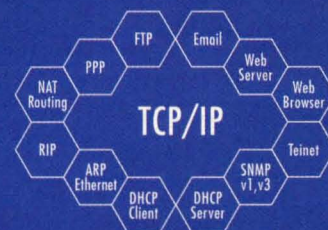


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COMMUNICATIONS PACKAGES

Product name	Product description	Target CPUs supported	Language supported	Package is ROMable	Package is reentrant	Source supplied all the time	Source optionally available	Package size (1,000's of 1's)	Days of free phone support	Technical Support					Protocol (e.g. CAN)	Price
										BBS/Web Fido, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training		
MultiPort Corp., Newton, MA, (508) 845-4130, www.multiport.com																
MP-Router Product Family	Portable source code offering IP routing capability including IP Router Code, RIP, OSPF and supporting MIBs.	Most	C	✓		✓		30	90	U	\$	\$	\$	\$	IP, RIP, OSPF, SNMP, RMON, HTTP	
Ncomm Inc., Salem, NH, (603) 893-6186, ext 60, www.ncomm.com																
NC1942 - Configurable Non-Blocking Digital TDM Switch Megafunction	Code scalable (via parameterization), Output Tri-statable per time slot, hyper channel/constant delay (1 frame/125uS @ 8KHz), data controllable per time slot, nonblocking switch.	Altera FLEX 10KE Series APEX 20K	Other					30	U	\$		\$	\$			\$18,995
T1 Trunk Management Software Suite	Software suite performing all aspects of T1 support (span alarming/maintenance/channelized signaling processing).	Most	C			✓		30	U	\$		\$	\$			\$85,000
ToneGen Altera Megafunction	Generates single/dual frequency tones used in telephony applications.	Altera Flex 10KE						30	U	\$		\$	\$			\$9,995
Objective Interface, Reston, VA, (703) 295-6500, www.ois.com																
ORBexpress	ORBexpress is an object request broker that provides a uniquely powerful environment for building high performance, high reliability, distributed software components.	68K, Alpha, MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Ada, C++		✓			20,000	365	\$	\$	\$	\$	\$	TCP IP, IIOP, ATM, Backplane	\$5,000
Performance Technologies Inc., Rochester, NY, (716) 256-0200, www.pt.com																
WAN Communications Protocols	PTI's WAN Communications Protocols, integrated with their T1/E1, sync, and async adapters, provide enabling technology to develop WAN systems.	MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode						90	U		\$	\$	\$		SS7, X25, Frame Relay, HDLC, LAPD	\$795
Quiotix, Mountain View, CA, (650) 843-1300, www.quiotix.com																
Quiotix Embedded AppleTalk	Portable, high-performance AppleTalk protocol implementation that supports printing, routing, remote access.	29K, 68K, ARM, i960, MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	C, C++	✓	✓		✓	100	30	\$	\$	\$	\$	\$	Full AppleTalk protocol suite	
RadiSys Corp., Hillsboro, OR, (503) 615-1100, www.radisys.com																
RadiSys/Communications Packages		i960, TMS320 and other TI DSPs	Assembly, C				✓	256							H.323, X.25, SS7, Custom	
Real-Time Innovations Inc., Sunnyvale, CA, (408) 734-4200, www.rti.com																
NDDS	NDDS is network middleware that simplifies the development of distributed, real-time applications. Its delivery system distributes data quickly and deterministically.	68K, ARM, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode	C, C++	✓	✓		✓	160	90	U	U	\$	\$	\$	RTPS	\$12,000
Sid Price's Software Tools for Embedded Systems, Tijeras, (505) 281-2705, www.softtools.com/tools/																
COMM32	Interrupt-driven serial port library for embedded applications.	68HC12, 8051 and derivatives	Assembly, C	✓	✓		✓	1,000	365	U	U		U		Asynch. Serial	
Spider Software, Edinburgh, +44 (0) 131 475 7000, www.spider.com																
SpiderDSF	An extension to the STREAMS architecture to provide transparent communication between STREAMS drivers running on different systems connected either by a shared memory bus or a high speed network, facilitating load sharing and high availability solutions.	68K, SPARC, x86 Real Mode, 175PowerPCOA, x86 Protected Mode, MPC8xx, i860, MIPS, i960	C							\$	\$	\$	\$	\$		

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CAN RIDE
THE WAVE
OF SUCCESS

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- **Web:** Web Micro Browser, Web Server, Graphics Toolkit/GUI
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COMMUNICATIONS PACKAGES

Product name	Product description	Target CPUs supported	Language supported	Package is ROMable	Package is reprogrammable	Source supplied all the time	Source optionally available	Package size (1,000's of K)	Days of free phone support	Technical Support					Product updates	Training	Protocols (e.g. CAN)	Price
										BBS/Web FIDO, bug fixes, other	Phone support standard	Phone support 24-hour response	Product updates	Training				
SpiderFRAME-RELAY	Portable, STREAMS-based, Frame Relay product supports PVCs and SVCs. Conforms to ITU-T and ANSI specifications and the FRF implementation agreements for the Frame Relay Bearer Service. High availability/fail over support via SpiderDSF.	68K, Alpha, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderFRAME-RELAY SDK for VxWorks and pSOSystem	Includes pre-ported binary Frame Relay software, extensible device driver, QUICC, and PowerQuicc drivers.																	
SpiderISDN	A portable BRI and PRI, STREAMS-based, implementation of the ITU-T 1998 recommendations for the ISDN protocol suite, it supports many NTT BRI RRI interfaces. High availability/fail over support via SpiderDSF.	68K, Alpha, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode							\$	\$	\$	\$	\$					
SpiderOSI	STREAMS-based implementation of layers 1-4 of the OSI model of US GOSIP, UK GOSIP, INTAP, EWOS profiles. High availability/fail over support via SpiderDSF.	68K, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderPPP	STREAMS-based implementation of the PPP protocols including RADIUS, CHAP, PAP and upper DLPI interface. High availability/fail over support via SpiderDSF.	68K, i860, i960, 175PowerPC0A, MIPS, MPC8xx, SPARC, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderSS7	A portable, STREAMS-based full implementation of SS7. Conforms to ITY, Telecordia and ANSI specifications. Based on Spider's own MTP1 implementation for maximum links per line card. High availability/fail over support via SpiderDSF.	MPC8xx, SPARC, 175PowerPC0A																
SpiderSTREAMS	Provides a framework for protocol drivers that enable OEMs to provide POSIX compliant interfaces, across different platforms, to end users. High availability/fail over support via SpiderDSF.	68K, Alpha, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderTCP	STREAMS-based implementation of the TCP/IP protocol with IPSEC functionality. High availability/fail over support via SpiderDSF.	68K, i860, i960, MIPS, MPC8xx, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderVPN	STREAMS-based implementation of the VPN protocols including IPsec, L2TP, MIB, AH, ESP, IKE, LAC and LNS support. High availability/fail over support via SpiderDSF.	MPC8xx, x86 Protected Mode, x86 Real Mode	C						\$	\$	\$	\$	\$					
SpiderX.25	STREAMS-based implementation of the x.25 protocol suite conforms to ITU-T (1980, 1984, 1988) and ISO specifications. High availability/fail over support via SpiderDSF.	68K, Alpha, i860, i960, MIPS, MPC8xx, SPARC, x86 Protected Mode, x86 Real Mode	C															
SpiderX.25 SDK for Vx Works and pSOSystem	Includes pre-ported binary Frame Relay software, extensible device driver, QUICC, and PowerQuicc drivers.																	
Syndesis Ltd., Athens, Greece, 30 1 7292985, www.flde.com																		
CANsim	CAN simulation and graphical analysis tool.							365	U	U	\$	\$	\$		CAN			\$995
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com																		
EMIT	Device networking software that networks 8- and 16-bit embedded devices to each other and the Internet.	8051 and derivatives, C16x	C	✓	✓	✓		2	90	U	\$	\$	\$		Web server			\$45,000

COMMUNICATIONS PACKAGES

Product name	Product description	Target CPUs supported	Languages supported	Package is ROMable	Package is reentrant	Source supplied all the time	Source optionally available	Technical Support					Product updates	Training	Protocol (e.g. CAN)	Price
								Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response					
TransDimension Intl. Corp., Riverside, CA, (909) 683-3600, www.transdimension.com/																
UH1000, UHCC11	USB host controller for embedded systems with standard MCU bus interface, may include full HW and firmware implementation of USB host controller driver and USB driver.	Most						30	U	\$		\$	\$			\$4 to \$99
Trillium Digital Systems Inc., Los Angeles, CA, (310) 442-9222, www.trillium.com																
Trillium Digital Systems Inc./Communications Packages+B7	Communications protocol software, SS7, ATM, H.323, GPRS, ISDN, V5, FRAME RELAY, X.25/X.75, FT/HA.	MIPS, MPC8xx, PowerPC, SPARC, Z8, Z80/Z180	C		✓			60		\$		\$	\$			
Tri-Pacific Software Inc., Alameda, CA, (510) 814-1780, www.tripac.com																
RapidSched	Scheduling service for real-time CORBA.	MIPS, PowerPC, SPARC, x86 Protected Mode, HP PARISC, x86 Real Mode	Ada, C, C++, Java													
Tundra Semiconductor Corp., Kanata, ON, Canada, (613) 592-0714, www.tundra.com																
Tundra Semiconductor Corp. Communications Packages		68K						U		U		U	U			
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com																
NetPeer	Use any protocol stack to create an embedded desktop interface and distributed operating environment.	68K, ARM, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode, x86 Real Mode	C, Java	✓	✓		16	90		\$		\$	\$		proprietary	
Vector CANtech Inc., Novi, MI, (248) 449-9290, www.vector-cantech.com																
CANalyzer Fundamental									U	U	U	\$	\$			\$2,720
CANalyzer Professional	Programmable CAN development tool.								U	U	U	\$	\$			\$4,530
CANalyzer Junior	Entry level CAN tool.								U	U	U	\$	\$			\$1,480
CANape	Tool for calibration of CAN modules and flash programming.								U	U	U	\$	\$			\$4,900
CANcardX	PCMCIA CAN interface PC card.								U	U	U	\$	\$			\$1,010
CANoe	Programmable system architecture tool for CAN networks. Allows simultaneous engineering for CAN projects.								U	U	U	\$	\$			\$11,310
CANscope	CAN physical layer oscilloscope showing wave forms in CAN message format.								U	U	U	\$	\$			\$4,090

EMBEDDED INTERNET PACKAGES

Product name	Product description	Languages supported	Web browser available	Web server available	TCP included	UDP included	IP included	ICMP included	SNMP available	SMTP/POP available	PPP/SLIP available	BOOTP available	Telnet client/server available
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com													
Intelligent System Software (iSys)	The iSys solution provides low level system software that allows hardware designs to communicate with the OS and consists of a core system software, accelBIOS; a configuration SDK, accelTool; and a system management tool, accelSys.	Assembly, C, VB, VHDL, EC++, Javascript, HTML, Verilog, RTOS target code generation, C++, Java	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com													
Nucleus	Provides fast and efficient data communications while the rest of your embedded application is minimally affected.	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nucleus WebBrowser	Permits access to Web servers and is able to render HTML files on the user's display device, regardless of the customer's CPU, video hardware, screen size, and input mechanisms.	Assembly, C	✓										
Nucleus WebServ	Nucleus WebServ brings HTTP services directly to your embedded applications.	Assembly, C		✓									
Agrat Systems Inc., Maynard, MA, (978) 461-0888, www.agrat.com													
EmStack	EmStack is an ultra-small, 35K byte TCP/IP stack. EmStack works with EmWeb to Web-enable microprocessor-based devices that do not require an operating system.	C, C++											
EmWeb Client	EmWeb Client enables developers to create an application that operates as an HTTP Client. Remote devices can actively send/retrieve configuration and status data to/from a central server.	C, HTML, Java, C++											
EmWeb Server	Developers may use any off-the-shelf web-authoring tool; thus, no ramp up time is required. The EmWeb Server also features easy creation, enhancement and uploading of web content for quick prototyping and fast product demonstrations.	Assembly, C++, Other, HTML, Java, C											
EmWeb/CLI	EmWeb/CLI, an option to the EmWeb Server, provides a solid infrastructure and flexible scripting tools for building a CISCO-like or UNIX-based CLI.	Assembly, HTML, C, C++											✓
EmWeb/Mail	EmWeb/Mail allows embedded devices to send e-mail to any SMTP server for server-initiated event notification. Messages may be constructed with either static information or dynamic device data.	Assembly, C++, HTML, C							✓				
EmWeb/SNMP	EmWeb/SNMP is an option to the EmWeb Server that allows drop-in integration between EmWeb and commercially available SNMP agents. Developers may interact with SNMP MIBs without writing additional code.	C, HTML, C++, Java											
EmWeb/SSL	EmWeb/SSL, with RSA Security's SSL-C encryption software, enables secure web interfaces using VxWorks or Linux. Network device manufacturers achieve complete encryption of communications between the user's browser and the EmWeb Server.	Assembly, C, C++											
GUIkit/NavPak	A member of the EmWeb GUIkit family, GUIkit/NavPak offers tools that help engineers quicken their time to market.												
GUIkit/ScreenPak	The GUIkit/ScreenPak offers enhanced GUI tools, including an automatic refresh capability. Only updated information is retransmitted to reduce network traffic.	Assembly, Java, C++, HTML, C											
Allegro Software Development Corp., Boxborough, MA, (978) 266-1375, www.allegrosoft.com													
RomDNS	RomDNS is a Domain Name Services Client that provides embedded devices the ability to perform lookups of a variety of DNS records. It may be used with RomPager, RomMailer, Rom POP, or as a standalone function with any RTOS and TCP/IP stack.	C, C++		✓					✓	✓			
RomMailer	The RomMailer email client source code product provides e-mail service for devices integrated with the leading RTOS/TCP stacks or stand alone applications.	Assembly, Java, C++, C		✓					✓	✓			
RomPager	The RomPager source code product family provides Web access for devices integrated with the leading RTOS/TCP stacks or stand alone applications.	Assembly, C, C++, Java		✓					✓	✓			
RomPager Java Graphlets	The RomPager Java Graphlets toolkit is a series of Java applets that facilitate the development of graphic control indicators for the embedded device. Applets include single, multiple variable bar and line charts and progress and dial indicators.	Java		✓					✓	✓			
RomPager Light	The RomPager Light source code product provides Web access for devices integrated with the leading RTOS/TCP stacks or stand alone applications.	Assembly, C++, Java, C		✓					✓	✓	✓		
RomPager SoftPages	The RomPager SoftPages adds HTML parser to RomPager Web server allowing the device vendor to support runtime source changes to HTML pages.	Java, HTML		✓					✓	✓			
RomPOP	The RomPOP embedded email client source code product and e-mail access for devices integrated with the leading RTOS/TCP stacks or stand alone applications.	Assembly, C, C++, Java		✓					✓	✓	✓		
RomWeb-Client	RomWebClient is an HTTP client that provides embedded devices the ability to retrieve remote objects from Web servers using the HTTP protocol. It works with any RTOS or TCP/IP stack.	C, Java, C++		✓					✓	✓			

FTP client/server available
 Package is ROMable
 Package is reprogrammable
 Source supplied all the time
 Source optionally available
 Typical pkg. size, in 1000s of bytes
 Days of free phone support
 BBS/Web FAQs, bug lists, other
 Phone support, standard
 Phone support 24-hour response
 Product updates
 Training
 Price
 Target CPUs supported

Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com

✓		✓		Varies										Can be ported to any CPU
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Accelerated Technology Inc., Mobile, AL, (800) 468-6853, www.atinucleus.com

✓	✓	✓	✓		50	180	\$	\$	\$	\$	\$	\$14,995	68K, H8, ColdFire, TriCore, M Core, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MPC8xx, MIPS, ARM
						180	\$	\$	\$	\$		\$99,995	MIPS, SH, StrongARM, MPC8xx
							\$	\$	\$	\$		\$9,995	68K, ARM, MIPS, PowerPC, V800, SH, StrongARM, TriCore, x86 Real Mode, x86 Protected Mode, MPC8xx, ColdFire

Agranat Systems Inc., Maynard, MA, (978) 461-0888, www.agranat.com

✓	✓	✓					\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓	✓					\$	\$	\$	\$	\$		Can be ported to any CPU
					25		\$	\$	\$	\$	\$	\$40,000	Can be ported to any CPU
✓	✓	✓				0	\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓	✓				0	\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓	✓				0	\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓	✓					\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓		✓				\$	\$	\$	\$	\$		Can be ported to any CPU
✓	✓		✓				\$	\$	\$	\$	\$		Can be ported to any CPU

Allegro Software Development Corp., Boxborough, MA, (978) 266-1375, www.allegrosoft.com

✓	✓	✓		4			\$	\$		\$		\$5,000	29K, 68HC05, 68HC08, 68HC12, 68K, Alpha, ColdFire, ARM, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MIPS, i960, i860, 80196, 68HC16, 68HC11
✓	✓	✓		5			\$	\$		\$		\$10,000	29K, Alpha, 80196, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MIPS, i960, i860, ColdFire, ARM, 68HC08, 68HC12, 68HC16, 68K, 68HC11, 68HC05
✓	✓	✓		25			\$	\$		\$		\$25,000	68HC05, 68HC08, 68HC16, Alpha, i860, MIPS, i960, x86 Real Mode, x86 Protected Mode, TLCS90/900, SPARC, SH, PowerPC, ARM, 68K, 68HC12
✓	✓	✓		2			\$	\$		\$		\$5,000	29K, Alpha, 80196, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MIPS, i860, ColdFire, ARM, 68HC08, 68HC12, 68HC16, 68K, 68HC11, 68HC05
✓	✓	✓		12			\$	\$		\$	\$	\$10,000	68HC05, 68HC08, 68HC11, 68HC16, 80196, ARM, Alpha, x86 Protected Mode, SPARC, SH, PowerPC, MPC8xx, MIPS, i960, i860, x86 Real Mode, ColdFire, 68K, 68HC12
✓	✓	✓		3			\$	\$		\$		\$5,000	29K, 68HC08, 68HC12, 68K, Alpha, 80196, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MIPS, i960, i860, ColdFire, ARM, 68HC16, 68HC11, 68HC05
✓	✓	✓		5			\$	\$		\$		\$10,000	68HC05, MIPS, i960, i860, ColdFire, ARM, Alpha, 80196, 68K, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, 68HC11, 68HC12, 68HC08, 68HC16
✓	✓	✓		12			\$	\$		\$		\$10,000	29K, 68HC05, 68HC11, 68HC16, 80196, ARM, i960, PowerPC, MIPS, x86 Real Mode, x86 Protected Mode, SPARC, SH, ColdFire, Alpha, 68K, 68HC12, 68HC08

EMBEDDED INTERNET PACKAGES

Product name	Product description	Languages supported	Web browser available	Web server available	TCP included	UDP included	IP included	ICMP included	SNMP enabled	SMTP/POP enabled	PPP/SLIP enabled	BOOTP enabled	Telnet client/server enabled
ANT Ltd., United Kingdom, www.ant.co.uk													
ANT Fresco Browser	ANT's small footprint browser is optimally designed for consumer electronics and Internet devices. With a modular architecture and fully customizable UI, Fresco enables control over product branding.	C, Java	✓						✓				
ANT SimplEmail	SimplEmail is a small footprint e-mail application for consumer and Internet devices.	C, Java	✓						✓				
AppForge, Inc., Atlanta, GA, (678) 686-9000, www.appforge.com													
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com													
TargetTCP	A reliable, re-entrant, and RFC-compliant TCP/IP implementation. Includes TCP, UDP, IP, ICMP, ARP, DNS client, Ethernet, and SLIP. Berkeley sockets API with features for embedded applications. Built-in TCP/IP protocol decoder.	Assembly, C		✓	✓	✓	✓	✓		✓	✓	✓	
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com													
bFax SDK, Voice Over IP SDK (VOIP), Web Appliance Kit for OEMs													
Caldera Thin Clients Inc., Linton, UT, (801) 426-5001, www.caldera.com													
WebSpyder	WebSpyder, a 32-bit, graphical Web browser, allows the browser to become the user interface, enabling OEMs to easily customize the user experience in HTML code. OEMs can incorporate branding elements and establish system defaults, including the home page	Assembly, C, Javascript, C++, Java	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CMX Systems Inc., Framingham, MA, (508) 872-7675, www.cmx.com													
CMX TCP/IP	High-performance, high-quality, RFC compliant networking stack and add-on components.	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CMX-MicroNet	CMX-MicroNet is a TCP/IP stack for 8- and 16-bit devices that takes up less than 12K bytes of ROM with a full HTTP Web Server, if desired.	Assembly, HTML, C++, C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CodeGen Inc., San Francisco, CA, (415) 834-9111, www.codegen.com													
SmartBus	SmartBus provides network connectivity between processors located on VMEbus, PCI, CompactPCI, PMC buses. Support is provided for a variety of operating systems and platforms.	C				✓	✓						
Connect One Ltd., AK, Israel, www.connectone.com													
iChip	iChip is an embedded TCP/IP peripheral chip that Internet-enables next-generation devices. As a fully integrated hardware and software chip solution, iChip implements Internet connectivity in a range of remote devices, and eliminates the need for a processor, server, or PC interface.	Ada, C++, Fortran, Java, Forth, C, Assembly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
DC Micro Development, Lawrenceville, GA, (678) 442-1623, www.dcmicro.com													
NetKit TCP/IP Class													
EBS Inc., Groton, MA, (978) 448-9340, www.erifs.com													
WEBSTER	WEBSTER is EBSnet's full function, small footprint Web Browser and HTML viewing program for embedded and consumer devices. Supports HTML V4.0, GIF/JPEG, animated GIFs, tables, forms, and frames. Portable, re-configurable user interface, runs with any TCP-IP stack or stand-alone. WEBSTER may be used to create HTML based embedded GUI applications.	C, C++							✓				✓
EBSnet Inc., Groton, MA, (978) 448-9340, www.ebsnetinc.com													
RTIP	RTIP is a full-featured Internet suite proven in several hundred OEM applications. IMAP, RIP, virtual file system, smart caching, smart packet filtering and a complete dial-up package have been added. RTIP can be ported to any RTOS or CPU	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

<div> <div>FTP client/server available</div> <div>Package is ROMable</div> <div>Package is reentrant</div> <div>Source supplied all the time</div> <div>Source optionally available</div> <div>Typical prog. size, in 1,000s of bytes</div> <div>Days of free phone support</div> <div>8051/Win. I/Os, long ints, other</div> <div>Phone support standard</div> <div>Phone support 24-hour response</div> <div>Product updates</div> <div>Training</div> <div>Price</div> <div>Target CPUs supported</div> </div> <div>Technical Support</div>											
ANT Ltd., United Kingdom, www.ant.co.uk											
✓	✓	✓	✓	500							All processors for which an ANSI compiler is available
✓	✓	✓	✓	500							All processors for which an ANSI compiler is available
AppForge, Inc., Atlanta, GA, (678) 686-9000, www.appforge.com											
Blunk Microsystems, San Jose, CA, (408) 323-1758, www.blunkmicro.com											
✓	✓	✓	✓	30	365	U	U		U	\$	\$5,000 68K, PowerPC, MIPS, MPC8xx
BSQUARE Corp., Bellevue, WA, (425) 519-5900, www.bsquare.com											
Caldera Thin Clients Inc., Lindon, UT, (801) 426-5001, www.caldera.com											
✓	✓		✓	4,800		U	\$	\$	U	\$	\$49 x86 Protected Mode, x86 Real Mode
CMX Systems Inc., Framingham, MA, (508) 872-7675, www.cmx.com											
✓	✓	✓	✓		180	\$	\$	\$	\$	\$	\$8,250 Most
✓	✓	✓	✓		180	\$	\$	\$	\$	\$	\$5,500 Most
CodeGen Inc., San Francisco, CA, (415) 834-9111, www.codegen.com											
	✓		✓	30	365	U	\$	\$	\$	\$	\$1,495 Alpha, MIPS, x86 Protected Mode, PowerPC
Connect One Ltd., AK, Israel, www.connectone.com											
				256						15-\$25	1750A, 65816, 68HC05, 68HC11, 68HC16, 68HC12, x86 Real Mode, x86 Protected Mode, V800, TMS320 and other TI DSPs, TLCS90/900, SPARC, SH, PowerPC, Z80/Z180, Z8, PIC, MPC8xx, MIPS, MELPS 7700, i960, i860, H8, ColdFire, C16x, ARM, Alpha, 8051XA, 8051 and derivatives, 80251, 80196, 78K series, 68K, 68HC08, 6800, 29K
DC Micro Development, Lawrenceville, GA, (678) 442-1623, www.dcmicro.com											
					60	U	U	\$	U	\$	\$349
EBS Inc., Groton, MA, (978) 448-9340, www.erfs.com											
✓				600	180	\$	\$	\$	\$	\$	Any 16-bit or greater processor
EBSnet Inc., Groton, MA, (978) 448-9340, www.ebsnetinc.com											
✓	✓	✓	✓	80	180	\$	\$	\$	\$	\$	\$8,500 68K, ARM, ColdFire, C16x, Any 16-bit or greater processor, x86 Real Mode, x86 Protected Mode, SPARC, PowerPC, MPC8xx, MIPS, 8051XA

EMBEDDED INTERNET PACKAGES

Product name	Product description	Language supported	Web browser available	Web server available	TCP included	UDP included	IP included	ICMP included	SNMP enabled	SMTP/POP enabled	PPP/SLIP enabled	BOOTP enabled	TELNET client/server enabled
WEBSTER	WEBSTER is EBSnet's full function, small footprint Web Browser and HTML viewing program for embedded and consumer devices. Supports HTML V4.0, GIF/JPEG, animated GIFs, tables, forms and frames. Portable, re-configurable user interface, runs with any TCP-IP stack or stand-alone. WEBSTER may be used to create HTML based embedded GUI applications.	C, C++								✓			✓
eDevice Technology Inc., New York, NY, (212) 856 0000, www.edevice.com													
SmartStack													
EMAC Inc., Carbondale, IL, (618) 529-4525, www.emacinc.com													
Server in a Box	Turn key embedded web server/browser allows any serial device to be easily connected to the web or LAN.	Java	✓	✓	✓	✓	✓				✓		✓
Empress Software Inc., Greenbelt, MD, (301) 220-1919, www.empress.com													
Empress Web Database Toolkit	A Web ready suite of database application development tools for the creation of dynamic, interactive data driven Web pages for the Internet, intranet and extranet.	C, HTML, C++, Java, Other, Perl, Fortran											
emWare Inc., Salt Lake City, UT, (801) 453-9300, www.emware.com													
EMIT 3.0 SDK-Pro	Includes everything needed to create a device network prototype: emGateway server software, emMicro device software, EMIT subnet router software, tools for working with non-EMIT enabled devices.	Assembly, Active X, C, Java, C++											
EMIT 3.0 SDK-Pro Software Only	For the developer who has purchased EMIT-enabled hardware evaluation kits from an emWare partner, or has downloaded EMIT Lite or EMIT Eval from emStore. The EMIT SDK-Pro software is shipped on CD-ROM; no hardware included.	Assembly, C++, Active X, Java, C											
EMIT 3.0 SDK-Standard	Includes emGateway and emMicro software, plus one hardware reference board.	Assembly, Java, Active X, C, C++											
EMIT 3.0 SDK-Std Software Only	For the developer who has purchased EMIT-enabled hardware evaluation kits from an emWare partner, or has downloaded EMIT Lite or EMIT Eval from emStore. The EMIT SDK-Standard software is shipped on CD-ROM; no hardware included.	Assembly, Active X, C, Java, C++											
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com													
Jbed		Assembly, C	✓	✓	✓	✓	✓	✓			✓	✓	
Espial Group Inc., Ottawa, ON, Canada, (613) 230-4770, www.espialgroup.com													
Espial Assistant	Java-based personal information manager (PIM) with total functionality and a small footprint (<90K). This 100% PersonalJava compliant PIM is customizable.	Java											
Espial Ebox	Small footprint e-mail client that allows for message communication from a smart-phone, PDA, television, mobile computer or any other Java enabled information appliance. Ebox supports POP3, SMTP, and IMAP4 with a customizable API.	Java											
Espial Escape	Escape provides the ultimate low-memory browser-operating environment, offering JavaScript, printing, HTML 3.2, forms, frames, tables, animated images and applets.	Java	✓										
GoAhead Software Inc., Bellevue, WA, (425) 453-1900, www.goahead.com													
GoAhead WebServer	GoAhead WebServer, an open source, embedded Web server, provides a secure, flexible, free way to access remote devices and appliances via standard Internet Protocols. Uses Active Server Pages, embedded JavaScript and in-memory CGI processing for Web page creation.	Other, Javascript	✓										
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com													
ChaiFarer	ChaiFarer is a highly modular, embedded Web browser designed specifically for customization by device manufacturers for their specific user interfaces and display requirements. ChaiFarer supports the latest Web standards, including XML, HTML and HTTP, with support for authentication and popular graphic image types.	C, C++	✓										
ChaiServer	ChaiServer is a web-based application server that integrates applications written in the Java programming language with Web Server technology. With ChaiServer, device manufacturers can access, communicate and control all devices and their applications directly via the Web.	Java	✓										

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EMBEDDED TCP-IP NETWORK STACK

The EBSnet Cross Development System provides comprehensive TCP/IP protocols and network applications for embedded CPUs. RTIP 3.0-MPC provides support for Motorola microprocessors including PowerPC, MPC860, 68K, 68360, and Coldfire. Systems are also available for 808x, 80186, 386, ARM, SparcLite, Mips, Hitachi, Mitsubishi, Philips, and Infineon.

INTERNET PROTOCOLS

SUPPORTS UDP, TCP, ARP, RARP, BOOTP, ICMP, IGMP, DNS

DEVICE DRIVERS

Ethernet, 100 Base-T, Uart, PCMCIA based, PCI based

KERNEL DRIVERS

AMX®, CMX®, SMX®, Nucleus®, RtKernel®, Pharlap®,
TNT®, ETS®, TNTRT®, PSOS®, RTXC®, RTPX,
Polled (no kernel), UCOS®, ECOS®, VRTX®, Threadx®

PORTING LAYER

Ports easily to any realtime OS/CPU

DIAL-UP

SLIP, CSLIP, PPP, modem support

APPLICATION PROTOCOLS

SNMP, DHCP, NFS, FTP, TFTP, Telnet, Mail (SMTP, POP3, IM AP),
RIP, and Virtual/Memory File Systems

WEB SERVER

Full featured embedded Web Server (with diskless option)

EMBEDDED WEB BROWSER

WEBSTER, EBSnet's Embedded Web Client, is a complete tool for developing WEB browser interfaces for interactive internet appliances and other embedded systems that wish to use HTML to present a user interface.

WEBSTER is written in portable C++, will port to any target that can support the PEG Graphics Library and uses standard socket calls to access the network.

WEBSTER is compatible with EBSnet's RTIP but can be standalone.

ERTFS-DOS COMPATIBLE FILE SYSTEM

Comprehensive, portable, high performance
DOS compatible file I/O for embedded systems.

ebsnet
Inc



EMBEDDED INTERNET PACKAGES

FTP client/server available	Package is ROMable	Package is reentrant	Source supplied at the time	Source optionally available	Typical pkg. size in 1 000s of bytes	Technical Support				Price	Target CPUs supported
						Days of free phone support	800/Web FIMs, bug lists, other	Phone support, standard	Phone support, 24-hour response		
✓		✓		600	180	\$	\$	\$	\$	\$	Any 16-bit or greater processor
eDevice Technology Inc., New York, NY, (212) 856 0000, www.edevice.com											
EMAC Inc., Carbondale, IL, (618) 529-4525, www.emacinc.com											
✓	✓		✓	22	365	U	U	U	\$	\$	x86 Protected Mode
Empress Software Inc., Greenbelt, MD, (301) 220-1919, www.empress.com											
						\$	\$	\$	\$	\$	SPARC, HP Series, RS 6000, x86 Real Mode, All major 32-bit and many 16-bit, Other
emWare Inc., Salt Lake City, UT, (801) 453-9300, www.emware.com											
✓	✓			1	0	U	\$		\$	\$	68HC08, 8051XA, 8051 and derivatives, M16C, C504, AVR, M Core, C16x, PIC, H8
✓	✓			1	0	U	\$	\$	\$	\$	68HC08, 8051 and derivatives, 8051XA, H8, PIC, C16x, C504, AVR, M16C, M-Core
✓	✓			1	0	U	\$		\$	\$	68HC08, 8051XA, C16x, 8051 and derivatives, M16C, C504, AVR, M-Core, H8, PIC
✓	✓			1	0	U	\$		\$	\$	68HC08, 8051XA, 8051 and derivatives, M16C, C504, AVR, M-Core, C16x, PIC, H8
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com											
✓	✓			211	365	U	\$	U	U	\$	68K, PowerPC, MIPS, ARM, ColdFire
Espial Group Inc., Ottawa, ON, Canada, (613) 230-4770, www.espialgroup.com											
✓				90		U	\$	\$	\$	\$	6800, All CPUs supporting a JVM, ARM, PowerPC, SPARC
✓				120		U	\$	\$	\$	\$	6800, PowerPC, SPARC, ARM, All CPUs supporting a JVM
✓				175		U	\$	\$	\$	\$	6800, ARM, SPARC, PowerPC, All CPUs supporting a JVM
GoAhead Software Inc., Bellevue, WA, (425) 453-1900, www.goahead.com											
✓	✓			850K							
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com											
	✓			220	\$	\$	\$	\$	\$	\$	ARM, x86 Protected Mode, MPC8xx, PowerPC, SH, MIPS
✓		✓		30	\$	\$	\$	\$	\$	\$	ARM, x86 Protected Mode, MPC8xx, PowerPC, SH, MIPS

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StrongARM	68HC11
SH 1, 2, 3, 4	68HC16
SPARCLite	80251
i960	Z80/180
NEC V85x	

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EMBEDDED INTERNET PACKAGES

Product name	Product description	Languages supported	Web browser available	Web server available	TCP included	UDP included	IP included	ICMP included	SNMP available	SMTP/POP available	PPP/SLIP available	BOOTP available	Telnet client/server available
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com													
PXProWeb/HTTP		Assembly, HTML, C++, Java, C	✓										
InterNiche Technologies Inc., San Jose, CA, (408) 257-8014, www.iniche.com													
TCP/IP	InterNiche offers a comprehensive suite of software that enable embedded systems developers, with a minimum of time and expense, to add value to their products in the area of communications, networking and management. Packages include NAT Routing, DHCP Server, Browser, HTTP Server, SNMPv1 and v3, RIP, PPP, FTP Telnet and more.	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com													
WatTCP & Embedded Web Server	The WatTCP TCP/IP stack and a simple Web Server.	C, C++	✓	✓	✓	✓				✓	✓	✓	✓
KADAK Products Ltd., Vancouver, BC, (604) 734-2796, www.kadak.com													
KwikNet TCP/IP Stack	Includes a fully compliant suite of protocols. The Windows Configuration Builder ensures that the components needed for your application will be properly configured for your use.	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com													
TRACE32-ICD													
Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com													
smxNet	A TCP/IP network stack which has been optimized for use in real-time embedded systems. It offers RFC-compliant TCP and conforms to the Berkeley sockets API. Fully integrated with smx.	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com													
Java Technology for OS-9	Microware's solution includes the Java Virtual Machine (JVM), application framework (AFW) used by the Java abstract Windowing Toolkit (AWT), and OS-9 Java Code Compact for diskless devices.	Assembly, C++, Java, C	✓	✓	✓	✓				✓	✓	✓	✓
NetBurner, San Diego, CA, (858) 530-0293, www.netburner.com													
NetBurner Embedded Network Controllers	All hardware and software required to implement network communications and control: hardware platform (single board computer), TCP/IP Stack, Web Server, C/C++ Compiler, RTOS, Debug Monitor, and Flash programming utilities. Supports ColdFire 5206e, 5307, 5407.	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com													
RTIP-16	RTIP-16 is a high performance embedded TCP/IP stack for On Time RTOS-32.	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RTIP-32 (On Time RTOS-32 module)	A full-featured high-performance TCP/IP stack for use with On Time RTOS-32. No royalties.	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pacific Softworks Inc., Newbury Park, CA, (805) 499-7722, www.pacificsw.com													
FUSION Internet Protocols	Portable, 100% RFC compliant, custom-built source stack that offers a complete integrated line of application protocols, to include: PPP, SNMP, FTP, Telnet, TFTP, BOOTP, DHCP, RIP, OSPF, SMTP, POP3, Web Server, and WebPilot.	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Peerless Systems Corp., El Segundo, www.peerless.com													
Peerless Software Print Server	With Peerless Software Print Server (SPS), OEMs can include networking capabilities directly on their printer's controller, using software only, by leveraging the power of its processor thus eliminating the need for a NIC (Network Interface Card) and the inefficiencies and higher costs associated with it.	C, C++		✓	✓	✓	✓	✓	✓				
Polyhedra Inc., Bellevue, WA, (425) 646-4907, www.polyhedra.com													
Polyhedra	Encapsulates any IP-based protocols as object methods with object methods running in the database process itself and accessible to other objects/information stored in the database.	C, Java, C++	✓	✓	✓	✓		✓	✓				

TTP client/server available
 Package is ROMable
 Package is reentrant
 Source supplied all the time
 Source optionally available
 Typical pkg. size in 1,000s of bytes
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 BIOS/Win I/O, bug fixes, other
 Phone support, standard
 Phone support, 24-hour response
 Product updates
 Training
 Price
 Target CPUs supported

HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com

✓	✓	✓	✓	365	\$	\$	\$	\$	DM 6,000,00	C16x
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InterNiche Technologies Inc., San Jose, CA, (408) 257-8014, www.iniche.com

✓	✓	✓	✓	<50	365	\$	\$	\$	\$	68K, PowerPC, x86 Protected Mode, x86 Real Mode, ARC Cores, AM186ES, AMD Elan SC400, NEC, Motorola, Intel StrongARM SA 1100, All major 32-bit and many 16-bit, SH, MIPS, ARM, i960
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JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com

✓	✓	✓	✓	512	120	U	U	U		x86 Real Mode
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KADAK Products Ltd., Vancouver, BC, (604) 734-2796, www.kadak.com

✓	✓	✓	✓	90	U	\$	\$	\$		68HC16, ARM, i960, MPC8xx, MIPS, x86 Real Mode, x86 Protected Mode, SH, PowerPC, ColdFire, 68K
---	---	---	---	----	---	----	----	----	--	--

Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com

✓	✓	✓	✓		U	U	\$	\$	\$2,500	68HC12, Other, V800, SH, PowerPC, MPC8xx, ColdFire, C16x, 68HC16, ARM, 68K
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Micro Digital Inc., Costa Mesa, CA, (714) 437-7333, www.smxinfo.com

✓	✓	✓	✓	65	180	\$	\$	\$	\$	\$8,500 to \$9,500	ColdFire, PowerPC, Portable version, x86 Protected Mode, x86 Real Mode
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Microwave Systems Corp., Des Moines, IA, (515) 223-8000, www.microwave.com

✓	✓	✓	✓	30	\$	\$	\$	\$	\$	68K, ARM, x86 Protected Mode, SH, PowerPC
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NetBurner, San Diego, CA, (858) 530-0293, www.netburner.com

✓	✓	✓	✓	70	90	U	\$	\$	\$	\$499	ColdFire
---	---	---	---	----	----	---	----	----	----	-------	----------

On Time Software, Setauket, NY, (631) 689-6654, www.on-time.com

✓	✓	✓	✓	70	U	U	U	U	\$	\$8,250	x86 Protected Mode
---	---	---	---	----	---	---	---	---	----	---------	--------------------

✓	✓	✓	✓	70	U	U	U	U	\$	\$8,250	x86 Protected Mode
---	---	---	---	----	---	---	---	---	----	---------	--------------------

Pacific Softworks Inc., Newbury Park, CA, (805) 499-7722, www.pacificsw.com

✓	✓	✓	✓	64	90	\$	\$	\$	\$	68HC11, 68K, 8051XA, 8051 and derivatives, SPARC, SH, PowerPC, MPC8xx, MIPS, i960, ColdFire, C16x, Any 16-bit or greater processor, AM186ES, AMD Elan SC400, Philips TriMedia, StrongARM, ST, x86 Real Mode, x86 Protected Mode, TMS320 and other TI DSPs, ARM, 68HC16
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Peerless Systems Corp., El Segundo, www.peerless.com

✓	✓	✓	✓		\$	\$	\$	\$	\$	MIPS, PowerPC
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Polyhedra Inc., Bellevue, WA, (425) 646-4907, www.polyhedra.com

✓	✓	✓	✓	30	\$	\$	\$	\$	\$	68K, SPARC, PowerPC, MIPS, Alpha, i860
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EMBEDDED INTERNET PACKAGES

Product name	Product description	Language supported	Web browser available	Web server available	TCP included	UDP included	IP included	ICMP included	SNMP available	SMTP/POP available	PPP/SLIP available	BOOTP available	Telnet client/server available
Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.psti.com													
Precise/HTTP	Precise/HTTP is an embedded web server that is compatible with several commercial web browsers and consists of source-code and development tools for creating embedded pages as well as services for saving embedded pages in RAM, in Flash, in EEPROM, or on disk.	Assembly, C, C++	✓						✓	✓	✓	✓	✓
Precise/HTTP Pro	Precise/HTTP Pro is an embedded web server supports all of the standard features and benefits of Precise/HTTP and provides a web-based application toolkit that includes an HTML development environment and an offline page compiler.	Assembly, C, C++	✓						✓		✓	✓	✓
Precise/POP3	Precise/POP3 enables embedded devices to communicate with POP3 servers using e-mail. The Precise/POP3 Client lets embedded devices receive e-mail from any POP3 server.	Assembly, C, C++							✓	✓	✓	✓	✓
Precise/RTCS	Precise/RTCS is a portable embedded Internet protocol stack and is delivered with Ethernet drivers, is completely reentrant and scalable, and is optimized for use with Precise/MQX.	Assembly, C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Precise/SMTP	Precise/SMTP enables embedded devices to communicate with SMTP servers using e-mail. The Precise/SMTP Client lets devices send e-mail to any SMTP server.	Assembly, C++, C	✓						✓	✓	✓	✓	✓
Precise/SNMPv3	Precise/SNMPv3 is integrated with Precise/RTCS and Precise/MQX and consists of source-code development tools for generating new MIBs and provides trilingual support for SNMP v1/v2/v3 Agents.	Assembly, C, C++	✓						✓	✓	✓	✓	✓
QNX Software Systems Ltd., Kanata, ON, Canada, (613) 591-0931, www.qnx.com													
Internet Appliance Toolkit (IAT)	Build the Internet into anything: smart phones, set-top boxes, PLCs, more. Contains the QNX real-time OS, Photon microGUI, Voyager Internet Suite, development tools, and more.	C, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quotix, Mountain View, CA, (650) 843-1300, www.quotix.com													
Embedded WebServer	Adds a WWW interface to embedded devices. A full-featured Webserver toolkit with a small memory footprint.	C, C++	✓										
Rapid Logic Inc., Alameda, CA, (510) 749-0900, www.rapidlogic.com													
MIBway for Rapid-Control	Instantly exports all of a network device's SNMP data to a Web browser for access and control with minimal engineering.	C											
Rapid-Control for Applets	Allows device vendors to achieve dynamic, real-time Java-based management of a network device using standard JavaBean applications without embedding a JVM, using expensive dedicated consoles or having Java programming expertise.	Java											
Rapid-Control for Web	Allows easy creation of powerful Web-based configuration, access and control applications. Built on the RapidControl Backplane, existing code is leveraged to reduce development time and life-cycle.	C	✓						✓				
Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com													
SX-Stack	The SX-Stack is a complete network connectivity stack implemented as reconfigurable software protocol modules that are loaded into the on-chip flash program memory of an SX Series communications controller. Physical layer interfaces are also implemented as loadable software modules, enabling true single-chip Web servers and e-mail clients for embedded applications.	Assembly, HTML, Javascript, Java	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SEGGER Microcontroller System GmbH, Germany, www.segger.com													
embOS+ TCP/IP			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Spyglass Inc., Naperville, IL, (630) 505-4944, www.spyglass.com													
Spyglass Device Mail	Spyglass Device Mail is a full-featured embedded email client designed specifically for televisions, cell phones, and hand-held computers. Built from the ground up for these products, it requires very little memory.	C, C++, Java	✓	✓									
Spyglass Device Mosaic	Occupying less than 850KB of code, it supports the latest Internet standard technologies, such as HTML, HTTP, JScript and SSL, and can be extended to include features such as Java and XML.	C, Internet languages, C++, Java	✓	✓					✓				
Spyglass ThinGUI	The Spyglass ThinGUI Library is a small footprint graphics library that is a new platform for device manufacturers and application developers. Spyglass ThinGUI Library offers all of the functionality needed for a robust user interface.	C, C++, Java	✓	✓									

FTP client/server available
 Package is ROMable
 Package is reentrant
 Source supplied all the time
 Source optionally available
 Typical pkg. size, in 1,000s of bytes
 Days of free phone support
 800/Mod F400, bug lists, other
 Phone support, standard
 Phone support, 24-hour response
 Product updates
 Training
 Price
 Target CPUs supported

Precise Software Technologies Inc., Nepean, ON, Canada, (613) 596-2251, www.pstii.com

✓	✓	✓	✓		90	\$	\$	\$	\$	\$	12,000
✓	✓	✓	✓		90	\$	\$	\$	\$	\$	30,000
✓	✓	✓	✓		90	\$	\$	\$	\$	\$	12,000
✓	✓	✓	✓	40	90	\$	\$	\$	\$	\$	17,500
✓	✓	✓	✓		90	\$	\$	\$	\$	\$	12,000
✓	✓	✓	✓		90	\$	\$	\$	\$	\$	30,000

QNX Software Systems Ltd., Kanata, ON, Canada, (613) 591-0931, www.qnx.com

✓				1.44 M	U	\$	\$	\$	\$		MIPS, PowerPC, x86 Protected Mode
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Quotix, Mountain View, CA, (650) 843-1300, www.quotix.com

	✓	✓	✓	60	30	\$	\$	\$	\$	\$	68K, x86 Real Mode, x86 Protected Mode, SPARC, PowerPC, MIPS, ARM, i960
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Rapid Logic Inc., Alameda, CA, (510) 749-0900, www.rapidlogic.com

	✓	✓	✓	15	U	\$	\$	\$	\$	\$	\$15,000	29K, 68HC11, 80196, Alpha, i860, MIPS, i960, x86 Real Mode, x86 Protected Mode, PowerPC, MPC8xx, ARM
	✓	✓	✓	30	U	\$	\$	\$	\$	\$	\$50,000	29K, 68HC08, 68HC11, 68K, Alpha, i860, MIPS, PowerPC, x86 Real Mode, x86 Protected Mode, MPC8xx, i960, ARM, 80196
	✓	✓	✓	30	U	\$	\$	\$	\$	\$	\$50,000	29K, 68HC08, 68HC11, 80196, ARM, i960, i860, x86 Real Mode, x86 Protected Mode, PowerPC, MPC8xx, MIPS, Alpha, 68K

Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com

	✓		✓		U	U	U		U	\$	\$0.00	SX chips from Scenix Semiconductor
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SEGGER Microcontroller System GmbH, Germany, www.segger.com

✓	✓	✓	✓	60	90	\$	\$	\$	\$	\$	DM28,000	MELPS 7700, Other, V850, M16C
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Spyglass Inc., Naperville, IL, (630) 505-4944, www.spyglass.com

				<500		\$	\$	\$	\$	\$		ARM, x86 Real Mode, SH, MIPS, Able to port, PowerPC
			✓	850		\$	\$	\$	\$	\$		Works with a variety of CPUs
				<300		\$	\$	\$	\$	\$		ARM, Able to port, x86 Real Mode, SH, MIPS, PowerPC

EMBEDDED INTERNET PACKAGES

Product name	Product description	Language supported	Web browser available	Web server available	TCP included	UDP included	IP included	TCP included	SNMP available	SMTP/POP available	PPP/SUP available	BOOTP available	TELNET client/server available
SSV EMBEDDED SYTEMS, Hannover, +49 511 40000 0, www.ssv-embedded.de													
CP486DX2	All of our SBCs support Linux.		✓	✓	✓								✓
TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com													
Communications Suite	TASKING supplies a suite of communications protocols designed for embedded applications, where memory and other resources are limited.	Assembly, C++, C	✓	✓					✓	✓	✓	✓	✓
EMIT	Distributed device networking software based on standard Internet technologies that networks 8- and 16-bit embedded electronic devices to each other and the Internet.	Assembly, C, C++											
Treck Inc., Cincinnati, OH, (513) 688-0553, www.treck.com													
	High-quality, high-performance, easy-to-use Internet protocols designed and developed for embedded real-time systems. Requires no porting.	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com													
NetPeer	With an ultra-small 16K footprint, NetPeer allows your embedded system to seamlessly interface with Java enabled remote desktop systems.	C, Java											
USNET	A reentrant embedded TCP/IP package that includes clients/servers, protocols, datalink layers and many drivers. Email protocols and DNS resolver available.	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
USNET Web Server	A full-featured HTTP server optimized to run in 16/32-bit embedded environments. The USNET Web server stands alone—independent of processor, TCP/IP stack, and RTOS.	C, C++	✓										
Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com													
Tornado for Embedded Internet	A fully integrated package for bringing the advantages of the Internet to embedded computers such as network computers, networked printers, cable modems, and switches.	Assembly, C, Java, C++	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wipro Ltd., Bangalore, India, (91)-80-2241730, www.cybermanage.wipro.com													
CyberManage (CEDK)	Embedded Development Kit	C, Java	✓										

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 Phone support, 24-hour response
 Product updates
 Training
 Price
 Target CPUs supported

SSV EMBEDDED SYTEMS, Hannover, +49 511 40000 0, www.ssv-embedded.de

✓	✓		✓		2,000	U	U		U			x86 Protected Mode, x86 Real Mode
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TASKING Inc., Dedham, MA, (781) 320-9400, www.tasking.com

✓	✓	✓	✓		90	U	\$		\$	\$	\$2,000 to \$40,000	68K, MPC8xx, C16x, TriCore, PowerPC
				1	90	U	\$		\$	\$	\$350	8051 and derivatives, 8051XA, C16x

Treck Inc., Cincinnati, OH, (513) 688-0553, www.treck.com

✓	✓	✓	✓		32	90	\$	\$	\$	\$	\$	68HC16, Alpha, 80251, x86 Real Mode, x86 Protected Mode, SPARC, SH, PowerPC, MPC8xx, i960, ColdFire, ARM, 68K
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U S Software, Hillsboro, OR, (503) 844-6614, www.usssw.com

	✓	✓			16	90		\$		\$	\$	68K, MIPS, PowerPC, x86 Protected Mode, x86 Real Mode, SH, MPC8xx, ARM
✓	✓	✓	✓		30	90		\$		\$	\$	68K, ARM, ColdFire, MIPS, PowerPC, V800, SH, StrongARM, x86 Real Mode, x86 Protected Mode, MPC8xx, i960, C16x
	✓	✓	✓		15	90		\$		\$	\$	68K, PowerPC, MPC8xx, x86 Real Mode, x86 Protected Mode, V800, SH, C16x, i860, i960, MIPS, ColdFire, ARM

Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com

✓	✓	✓		✓	0	U	\$	\$	\$	\$		ARM, MIPS, x86 Protected Mode, PowerPC
---	---	---	--	---	---	---	----	----	----	----	--	--

Wipro Ltd., Bangalore, India, (91)-80-2241730, www.cybermanage.wipro.com

✓			✓		240	90		\$	\$	\$	\$	CPU-independent
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 code. The simulator
 drastically reduced
 the development cycle.
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JAVA LANGUAGE PRODUCTS

Product name	Product description	Target CPUs supported	Platforms supported	Available IDE interface to debugger	Product type	Assembler included	ANSI-compliant
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com							
Jade	This is a full embedded Java development environment, modeled after the Microsoft developer studio for a common look and feel. The product contains multi-phase optimizers.	PowerPC, x86 Real Mode	Windows 3.1/95/98/NT, Solaris	✓	Ahead-of-time compiler	✓	✓
Apogee Software Inc., Campbell, CA, www.apogee.com							
Aphelion	A development environment for creating Java and Java/C/C++ applications for many types of embedded systems. Includes a GUI, project management tools, application development tools, and performance tuning tools.	MIPS, MPC8xx, PowerPC, SPARC, x86 Real Mode, Other	Windows 3.1/95/98/NT, Solaris	✓	Java virtual machine	✓	✓
Dinkumware Ltd., Concord, MA, (978) 371-2773, www.dinkumware.com							
Dinkum Jcore Library		Most		✓	Ahead-of-time compiler		
Dinkum Jcore Proofer	Testing tool for the Java language and the Java core library. Contains over 500 anecdotal breadth tests.	Most	DOS, Solaris, Linux, Windows 3.1/95/98/NT		Ahead-of-time compiler		
Empress Software Inc., Greenbelt, MD, (301) 220-1919, www.empress.com							
Empress JDBC Interface	Enables Java programmers to easily send SQL statements to Empress databases. Empress JDBC Interface contains both a category 2 and category 4 JDBC driver, as defined by JavaSoft.	Alpha, x86 Real Mode, PowerPC, SPARC	SGI, SCO Unixware, SCO OpenServer, Digital Unix, HP-UX, UNIX, AIX				
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com							
Jbed	Jbed is a combination of a JVM and an RTOS. It always compiles, never interprets. It uses earliest deadline first (EDF) scheduling with admission testing.	68K, ARM, PowerPC, MIPS, ColdFire	Other	✓	Ahead-of-time compiler, Java virtual machine, Debugger	✓	
Espial Group Inc., Ottawa, ON, Canada, (613) 230-4770, www.espialgroup.com							
Kalos Architect	Rapid Application Development toolkit. Features specific to Kalos Architect including multiple platform support, instant UI previews, on-screen device-layering, rapid visual application development, collaborative application development.	6800, ARM	Windows 3.1/95/98/NT, Linux, Solaris, Any with Java VM				
Kalos Espresso 3.02	GUI toolkit for embedded Java development. Provides a set of lightweight components with minimal memory requirements. Core memory footprint of 175Kb.	6800, ARM	Windows 3.1/95/98/NT, Solaris, Any with Java VM, Linux				
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com							
Chai Appliance Platform	An integrated suite of software products for device manufacturers. Includes ChaiVM, ChaiServer, ChaiAppliance Plug and Play, TurboChai, and more.	68K, ARM, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT	✓	Java virtual machine	✓	
ChaiVM	ChaiVM is a complete environment for running Java programming language applications on information appliances. ChaiVM provides a small memory footprint and maintains compliance with the Java Programming Language Specification and the Java Virtual Machine Specification.	ARM, PowerPC, x86 Protected Mode, SH, MPC8xx, MIPS	Windows 3.1/95/98/NT, Other, HP-UX	✓	Java virtual machine	✓	
TurboChai	Compiles performance-critical portions of the application, provides performance comparable to C/C++, yet preserves the memory footprint and benefits of the Java run-time behavior.	68K, ARM, MIPS, MPC8xx, PowerPC, SH, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, HP-UX	✓	Ahead-of-time compiler		
Insignia Solutions, Fremont, CA, (510) 360-3700, www.insignia.com							
Jeode Platform	An accelerated implementation of the PersonalJava and EmbeddedJava specifications tailored for Internet appliances and embedded devices. Includes the Embedded Virtual Machine, a Sun-compliant Java runtime engine. Also includes extensive tool support, a configurator, monitor.	ARM, SH, PowerPC, StrongARM, x86 Real Mode, x86 Protected Mode, MIPS	Windows 3.1/95/98/NT, Linux, Windows CE, ITRON, VxWorks	✓	Java virtual machine	✓	

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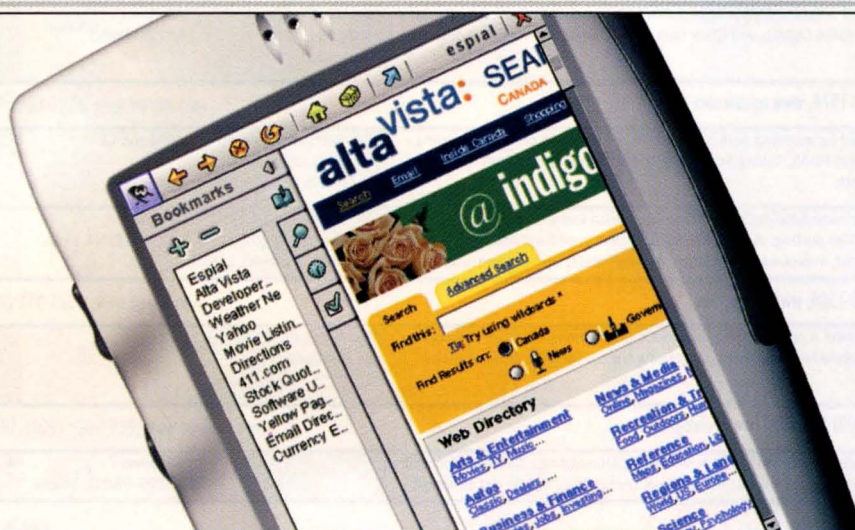
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JAVA LANGUAGE PRODUCTS

If this is a compiler:											If this is a JVM:													
Target CPU-specific extensions included	Produces reentrant code	Includes floating point emulation pkg.	Standard Template Library compatible	Support generation of GDBs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size	Approx. installed base	OS required?	Input language?	Output language?	Class libraries included?	Windowing library included?	RAM req'd in 1,000s of bytes	ROM req'd in 1,000s of bytes	Garbage collection algorithm	File system required?	Class libraries included?	Windowing library included?	Source code available?	Price
Aonix, San Diego, CA, (858) 257-2700, www.aonix.com																								
✓	✓			✓			✓	✓				Java or Byte Code	Java or Byte Code	Java, Byte Code, native object code	yes			available	no	yes		no		\$10,000
Apogee Software Inc., Campbell, CA, www.apogee.com																								
✓			✓		✓		✓		✓								50	2000	incremental	yes	yes		no	\$1,900
Dinkumware Ltd., Concord, MA, (978) 371-2773, www.dinkumware.com																								
	✓						✓		✓			Java	Java		Yes							Yes	Yes	\$75,000
												Java	Java		Yes						Yes		Yes	\$120
Empress Software Inc., Greenbelt, MD, (301) 220-1919, www.empress.com																								
✓							✓		✓		30,000				No	No				No	No	No	No	
esmertec inc., Zurich, Switzerland, +41 1 445 37 30, www.esmertec.com																								
	✓	✓	✓				✓		✓		50	Java, byte-code	Java, byte-code	binary	yes	yes	from 10K	from 10K	proprietary, incremental, hard real-time compliant	no	yes	yes	no	
Espial Group Inc., Ottawa, ON, Canada, (613) 230-4770, www.espialgroup.com																								
			✓				✓				500	Java	Java		No	No				No	No	No	No	
			✓				✓				500				No	No				No	No	No	No	
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com																								
✓			✓				✓		✓			Java byte-code	Java byte-code	C	No	yes	80	228	Concurrent, mark and sweep	No	yes	yes	yes	
✓	✓		✓	✓			✓		✓															
✓		✓		✓			✓		✓			Java byte-code	Java byte-code	C	No	yes				No	No	No	No	
Insignia Solutions, Fremont, CA, (510) 360-3700, www.insignia.com																								
							✓	✓	✓						No	No		250	Concurrent, precise, mark and sweep	No	yes	No	yes	\$10,000



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JAVA LANGUAGE PRODUCTS

Product name	Product description	Target CPUs supported	Platforms supported	Available IDE interfaces to debugger	Product type	Assembler included	ANSI compliant
CodeWarrior, Personal Java Platform Edition, v. 1.0	Provides a development environment for building, testing and deploying PersonalJava applets and apps targeting PersonalJava-enabled devices, such as set-top boxes, internet TV, and internet appliances. Its project manager and build system, class browser, and code navigation systems enable solid code writing.	Other, Motorola	Windows 3.1/95/98/NT		Debugger	✓	
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com							
Java Technology For OS-9	Includes the Java Virtual Machine (JVM), application framework (AFW) used by the Java Abstract Windowing Toolkit (AWT), and OS-9 Java Code Compact for diskless devices.	68K, x86 Protected Mode, SH, ARM, PowerPC	Windows 3.1/95/98/NT	✓	Java virtual machine	✓	✓
NSI Com, Or-Yehuda, Israel, 11-972-3533-1976, www.nsicom.com							
CrEme	Designed and optimized for enabling Java on Windows CE standard devices, including palmtops, handhelds and PDA's. Taking Sun's JVM and adapting it, NSI Com has developed this robust product.	68K, MIPS, i960, ARM, PowerPC, x86 Real Mode, x86 Protected	Windows CE		Java virtual machine		
JSCP Software Co-Processor for Java	Enables optimized and immediate implementation of Java on Embedded Devices. Compared to regular JVM porting, JSCP offers its customers important advantages: high robustness, low footprint, improved determinism, maintainability and performance.	68K, SPARC, x86, Philips TriMedia, StrongARM, SH, ARM, i960, PowerPC, MIPS	Windows 3.1/95/98/NT, Linux		Java virtual machine		
Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com							
Scenix Java-Programmable Virtual Machine	The Scenix virtual machine is optimized for embedded applications. It allows developers to write and deploy embedded Java applications using the SX Series communications controller easily.	SX chips from Scenix Semiconductor			Java virtual machine	✓	
Telelogic North America, Princeton, NJ, (609) 520-1935, www.telelogic.com							
JTestChecker	Use TestChecker for instrumentation of the source code. During tests, this instrumented executable program will produce traces used by TestChecker to compute test coverage.		Windows 3.1/95/98/NT, Solaris	✓		✓	
Vertel, Woodland Hills, CA, www.vertel.com							
e*ORB Java Edition	Designed for distributed application development where performance and memory footprint are critical. Leverage CORBA to develop multi-environment distributed applications.	PowerPC, x86, PA RISC, SPARC	Linux, VxWorks, Windows CE, Solaris				
Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com							
Personal JWorks/Embedded	Certified for full Java compatibility. This means that any application written for the PersonalJava application program interface (API) runs without any modifications on VxWorks.	ARM, x86 Protected Mode, MIPS, PowerPC	VxWorks	✓	Java virtual machine	✓	✓

												If this is a compiler:			If this is a JVM:									
Target CPU-specific extensions included	Produces reentrant code	Includes floating point emulation pkg.	Standard template library compatible	Support generation of GUIs	Includes templates	Linker optimizations	Online manual provided	Printed manual provided	Can optimize for execution speed	Can optimize for program size	Approx. installed base	OS required?	Input language?	Output language?	Class libraries included?	Windowing library included?	RAM req'd in 1,000s of bytes	ROM req'd in 1,000s of bytes	Garbage collection algorithm	File system required?	Class libraries included?	Windowing library included?	Source code available?	Price
✓				✓	✓							Java	Java	Java byte code	Yes	Yes								\$549
Microware Systems Corp., Des Moines, IA, (515) 223-8000, www.microware.com																								
✓	✓	✓	✓	✓	✓		✓		✓		250,000				yes	yes	4	4	mark and sweep	No	yes	yes	No	
NSI Com, Or-Yehuda, Israel, 11-972-3533-1976, www.nsicom.com																								
	✓	✓	✓		✓			✓	✓						No	No			Sun-based	No	yes	yes	No	
	✓	✓	✓		✓	✓	✓	✓	✓						No	No			Sun-based	No	yes	yes	yes	
Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com																								
																	3K	None						\$25,000
Telelogic North America, Princeton, NJ, (609) 520-1935, www.telelogic.com																								
	✓		✓					✓	✓						No	No				No	No	No	No	\$2,400
Vertel, Woodland Hills, CA, www.vertel.com																								
Wind River Systems, Alameda, CA, (800) 545-WIND, www.wrs.com																								
✓	✓	✓	✓	✓	✓		✓	✓	✓		150				No	No	100	500	Mark 2 sweep	No	yes	yes	yes	

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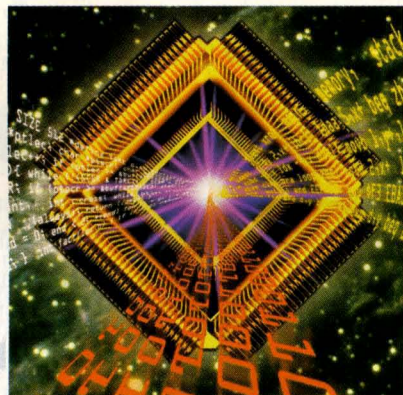
For full information please consult our web site: www.wrlcomp.com.
 World Computers Ltd. Suppliers of high quality software modules and components to the embedded software industry.

Product name	Product description	Target CPUs supported	Platforms supported	Technical Support							Price
				Days of free phone support	885/ Web/ FAQs	Long hrs. other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	
Centura Software, Redwood Shores, CA, (650) 596-4770, www.centurasoft.com											
SQLBase	An SQL database for Intel-based operating systems. It supports RI, triggers, and stored procedures.			0	U	\$	\$	\$	\$	\$	\$395
CrosStor Software, South Plainfield, NJ, (908) 226-0100, www.crosstor.com											
CrosStor FS	A plug-and-play, high-availability file system for embedded operating system environments, provides modular, transparent RTOS file system replacement; bulletproof reliability.	68K, ARM, i960, MIPS, PowerPC, x86 Protected Mode	VxWorks, PSOS, Nucleus	0	\$	\$	\$	\$	\$	\$	
Empress Software Inc., Greenbelt, MD, (301) 220-1919, www.empress.com											
Empress Connectivity Server	ODBC interface provides cross-platform functionality. Client/server architecture allowing client applications to access data stored through standard, non-application specific SQL functions	PowerPC, SPARC, x86 Protected Mode, x86 Real Mode, All major 32 bit and many 16 bit, Other, Intel 386, x86 Flat Mode, HP Series, RS 6000	Linux, Solaris, Other, Lynx, HP-UX, UNIX, NetBSD, BSD/OS, SunOS, Digital Unix, SCO Unixware, SCO OpenServer, QNX Neutrino, Compaq TRU64, IBM AIX, FreeBSD		\$	\$	\$	\$	\$	\$	
Empress Embedded Database Toolkit	Includes EMPRESS RDBMS with "C" interface for enhanced performance tuning, ODBC Server and Client for rapid data transfer, Dynamic SQL for rapid prototyping, and Internet kit for interfacing applications to Web.	Alpha, PowerPC, All major 32 bit and many 16 bit, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Linux, Solaris, Other, SGI, Lynx, HP-UX, UNIX, NetBSD, BSD/OS, SCO Unixware, SCO OpenServer, QNX Neutrino, Compaq TRU64, IBM AIX, FreeBSD		\$	\$	\$	\$	\$	\$	
Empress Hypermedia	Web application development toolkit linking dynamic web applications to EMPRESS RDBMS and other SQL compatible databases. Works in conjunction with popular Web browsers.	PowerPC, SPARC, All major 32 bit and many 16 bit, x86 Protected Mode, Intel 386, x86 Flat Mode, HP Series, x86 Real Mode	Windows 3.1/95/98/NT, Linux, Solaris, Other, SGI, Lynx, HP-UX, AIX, UNIX, NetBSD, BSD/OS, SunOS, Digital Unix, SCO Unixware, SCO OpenServer, QNX Neutrino, Compaq TRU64, IBM AIX, FreeBSD		\$	\$	\$	\$	\$	\$	
Empress JDBC Interface	Connects Java programs to database. Support JDBC standard. Enables Java programs to execute SQL statements. Contains Category 1, 2 and 4 JDBC client driver.	SPARC, Intel 386, x86 Flat Mode, HP Series, RS 6000, All major 32 bit and many 16 bit, x86 Protected Mode, x86 Real Mode, Other	Linux, Solaris, NetBSD, SunOS, SCO Unixware, Digital Unix, FreeBSD, IBM AIX, Compaq TRU64, QNX Neutrino, SCO OpenServer, BSD/OS, Other, SGI, Lynx, HP-UX, UNIX		\$	\$	\$	\$	\$	\$	
Empress RDBMS	Database management system for UNIX, Windows and real-time operating systems. EMPRESS supports multiple API's including C, HTML, Java, ODBC, and XML.	Alpha, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Linux, Solaris, SGI, HP-UX, SCO Unixware, SCO OpenServer, Compaq TRU64		\$	\$	\$	\$	\$	\$	
FairCom Corp., Columbia, MO, (573) 445-6833, www.faircom.com											
c-treePlus	C-tree Plus File Handler.	68K, Alpha, MIPS, PowerPC, Any CPU that runs an application generated from ANSI C Compiler, SPARC, x86 Protected Mode, x86 Real Mode	Any platform that supports ANSI C compiler	90	U	\$	\$	\$			\$895
PointBase Inc., Mountain View, CA, (877) 238-8798, www.pointbase.com											
PointBase Embedded Server	A pure Java, multiple connection database designed for embedded environments and Internet appliances. The multi-threaded architecture allows multiple connections from within the same JVM.	All CPUs supporting a JVM	Windows 3.1/95/98/NT, Linux, Solaris, Any with Java VM	30	U		\$	U	\$	\$	\$695
PointBase Mobile Edition	A single connection object-relational database optimized for mobile systems and devices. It provides full database functionality in an extremely small memory footprint built entirely in Java.	All CPUs supporting a JVM	Windows 3.1/95/98/NT, Linux, Solaris, Any with Java VM	30	U		\$	U	\$	\$	\$195
PointBase Network Server	PointBase Network Server provides object-relational data management for networked applications built on Internet standards for providing ubiquitous data access from anywhere on the Net.	All CPUs supporting a JVM	Windows 3.1/95/98/NT, Linux, Solaris, Any with Java VM	30	U		\$	U	\$	\$	\$1,295
PointBase UniSync Option		All CPUs supporting a JVM	Windows 3.1/95/98/NT, Linux, Solaris, Any with Java VM	30	U		\$	U	\$	\$	

U - Unlimited free \$ - paid

Product name	Product description	Target CPUs supported	Platforms supported	Technical Support						
				Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price
PointBase UniSync	UniSync provides a seamless solution for sharing application logic and data between PointBase databases, as well as with all major database systems including Oracle, IBM DB2, Sybase, and Microsoft SQL Server.	All CPUs supporting a JVM	Windows 3.1/95/98/NT, Solaris, Any with Java VM, Linux	30	U	\$	U	\$		
Polyhedra Inc., Bellevue, WA, (425) 646-4907, www.polyhedra.com										
Polyhedra	Polyhedra is a main-memory (MMDB) embedded Object-relational database for use on RTOS, UNIX, and NT computing platforms. The object-relational database is designed for mission-critical applications requiring event-driven real-time responses.	6800, 68K, Risc, Alpha, i860, MIPS, PowerPC, SPARC, x86 Protected Mode, x86 Real Mode	Windows 3.1/95/98/NT, Linux, Solaris, VxWorks, Lynx, PSOS, OSE-Delta	30	\$	\$	\$	\$	\$	
Sleepycat Software Inc., Carlisle, MA, (978) 371-0408, www.sleepycat.com										
Berkeley DB	Berkeley is an Open Source embedded database library. It is scalable, supports transactions, and survives crashes. Berkeley DB includes APIs for C, C++, Java, and a variety of scripting languages.	Portable source code, Works with a variety of CPUs	Windows, Solaris, SGI, TRU64, VxWorks, HP-UX, AIX, SCO, UNIX, NetBSD, BSD/OS, QNX Neutrino, Compaq, FreeBSD		U	\$	\$	\$	\$	
Sybase Inc., Emeryville, CA, (510) 922-3555, www.sybase.com										
SQL Anywhere Studio 7.0		MIPS, Dragon ball, SH, SPARC, x86 Protected Mode	DOS, Windows, Linux, Solaris, UNIX, Novell Netware, OS/2		U	U	U	U	U	\$399
Sybase UltraLite Database	Provides a flexible, in-memory, database optimized for embedded systems. MobiLink synchronization server allows users to synchronize data from embedded devices to any enterprise database.	MIPS, x86 Protected Mode, SHx, x86 Real Mode	VxWorks, Windows CE, QNX Neutrino, WindRiver VxWorks		U	\$	\$	\$	\$	
U S Software, Hillsboro, OR, (503) 844-6614, www.ussw.com										
NetPeer	Allows embedded systems to access remote database through SQL using JDBC::ODBC bridge.	68K, ARM, MIPS, MPC8xx, PowerPC, SH, x86	DOS, Windows 3.1/95/98/NT, Linux, Solaris, JRE	90		\$		\$	\$	
Vermont Database Corp., Stowe, VT, (802) 253-4437, www.vermontdatabase.com										
RC21	RC21 is a multi-user, thread-safe, embeddable client-server.		Windows 3.1/95/98/NT, Linux	365	U	\$	\$	\$	\$	

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Hardware Tools for Embedded Systems Development

All of the categories in this section are hardware tools designed to assist in debugging systems.

After 15 years in the in-circuit emulator business, I learned that developers really want a source-level debugger with just two buttons on the screen: Find Bug and Fix Bug. It's interesting that in the entire history of software engineering we've made essentially zero progress towards creating that sort of automated tool. A critical skill firmware folks must master is the art of debugging.

And debugging is indeed an art rather than a science. The best developers have a bagful of tricks they use, coupled with a section of the right tools. Sometimes we're more like cat burglars than geeks, slipping into the system, stealing a bit of information, leaving no trail of our entry.

Our challenge is to pry into a system that's inherently closed, to gain visibility into registers, memory, and CPU transactions that exist on a microscopic scale, that leave no clues behind. Only the skillful use of the right tools makes this possible.

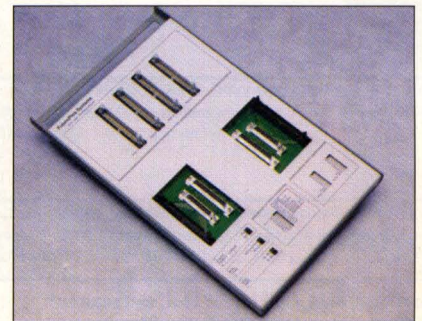
Some of the tools listed here may seem more the province of hardware engineers than firmware developers. How many software folks use oscilloscopes? Yet the challenge of getting visibility into the system means we've got to employ every conceivable tool, in clever and effective ways. Something as simple as a blinking LED can tell a lot about what the code is doing; a scope shows ever so much more data. Toggle a bit high and low

as a function starts and ends, and suddenly the scope becomes a performance analyzer.

Conversely, traditional software development tools like emulators and BDMs are astoundingly powerful hardware debuggers. It's astonishing how few hardware designers use these devices when bringing up a new design. Turn power on, and if anything is wrong with the design the system will crash within a microsecond. Address and data buses must be perfect. You've got to burn at least a short bit of correct code into ROM or flash. The chip select system, code and hardware, has got to be right. Sure, we can capture the crash with a logic analyzer, but, better, use a BDM or emulator to create controlled, repeatable tests. Fire the product up, and use the tool to read a few ROM locations. Test RAM. Exercise I/O.

If—when—something doesn't work, make the tool loop, perhaps reading that failed ROM repeatedly. Then probe around with the scope or analyzer. The emulator/BDM creates a known, controlled, repeating stimulus, while the scope/analyzer tests nodes to see if the proper response results. This is far more effective than burning ROMs like mad to create small test programs while cycling power hundreds of times to figure out why the system crashes.

It's not unusual to spend half your development time debugging hardware and software. It pays to find tools that are comfortable and intuitive, that offer a mix of powerful capabilities



ties and ease of use.

Then, master your debugging tools. Learn their quirks and their less visible but perhaps profoundly useful features. Debugger vendors constantly despair of customers who never get beyond the five or six most common uses. Often a command or button buried in the documentation can knock days or weeks out of complex debug tasks.

Old salts laugh at newbies who are too busy "working" to set up makefiles, yet the same folks all too often won't invest a bit of time up-front to create the debugging tools' start-up files and configuration. Why not set breakpoints on error routines, stack overflow, and so on, automatically, every time you start the system up? Practice proactive, rather than reactive, debugging. On a logic analyzer build or buy decent connectors to get three-second access to the system bus—relying on clip leads is an exercise in frustration.

The tools give you vast capabilities that go untapped, unless you buy them before the panic of debugging sets in, and unless you learn enough about them to squeeze every bit of capability out. Debugging is hard; give the tools a chance to help. **esp**

IN-CIRCUIT EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Overlay RAM size, standard	Overlay RAM size, maximum	Trace buffer size, depth	Trace buffer size, bits/width	# of SW breakpoints	# of address-only HW breakpoints	# of complex breakpoints	Nesting levels for complex breakpoints	Pass counter included	Time stamp recorded in trace
Advanced Transdata Corp., Dallas, TX, (972) 980-2960, www.adv-transdata.com													
MPLAB-ICD	PIC	Windows 3.1/95/98/NT	Runs under MPLAB IDE from Microchip					1					
RICE17A	PIC	Windows 3.1/95/98/NT, Windows 2000	Comes with IDE; Source level support on MPASM, MPC, MPLAB-C17, Hi-Tech C, IAR, PCB, PCM	64K word	64K word	32K	24	U	1	1	2	√	√
RICE2000	PIC	Windows 3.1/95/98/NT, Windows 2000	Comes with IDE, provides source level support on MPASM, MPC, MPLAB-C17, Hi-Tech C, IAR, PCB, PCM	64K	64K	64		U	1	1	2	√	√
RICE65	65C02 from WDC, UMC, Rockwell	Windows 3.1/95/98/NT, Windows 2000	Comes with debugger, provides source level support on 2500AC, WDC/ZardoZ C compilers	64K	8K	24		U	1	1			
SX-ISD	SX chips from Scenix Semiconductor	Windows 3.1/95/98/NT, Windows 2000	Win95/98/2000 debugger, SASM assembler		8K software trace	72		1	1				
American Arium, Tustin, CA, (714) 731-1661, www.arium.com													
ECM-55	Pentium	Windows 3.1/95/98/NT	WinDb					64	4	4	1		
ECM-S2	Celeron, Pentium II, Pentium III	Windows 3.1/95/98/NT	WinDb					64	4	4	0		
TRC-55	Pentium	Windows 3.1/95/98/NT	WinDb		128	207		64	4	10	4	√	√
TRC-MM	Mobile Pentium II processors	Windows 3.1/95/98/NT	WinDb		128	207		64	4	10	4	√	√
TRC-P6	Pentium Pro processor	Windows 3.1/95/98/NT	WinDb		128	207		64	4	10	4		√
TRC-S1	Pentium II III Slot 1 processors	Windows 3.1/95/98/NT	WinDb		128	207		64	4	10	4	√	√
TRC-S2	Pentium II III Xeon processors	Windows 3.1/95/98/NT	WinDb		128	207		64	4	10	4	√	√
TRC-SA	Pentium II socket 370 processors	Windows 3.1/95/98/NT			128	207		64	4	10	4	√	√
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com													
CodeICE 5102	ColdFire	Windows 3.1/95/98/NT, Solaris, HP-UX	MWX-ICE	0	16,384	32	128	100	8	100		√	√
SuperTAP 68302	68302, EN, QH, PM	Windows 3.1/95/98/NT, HP-UX, Solaris	MWX-ICE	0	8,192	256	128	64	8	64		√	√
SuperTAP 860/823		Windows 3.1/95/98/NT, Solaris, HP-UX	MWX-ICE	0	8,192	128	168	100		50		√	√
x86 Product Line	x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT, Solaris, HP-UX	CAD-UL XDB, Paradigm	1,024	8,192	64-256	88	U	8	16	4	√	√
Ashling Microsystems, Sunnyvale, CA, (408) 732-6490, www.ashling.com													
Opella-TriCore	TriCore	Windows 3.1/95/98/NT	PathFinder-Plus					U	4	4	4		
Ultra-51	8051 and derivatives	Windows 3.1/95/98/NT	PathFinder-Plus	64	1024	512	96			4	2	√	√

Can collect and display trace data w/o halting emulation Code coverage available				Performance analyzer available	Real-time trace triggers provided	Seconds to download a 64K file	Technical Support							Price	Comments
						Cost to support additional CPU	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
Advanced Transdata Corp., Dallas, TX, (972) 980-2960, www.adv-transdata.com															
					30		U	U	U			\$	\$	\$149	Supports the PIC16F87x only. Uses the chip's built-in programming and debugging capabilities to provide low-cost emulation. Connects to the PC's RS232 port and comes with a Demo board for evaluation and prototyping tests.
			✓		2 to 3	\$195 to \$375	U	U	U			\$	\$	\$400	Supports all PIC12/14/16/17 and connects to parallel port to provide fast downloading. Comes with 12-clip external probes, 64K program memory and 32K real-time trace. Full-speed and real-time emulators with full-featured emulation controls. Optional time stamp function. Real-time data breakpoints on selected new modules.
✓	✓	✓	✓		2 to 3	\$500	U	U	U			\$	\$	\$1,250	Is connected to a parallel port. It provides low-voltage emulation, frequency synthesizer, complex breakpoints, 32-bit cycle counter and 12-clip external probe which provides break input, break output, trigger output, eight trace lines and GND.
					5		U	U	U			\$	\$	\$995	Connects to a parallel port. It provides a 32-bit cycle counter to time instruction execution. The data capture break feature generates halt the processor when specified program memory satisfies the break condition. Comes with 12-clip probe.
					20	\$0	U	U	U			\$	\$	\$295	An in-system debugger/programmer which utilizes the SX chip's built-in debugging capability for emulation. Codes and fuse data are programmed into the SX chip in circuit test for debugging. Optional SX Demo/Proto board for evaluation and testing.
American Arium, Tustin, CA, (714) 731-1661, www.arium.com															
					4	\$0	365	U		\$	\$	\$	\$	\$8,000	In-target probe ICE.
					4	\$0	365	U		\$	\$	\$	\$	\$12,000	In-target probe ICE.
			✓		4	\$0	365	U		\$	\$	\$	\$	\$20,000	Real-time front-side bus trace and breakpoints.
			✓		4	\$8,000	365	U		\$	\$	\$	\$	\$30,000	100 MHz real-time front-side bus trace and data breakpoints using state-per-transfer technology. Various packages supported.
			✓		4	\$8,000	365							\$30,000	Real-time front-side bus trace and data breakpoints.
			✓		4	\$8,000	365	U		\$	\$	\$	\$	\$30,000	Symmetrical multi-processing (SMP) supported.
			✓		4	\$8,000	365	U		\$	\$	\$	\$	\$30,000	C high-level debug supported.
			✓		4	\$8,000	365	U		\$	\$	\$	\$	\$30,000	Advanced real-time data breakpoints based on exclusive state-per-transfer technology.
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com															
✓			✓		2.1		0	\$	\$	\$	\$	\$			High-performance, palm-sized, in-circuit emulator. Fastest, most accurate analysis and debugging of firmware and software running in-target, with minimal intrusion. Hardware-enhanced approach lets you focus on debugging your application, not your tools.
✓	✓	✓	✓		0.8		90	\$	\$	\$	\$	\$			High-performance, palm-sized, in-circuit emulator. Fastest, most accurate analysis and debugging of firmware and software running in-target, with minimal intrusion. Hardware-enhanced approach lets you focus on debugging your application, not your tools.
✓	✓	✓	✓		0.9		90	\$		\$	\$	\$			Innovation of the year award-winner, Non-Stop Emulation support, move from full ICE support to full BDM/DPI support, integrated BDM, full bus trace, event triggering, overlay memory, remote ethernet communications capabilities.
✓	✓	✓	✓		1		0	\$	\$	\$	\$	\$			Includes patented technology and innovation-of-the-year award winners.
Ashling Microsystems, Sunnyvale, CA, (408) 732-6490, www.ashling.com															
							365	U	U	U		\$	\$	\$170	Opella-TriCore is a low-cost entry-level in-circuit emulator which provides run-time control for TriCore development.
✓	✓	✓	✓		8		365	U	U	U		\$	\$	\$5,000	Ashling supports standard 80C51 derivatives, Smart Card, DECT, and TV family derivatives.

IN-CIRCUIT EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Overlay RAM size, standard	Overlay RAM size, maximum	Trace buffer size, depth	Trace buffer size, bits width	# of SW breakpoints	# of address-only HW breakpoints	# of complex breakpoints	Nesting levels for complex breakpoints	Pass counter included	Time stamp recorded in memory
Ultra-51XA	8051XA	Windows 3.1/95/98/NT	PathFinder-Plus	256k	16MB	512k	96			4	2		
Ultra-66K	8051 and derivatives, Oki66K, Siemens Smart XA, C5xx, 8051XA, MELPS 7700, M16C, TriCore	DOS, Windows 3.1/95/98/NT	Path Finder	256	16,384	512K	96	256K	256K	6	6	✓	✓
Ultra-M16C	M16C	Windows 3.1/95/98/NT	Path Finder-Plus	256k	16MB	512k	96	64K	64	2	2	✓	✓
Vitra-TriCore	TriCore	Windows 3.1/95/98/NT	PathFinder-Plus	256k	1MB	512k	96			4	2	✓	✓
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com													
AVR ICE	AVR 8 bit Risc Flash Controller Family	Windows 3.1/95/98/NT	AVR Studio	128	128	32	96	0	U	0	0		✓
Ceibo Inc/Ceibo Ltd., Florissant, MO, (314) 830-4084, www.ceibo.com													
DS-186 Emulator	x86 Real Mode	DOS, Windows 3.1/95/98/NT	Paradigm	256	1,024	32	64	1024	1024	64k	3	✓	✓
DS-251 Emulator	80251	Windows 3.1/95/98/NT	Included	256	1,024	128	104	256k	256k	64k	3	✓	✓
DS-51 Emulator	8051 and derivatives	DOS, Windows 3.1/95/98/NT	Emulates all 80C51 derivatives	128	512	32	104	512k	512k	64k	3	✓	✓
DS-M8 Emulator	PIC	Windows 3.1/95/98/NT	Included	128	128	32	104	128k	128k	64k	3	✓	✓
DS-XA Emulator	8051XA	Windows 3.1/95/98/NT	Included	64	2,048			64k	2048k	64k	3	✓	✓
EB-251 Emulator	80251	Windows 3.1/95/98/NT	Included	128	128	4	48	128k					
EB-51	8051 and derivatives	DOS, Windows 3.1/95/98/NT	Included free, DOS and Windows	128	128			64k					
EB-XA Emulator	8051XA	Windows 3.1/95/98/NT	Included	64	64			64k					
Eclipse International Inc., Mountain View, CA, (650) 691-6400, www.eclipseint.com													
advanCE Development System for Windows CE	SH	Windows CE											
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com													
Real-time in-circuit emulators	MIPS, LEXRA, QED, NKK, Nec, IDT	DOS, Windows 3.1/95/98/NT, HP-UX, Solaris	EPI	1,000	8,000	32	64	U	50	U		✓	✓
Emulation Technology Inc., Santa Clara, CA, (408) 982-0660, www.1800ADAPTER.com													
	Most												
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com													
visionICE	68K, ColdFire, PowerPC	Windows 3.1/95/98/NT, HP 9000, Solaris, SunOS	Nucleus, pSOS, XRAY, SingleStep, CrossView Pro, VxWorks	1,000	4,000	32,128	max. 128	U	64	64	8	✓	✓
HiTech Equipment Corp., San Diego, CA, (619) 566-1892, www.hte.com													
8051SDK	8051 and derivatives	DOS, Windows 3.1/95/98/NT		32									
DryICE	8051 and derivatives	DOS, Windows 3.1/95/98/NT, Linux, Solaris, Using terminal emulator		32				1	1				

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A modular family of powerful in-circuit emulator systems for the Siemens C16x variants featuring the most advanced adaptation technology: PressOn. Our C161 system with a 64 K trace buffer module is available for less than \$3,500. Also supports ST-10 microcontrollers.

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For 68HC12 processors; supports maximum speed and all operating voltages; plug and play (no jumpers, no switches); additional BDM interface cable; flash programming built-in; PlugOn trace with 32k frames. Move up to super advanced features with DBoxHC12.

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IN-CIRCUIT EMULATORS

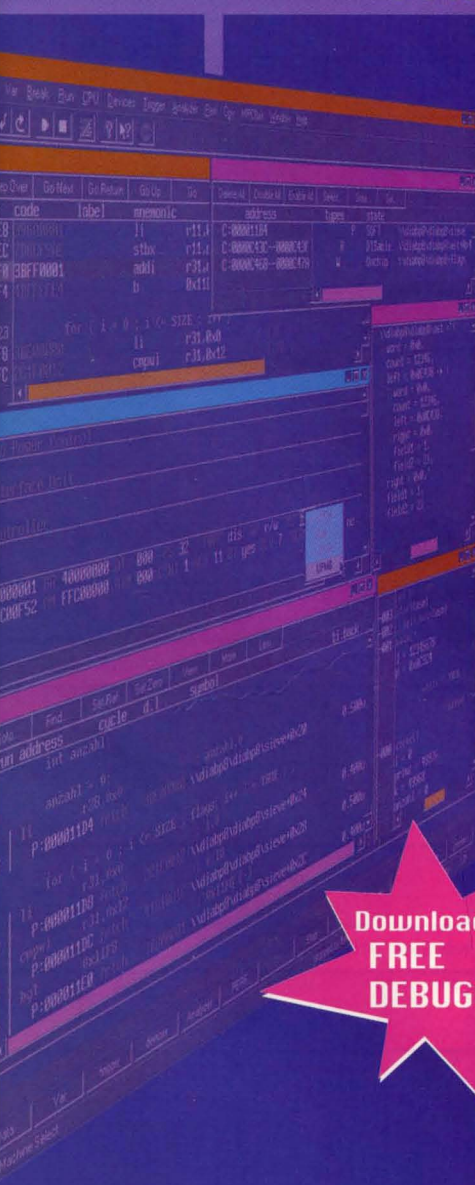
Can collect and display trace data w/o halting emulation Code coverage available Performance analyzer available Real-time trace triggers provided Seconds to download a 64K file					Technical Support Cost to support additional CPU Days of free phone support 800/Web FAXs, bug fixes, other Phone support, standard Phone support, 24-hour response Product updates Training Price					Comments				
					365	U	U	U	\$	\$	\$6,950			
✓	✓	✓	✓		\$400	365	U	U	U	\$	\$	\$9,950	Includes RTOS awareness window.	
✓	✓	✓	✓	8		365		U	U	\$	\$	\$7,250	Ashling's Ultra M16C development system provides a complete development environment for the full Mitsubishi M16C microcontroller family hosted under Windows.	
✓	✓		✓	8		U	U	U	U	\$	\$	\$10,000	Ashling's Ultra-66K Microprocessor Development System provides a complete development environment for the OKI Semiconductor MSM6657x and MSM6658x microcontroller families hosted under Windows.	
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com														
			✓	35	0	30	U	U		U		\$200 to \$4,000	Four emulators are offered. Each supports a product family and serves various price performance points.	
Ceibo Inc/Ceibo Ltd., Florissant, MO, (314) 830-4084, www.ceibo.com														
			✓	6	\$830	U	U	U	U	U	U	\$4,100	Supports 8086/8, V-Series and 80C186xx derivatives.	
✓	✓	✓	✓	6	\$690	U	U	U	U	U	U	\$6,300	Supports all MCS-251 derivatives.	
✓		✓	✓	6	\$690	U	U	U	U	U	U	\$2,690	Emulates all 80C51 derivatives.	
✓	✓	✓	✓	6	\$620	U	U	U	U	U	U	\$1,350	Supports all PICs at maximum frequency.	
✓	✓	✓	✓	6	\$690	U	U	U	U	U	U	\$5,150	Supports all XA derivatives.	
✓				6		U	U	U	U	U	U	\$1,190	Supports all Intel MCS-251.	
				6	\$190	U	U	U	U	U	U	\$790	3.3V and 5V support, 40MHz for all 40-DIP and 44-PLCC derivatives.	
				6	\$600	U	U	U	U	U	U	\$1,390	Assembler included in the basic unit.	
Eclipse International Inc., Mountain View, CA, (650) 691-6400, www.eclipseint.com														
						90	U		\$	\$	U	\$	\$4,995	Assists OEMs with developing and deploying Windows CE-based embedded systems at a very low entry cost, enabling them to modify the proposed design and add the desired peripherals.
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com														
✓	✓	✓	✓	0.5	\$2,500			\$	\$	\$	\$	\$		
Emulation Technology Inc., Santa Clara, CA, (408) 982-0660, www.1800ADAPTER.com														
						U		U	U					Adapters, test clips and 4,000 unique test accessories used to debug new designs using Emulators, Logic Analyzers and Oscilloscopes. Custom adapter support is also available.
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com														
✓		✓	✓	0.1		90	U		\$		U	\$	\$3,400	
HiTech Equipment Corp., San Diego, CA, (619) 566-1892, www.hte.com														
							U	U		U		\$99	An educational tool which can operate as a stand alone SBC or as an ICE. It comes with instructional material on the development of embedded systems.	
						30	U	U	U	U		\$149	Provides low-cost 8051 family development tool for debugging simple 8051-based target systems.	

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IN-CIRCUIT EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Overlay RAM size, standard	Overlay RAM size, maximum	Trace buffer size, depth	Trace buffer size, bits width	# of SW breakpoints	# of address-only HW breakpoints	# of complex breakpoints	Nesting levels for complex breakpoints	Pass counter included	Time stamp recorded in trace
DryICE+	8051 and derivatives, Atmel 89C series	DOS, Windows 3.1/95/98/NT, Linux, Solaris, Using terminal emulator		32				1					
Hitek Development Tools, Sunnyvale, CA, (408) 733-7080, www.hitek.com													
AX186	x86 Real Mode	Windows 3.1/95/98/NT	HITOP98	256	1	32K	112	256K	256K	2	2	✓	✓
AX430	Texas Instruments MSP430	Windows 3.1/95/98/NT	HITOP98	64	64	32 K	64	64k	64K	2	2	✓	✓
AX51	8051 and derivatives	Windows 3.1/95/98/NT	HITOP98	256	256	32K	48	U	256K	4	2	✓	✓
AX6811	68HC05, 68HC08, 68HC11	Windows 3.1/95/98/NT	HITOP98	64	256	32 K	48	256 K	256 K	4	2	✓	✓
AX68300	68K	Windows 3.1/95/98/NT	HITOP98	64	256	32 K	48	256 K	256 K	4	2	✓	✓
DProbe167	C16x, STMicroelectronics ST10	Windows 3.1/95/98/NT	HITOP98, FastView	1	2	128 K	144	256 K	8	2	2	✓	✓
DProbe251	80251	Windows 3.1/95/98/NT	HITOP98	256	256	32 K	96	256 K	256 K	4	2	✓	✓
DProbe386EX	x86 Real Mode	Windows 3.1/95/98/NT	HITOP98	384	2	64 K	96	256 K	4	2	2	✓	✓
DProbe51XA	8051XA	Windows 3.1/95/98/NT	HITOP98	256 K	256 K	32 K	96	256 K	256 K	4	2	✓	✓
DProbeHC12	68HC12	Windows 3.1/95/98/NT	HITOP98	512 K	512 K	32 K	80	512 K	512 K	2	2	✓	✓
DProbeP5	x86 Protected Mode	Windows 3.1/95/98/NT	HITOP98, CADUL XDB	N/A	N/A	256 K	192	256 K	8	8	8	✓	✓
MX51	8051 and derivatives	Windows 3.1/95/98/NT	HITOP98	128	256	32 K	64	256 K	256 K	4	2	✓	✓
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com													
HMI-200 Series In-Circuit Emulator	68HC11, 68HC16, 68K, 8085, 6809, 80196, 8051 and derivatives, Z80/Z180	DOS, Windows 3.1/95/98/NT, HP-UX, Solaris	SourceGate	64	4,096	Dual 4K or 16K		128	U	4	4	✓	✓
SPS-1000 In-Circuit	68HC12, 68K, IBM PPC4xx, MPC8xx, PowerPC	DOS, Windows 3.1/95/98/NT, HP, Solaris	SourceGate	512	4,096	128	80	128	U	3	3	✓	✓
SPS-2000 In-Circuit	68K, MPC8xx, PowerPC, IBM PPC4xx	DOS, Windows 3.1/95/98/NT, HP, Solaris	SourceGate	512	4,096	128	136	128	U	8	8	✓	✓
iSYSTEM USA, LLC, San Diego, CA, (619) 385-9100, www.isystem.com													
iC181 PowerEmulator	68HC05, 68HC11, C500, SAM8, 8051 and derivatives, PIC, Z80/Z180	Windows 3.1/95/98/NT	Integrated debugger included in winIDEA.	256	1,024	32	96	U	U	U	U	✓	✓
iC2000 PowerEmulator	68HC05, 68HC08, 68HC11, 68HC12, 68HC16, 68K, 80251, SAM8, 6502, M Core, 8051 and derivatives, PIC, PowerPC, x86 Protected Mode, x86 Real Mode, C500, Z80/Z180	Windows 3.1/95/98/NT	Integrated debugger included in winIDEA.	256	16,000	32	96	U	U	U	U	✓	✓
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com													
TRACE32-FIRE	ARM, EGOLD, C166C8C, STMicroelectronics ST10, Qualcomm MSM3000, V850, SH2, H8S, MPC8xx, C16x	Windows 3.1/95/98/NT, Windows 2000, HP-UX, Linux, Solaris	TRACE32-PowerView, RTA Suite, Tornado,	1000	4000	8000	250	U	U	U	8	✓	✓
TRACE32-ICE	Most	DOS, Windows 3.1/95/98/NT, HP-UX, Linux, Solaris	TRACE32-PowerView, RTA Suite, Tornado	512	8,000	32,000	250	U	U	U	8	✓	✓

					Technical Support								Comments
Can collect and log/trace data w/o halting emulation	Code coverage available	Performance analyzer available	Real-time trace triggers provided	Seconds to download a 64k file	Cost to support additional CPU	Days of free phone support	885/Web FAQs, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	
					\$150	U	U	U	U			\$448	Allows emulating 8051 CPU derivatives in a low-cost system with the ability to emulate different CPUs by changing emulator pods.
Hitex Development Tools, Sunnyvale, CA, (408) 733-7080, www.hitex.com													
√	√	√	√	<1	\$1,700	U	U	U	\$	\$	\$	\$6,990	
√	√	√	√	<1	\$400	U	U	U	\$	\$	\$	\$8,995	
√	√	√	√	2	\$600	U	U	U	\$	\$	\$	\$4,995	
√	√	√	√	<1	\$1,200	U	U	U	\$	\$	\$	\$4,990	
√	√	√	√	<1	\$1,200	U	U	U	\$	\$	\$	\$7,990	
√	√	√	√	<1	\$800	U	U	U	\$	\$	\$	\$9,500	Additional enhancements with DBox167.
√	√	√	√	<1		U	U	U	\$	\$	\$	\$6,245	Some additional features require DTrace16 / DBox16.
√	√	√	√	<1	\$800	U	U	U	\$	\$	\$	\$4,995	
√	√	√	√	<1		U	U	U	\$	\$	\$	\$6,245	Some additional features require DTrace16 / DBox16.
√	√	√	√	<1	\$2,000	U	U	U	\$	\$	\$	\$6,385	Some enhanced features available with DBox16.
√		√	√	<1		U	U	U	\$	\$	\$	\$15,995	Additional enhancements with DTrace / XTracem option.
√		√	√	<1	\$600	U	U	U	\$	\$	\$	\$2,195	No real time violation when triggering on internal access.
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com													
√	√	√	√	7		180	U	\$	\$	\$	\$	\$3,495+	Proven technology for a host of processors.
√	√	√	√	1	\$1,995	180	U	\$	\$	\$	\$	\$1,995	Supports Flash programming. Universal Design. Overlay RAM available third quarter 1999.
√	√	√	√	6	\$1,995	180	U	\$	\$	\$	\$	\$12,995	Supports PowerPC and 68060 processors.
iSYSTEM USA, LLC, San Diego, CA, (619) 385-9100, www.isystem.com													
√	√	√	√		\$0 to \$1,500+	365	U	\$	\$	\$	\$	\$4,200+	
√	√	√	√		\$0 to \$3,000+	365	U	\$	\$	\$	\$	\$11,000+	Supports over 300 MCUs with either a software setup or a change of the pod. Driven by winIDEA, an integrated development environment.
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com													
√	√	√	√	0.5	\$5,000	U	U	U	\$	\$		\$12,500	universal and modular system
√	√	√	√	0.5	\$5,000	1,000	U	U	\$	\$		\$7,500 to \$20,000	Universal, modular, supports more than 300 CPUs.

IN-CIRCUIT EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Overlay RAM size, standard	Overlay RAM size, maximum	Trace buffer size, depth	Trace buffer size, bits width	# of SW breakpoints	# of address-only HW breakpoints	# of complex breakpoints	Nesting levels for complex breakpoints	Perf counter included	Time stamp recorded in trace
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz													
IceP2051	8051 and derivatives	DOS, Windows 3.1/95/98/NT	DbgX51										
Trice-52	8051 and derivatives	DOS, Windows 3.1/95/98/NT	DbgX51										
Metalink Corp., Chandler, AZ, (602) 926-1198, www.metaice.com													
iceMASTER-AA	8051 and derivatives	Windows 3.1/95/98/NT	most	64	64	4		64	64			√	
iceMASTER-AB	68HC05, 68HC11	DOS	most	64	64	4		64	64			√	
iceMASTER-PE	8051 and derivatives	Windows 3.1/95/98/NT	most	64	64	16		64	128			√	
iceMASTER-SF	8051 and derivatives, Dallas 87C550 Philips 509xy	Windows 3.1/95/98/NT	most	128	512	64	72	500+	512K			√	√
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com													
MPLAB-ICE 2000	PIC	Windows 3.1/95/98/NT	MPLAB	128	128	32	128	U	U	4	4	√	√
PICMASTER/ PICMASTER-CE	PIC	Windows 3.1/95/98/NT	MPLAB	128	128	8	48	U	U				
Microtek International, Hillsboro, OR, (503) 533-4463, www.microtekintl.com													
PowerPack for 486 Processors	486, Intel/AMD Am486	Windows 3.1/95/98/NT	Microsoft Windows CE Platform Builder 3.0, Windriver Tornado II, CAD-UL, Microtek SLD	1,024KB	4,096KB	256KB	160 Bits	256	4	8	4	√	√
PowerPack for Intel386 EX processors	x86 Protected Mode, x86 Real Mode, Intel386CX/SX/EX	Windows 3.1/95/98/NT	Microtek, WindRiver, CAD-UL, Microsoft Windows CE	1000K	4,096K	256K	160	256	4	8	4	√	√
PowerPack for Motorola 683xx processors	Pentium II Slot 1 processors, Pentium II socket 370 processors, Pentium II	Windows 3.1/95/98/NT		256	1,096	128	96			8	4	√	√
PowerPack for Pentium processors	x86 Protected Mode, Intel low power, Pentium, x86 Real Mode	Windows 3.1/95/98/NT	Microtek, CAD-UL, Windriver Tornado II, Microsoft Windows	1000K	4000K	256K	160	256	4	8	4	√	√
Momentum Data Systems, Fountain Valley, CA, (714) 378-5805, www.mds.com													
218X-ICE	Analog Devices ADSP218X Family	Windows 3.1/95/98/NT	Analog Devices Visual DSP, MDS 218x Debugger	0	0	0	0	20	0	0	0	no	
Nohau Corp., Campbell, CA, (408) 866-1820, www.nohau.com													
EMUL-PC	68HC11, 68HC12, MCS296, M16C, 68HC16, 68K, 80196, 80251, 8051 and derivatives, 8051XA, C16x	DOS, Windows 3.1/95/98/NT		32-256	4,096	512	104	U	U	3 to 8	3 to 8	√	√
Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com													
Flex-ICE	68HC12, 68020	Windows 3.1/95/98/NT	Flex	512	4,000	32	128	4M	4M	4	4	√	√
SDT-XFI	65816, 6800, 68HC12, 68K, x86 Real Mode, Z80/Z180	DOS, Windows 3.1/95/98/NT	Flex, Prism	256	2,000	32	88	U	4	4	8	√	√
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com													
8800	68HC11, 68K, WDC65Cxxx, 80196, Z80/Z180, Z382	DOS, Windows 3.1/95/98/NT	SingleStep/ICE	512	2,000	64	48	256	65,000	3	3	√	

Can collect and display trace data w/o halting emulation				Code coverage available	Performance analyzer available	Real-time trace triggers provided	Seconds to download a 64K file	Technical Support				Price	Comments	
							Cost to support additional CPU	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response			Product updates
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz														
								30	U				\$500	Emulates and programs, Atmel 20 Pin FLASH µC.
							\$0	30	U				\$995	A universal ICE, supports DS80C320,DS80C550, ADuC812,Siemens, Philips, Atmel uC.
MetaLink Corp., Chandler, AZ, (602) 926-1198, www.metaice.com														
				3	\$800		365						<\$2,500	Interchangeable probe cards; offers an affordable debug solution.
		✓		3	\$700		365		U				\$2,000	An affordable debugging tool with trace buffer and dual performance analyzers.
				3			365		U				\$1,951	Unique with its integrated probe card. This palm-sized package can fit into any project budget.
✓			✓	3	\$1,500		365						<\$5,000	Interchangeable probe cards; incorporates the most advanced emulation features into a very affordable and portable package.
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com														
✓	✓	✓	✓	2	\$470	U	U	U		U	U		\$1,995	Full-featured modular universal ICE for PICmicro family of 8-bit microcontrollers offering real-time, full-speed (up to 40 MHz), and low-voltage operation.
			✓	2	\$315 to \$355	U	U	U		U	U		\$799	Modular universal ICE for PICmicro family.
Microtek International, Hillsboro, OR, (503) 533-4463, www.microtekintl.com														
✓	✓	✓	✓	6		U	U	U		\$	\$		\$11,995	The PowerPack 486 emulator also supports the Intel DX2, and DX4 processors and the AMD 486, AMD 486DX2 and AMD DX5.
✓	✓	✓	✓			U	U	U		\$	\$	\$	\$9,500	C++ support. Clock trace/triggers option. Built-in flash programming. Ethernet option.
✓			✓			90	U	U	U	\$	\$		\$10,995	Clock level trace and triggers.
✓	✓	✓	✓	6.5		U	U	U		\$	\$	\$	\$11,995	C++ support. Clock trace/triggers option. Built-in flash programming. Ethernet option.
Momentum Data Systems, Fountain Valley, CA, (714) 378-5805, www.mds.com														
					\$0	30	U		\$	\$	\$	\$	\$1,995	The MDS-218X-ICE system is a software development and integration environment for Analog Devices' ADSP-218x based products. Target hardware is controlled by the MDS-218X-ICE In-Circuit Emulator while user programs are observed and tested.
Nohau Corp., Campbell, CA, (408) 866-1820, www.nohau.com														
✓	✓	✓	✓		\$300 to \$5,000		U	U	U	U				
Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com														
✓			✓	<2		365	\$	\$	\$	\$	\$		\$9,995	Small enough to carry with a notebook PC and include: software breakpoints in ROM/flash, dual port memory access, interrupt servicing while not executing, power cycling, 2.7 to 5.5V support.
✓			✓	<2	\$3,500	365	\$	\$	\$	\$	\$		\$9,995	Standard system includes OWS non-intrusive emulation, powerful breakpoint systems, event detect and sequencing, 50 nsec timestamp trace with input filtering, address violation detection, support for 8 external logic probes.
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com														
✓		✓	✓	3	\$2,500	365	U	U	U	\$	\$			Combines a logic analyzer, zero-wait-state emulation memory, and innovative probing.

IN-CIRCUIT EMULATORS

Product name	Targets (Tb) supported	Platforms supported	Debuggers supported	Overlay RAM size, standard	Overlay RAM size, maximum	Trace buffer size, depth	Trace buffer size, bits width	# of CPU breakpoints	# of address-only I/O breakpoints	# of complex breakpoints	Watchpoint levels for complex breakpoints	Pass counter included	Time stamp recorded in memory
Orion/ADVCE	68HC05, 68HC11, 68HC12, 68HC16, 68K, 78K series, ARM, C16x, ColdFire, H8, MELPS 7700, MIPS, MPC8xx, PowerPC, MSM3000, Sharp, Panasonic, Oki OLMS66K, FR20 30, F2MC, H8S, M16C, SPARC Lite, SH, SPARC, TLC590/900, V800, Z80/Z180	DOS, Windows 3.1/95/98/NT, UNIX, HP-UX, Solaris	Green Hills MULTI, GAIO Open Plus	256	8,250	8K	104	65	6	6	4	✓	✓
Parallax Inc., Rocklin, CA, (916) 624-8333, www.parallaxinc.com													
SXKey Development System	Scenix SX	Windows 3.1/95/98/NT	Parallax SX-Key Integrated Editor Assembler and Debugger for the Scenix SX.										
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com													
PICE	80196, 8051 and derivatives, PIC, AVR, Atmel AVR90	Windows 3.1/95/98/NT, Windows 2000	Keil, IAR, TASKING, Hi-Tech, Avocet, Franklin, Archimedes, Intel, Phyton, CCS	64K-256K	65K-256K	16K-64K	64-128			2-4	2-4	✓	✓
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com													
fast-view66	C16x, ST10, TriCore	Windows 3.1/95/98/NT	fast-view66/win	1,024	1,024	128	144	U	U	3	2	✓	✓
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com													
ICE-PIC2	PIC, 175PIC0A	Windows 3.1/95/98/NT	MPLAB	8	16	4	24	U	U	0	0		
USP-186	80C186	Windows 3.1/95/98/NT	Chameleon	64	1,024	32	80	U	U	3	8	✓	✓
USP-196	80196	Windows 3.1/95/98/NT	Chameleon	64	256	32	80	U	U	3	8	✓	✓
USP-1x	TMS320 and other TI DSPs	DOS	EMU10	4	64	32	80	U	U	3	8	✓	✓
USP-25	TMS320 and other TI DSPs	DOS	EMU25	256	256	32	80	U	U	3	8	✓	✓
USP-51	8051 and derivatives, C504, C5xx, C500	Windows 3.1/95/98/NT, Windows 2000	Chameleon Debugger	64	320	32	80	U	U	3	8	✓	✓
USP-85	8085	DOS	EMU85	64	64	32	80	U	U	3	8	✓	✓
USP-Z8	Z8	Windows 3.1/95/98/NT, Windows 2000	EMUZ8	128	320	32	80	U	U	3	8	✓	✓
Softaid Inc., Rockport, ME, (207) 236-9055, www.softaid.com													
UEM Series	68K, 683xx, 8085, x86 Real Mode, Z80/Z180, 8088, 80188, 80186, 64180, 80386	Windows 3.1/95/98/NT, Windows 2000	Softaid's SLDW	256	1,064	32	80	0	1MB	1	4	✓	✓
Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com													
ICE-Cube	Z80/Z180	DOS, Windows 3.1/95/98/NT	Supplied with debugger	128	1,024			0	1,024	0	0	✓	
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com													
ClearView Mathias	PIC	Windows 3.1/95/98/NT, Windows 2000	TechTools' ClearView	16	16	16	64	U	U	2	0		✓
Tribal Microsystems Inc., Fremont, CA, (510) 623-8859, www.tribalmicro.com													
NICE-52H	8051 and derivatives	DOS	Supports source level debugging.	128	128				64K	10			

Technical Support													Comments
Can collect and display trace data w/o halting emulation	Code coverage available	Performance analyzer available	Real-time trace triggers provided	Seconds to download a 64k file	Cost to support additional CPU	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	
✓	✓	✓	✓	2 to 3		U	U	U	\$	\$			Supports over 200 processors, including 32-bit CPUs. The architecture is modular and can be reused for other devices.
Parallax Inc., Rocklin, CA, (916) 624-8333, www.parallaxinc.com													
					999	U	U					\$199 to \$299	Fully exploits SX internal debug mode with breakpoint and single step. Emulation from 400kHz to 100MHz.
Phyton Inc., Brooklyn, NY, (718) 259-3191, www.phyton.com													
✓			✓	10	\$350-\$500 for add'l POD	365	U	U		U	\$	\$1,500-\$3,500	Source level debugging for all popular compilers. Project support for Keil, IAR compilers and embedded Phyton macro assembler. Memory mapping with 1 byte resolution. Memory banking support. Programmable clock generator. 8 inputs, 4 trigger outputs, 3x3x2 inch emulator header that plugs directly into a target socket.
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com													
✓			✓	2		365	\$	\$	\$	\$	\$		Supports Dual Ported RAM, CAN, RTOS, FLASH Programming, C++, CASE, Integrated Development Environment.
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com													
✓					\$299	365	U	\$	\$	\$	\$	\$1,250	Supports virtually all PIC derivatives via optional daughter-boards. It comes with Windows debugger, assembler and serial interface to PC.
✓	✓	✓	✓	1.7	\$895	365	U	\$	\$	\$	\$	\$6,995	Supports all Intel 80C186 and 188 devices. Dual-ported RAM allows reading and writing to memory while the CPU is running in real-time. Price includes Chameleon Debugger.
✓			✓	18	\$895	365	U	\$	\$	\$	\$	\$6,995	Comes with dual-ported memory which allows one to read and write memory while the CPU is executing in real-time. Unit comes with Chameleon Debugger for 196 and serial interface to PC.
✓			✓	13	\$995	365	U	\$	\$	\$	\$	\$6,995	Supports the first generation of DSPs from TI: TMS320C10, 15, 16 and 17. Unit comes with debugger and serial interface to PC.
✓			✓	22		365	U	\$	\$	\$	\$	\$9,500	Supports the second generations of DSPs from TI: TMS320C25 and C29. Unit comes with dual-ported RAM, debugger and serial interface to PC.
✓	✓	✓	✓	5	\$595 - \$1,595	365	U	\$	\$	\$	\$	\$1,995	Supports virtually all 8051 derivatives from Intel, Philips, Infineon, Dallas, Atmel, Temic and OKI. Offers real-time emulation of up to 60 MHz, allows reading and modifying memory while the CPU is running and Real-Time SFR trace.
✓			✓	13		365	U	\$	\$	\$	\$	\$3,995	Comes with dual-ported RAM and DOS based debugger. Supports Softools C85 and assembler.
✓	✓	✓	✓	13	\$995	365	U	\$	\$	\$	\$	\$4,995	Supports many Z8 derivatives with several PODs. Unit features dual-ported RAM and serial interface to PC. Comes with Chameleon windows based debugger.
Softaid Inc., Rockport, ME, (207) 236-9055, www.softaid.com													
✓		✓	✓	4		180	U	\$	\$	\$	\$		Extensive chip support including processors from Intel, AMD, NEC, Toshiba, Zilog, and Motorola at speeds up to 40MHz.
Softools Inc., West Hartford, CT, (860) 236-4201, www.softools.com													
				7		365	U	U	U	\$		\$1,799	Four ounce pocket-sized unit, lowest cost Z80/Z180 ICE available.
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com													
				3	\$100	U	U	U		U		\$699	Mathias is a modular emulator, using separate plug-in modules to configure a processor core and a particular processor peripherals. Base price includes Debugger and IDE.
Tribal Microsystems Inc., Fremont, CA, (510) 623-8859, www.tribalmicro.com													
						U	U	U		U		\$895	Supports real-time emulation at up to 24MHz for most 40-pin DIP 8xC5x type microcontrollers.

BDM/JTAG-BASED EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Serial interface available	Parallel interface available	SCSI interface available	TCO/P interface available	Ethernet interface available	PC plug-in card
Allant Software Corp., Walnut Creek, CA, (925) 944-9690, www.allant.com									
VIA by Allant JTAG Emulator Family	ARM, TeakliteDSPCore	Windows 3.1/95/98/NT	ASPEX Debugger	✓		✓	✓	✓	✓
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com									
CodeTAP 8xx	MPC8xx, PowerPC	Windows 3.1/95/98/NT, HP-UX, Solaris	MWX-ICE, Metrowerks CodeWarrior, WindRiver GB Tornado, ISI Prism Plus			✓	✓		
PowerTAP	PowerPC, MPC 603E EC603E 740 750, 8260 8240	Windows 3.1/95/98/NT, Solaris	MWX-ICE, Metrowerks CodeWarrior, WindRiver GB, Tornado, ISI Prism Plus			✓	✓		
Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com									
Blackhawk USB-JTAG Emulator	TMS320 and other TI DSPs	Windows 3.1/95/98/NT							
Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com									
EMDT/29K	29K	Windows 3.1/95/98/NT	UDB						✓
EMDT/960	i960	Windows 3.1/95/98/NT	UDB						✓
PowerEM	PowerPC	Windows 3.1/95/98/NT	UDB			✓	✓	✓	
ScanICE	MIPS	Windows 3.1/95/98/NT	UDB			✓	✓	✓	
ScanICE-BCM3310	i960, MIPS, PowerPC	Windows 3.1/95/98/NT	UDB				✓	✓	
Emutec Inc., Everett, WA, (425) 267-9604, www.emutec.com									
DebugJET	ARM, MIPS, MPC8xx, PowerPC, SH, SPARC	DOS, Windows 3.1/95/98/NT, Linux, Solaris	XRAY, SDS and WindRiver	✓		✓	✓		
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com									
visionICE / visionPROBE	68K, ColdFire, PowerPC	Windows 3.1/95/98/NT, SunOS, Solaris, HP 9000	Nucleus, pSOS, XRAY, SingleStep, CrossView Pro, VxWorks	✓	✓		✓		
FS FORTH-SYSTEME GmbH, Breisach, Germany, +49 7667 908 0, www.fsforth.de									
FS FORTH-SYSTEME BDM/JTAG-based emulator	ARM, StrongARM, C16x, x86 Protected Mode, x86 Real Mode	DOS, Windows 3.1/95/98/NT			✓		✓		
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com									
Emulation Modules	ARM, MELPS 7700, MIPS, MPC8xx, PowerPC	DOS, HP-UX, Windows 3.1/95/98/NT, Solaris	Green Hills, Mentor Graphics, SDS	✓			✓	✓	
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com									
BackGround Mode Debugger (BMD)	68HC12, ColdFire, PowerPC, IBM PPC4xx	Windows 3.1/95/98/NT, HP, Solaris	SourceGate, GDB	✓					
IBM Microelectronics, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc									
RISCWatch JTAG Ethernet (and with TRACE)	PowerPC	Windows 3.1/95/98/NT, UNIX		✓	✓		✓	✓	
iSYSTEM USA, LLC, San Diego, CA, (619) 385-9100, www.isystem.com									
iC2000 PowerEmulator	68HC12, 68K, M Core, PowerPC	Windows 3.1/95/98/NT	Integrated debugger included with winIDEA.	✓	✓				
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com									
TRACE32-ICD	68HC12, 68HC16, 68K, 80196, C166CBC, TriCore, ARM, ColdFire, MPC8xx, PowerPC	DOS, Windows 3.1/95/98/NT, Linux, HP-UX, Solaris	TRACE32-PowerView, TRA Suite, Tornado	✓		✓	✓	✓	✓
Macraigor Systems LLC, Brookline Village, MA, (617) 739-8693, www.macraigor.com									
OCDemon	68K, Motorola DSP, MPC82xx, Motorola, ARM, ColdFire, MIPS, M Core, MPC8xx, PowerPC, SH	Windows 3.1/95/98/NT, HP-UX, Linux, Solaris	SingleStep, XRAY, Multi, Code Warrior, Suite 56, Aspx, GDB, pRISM+, CrossView, SeeCode	✓		✓	✓	✓	✓

Technical Support													Comments
Seconds to download 64K program file	Supports 3.3 volts	Includes hardware breakpoints	Upgrade path to real-time trace	Performance analysis	Flash programming	Days of free phone support	BDS/Web FADS, log lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	
Allant Software Corp., Walnut Creek, CA, (925) 944-9690, www.allant.com													
1 to 4	✓	✓				90	\$	\$	\$	\$	\$	\$250 to \$3,000	Multi-core debugging for cores on the same scan path.
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com													
1.5	✓	✓	✓	✓	✓	90	\$	\$	\$	\$	\$		Cache-on visibility of entire program; virtual memory support; debug code in cache, ROM, RAM flash; fast flash programming; memory diagnostics; RTOS integration, logic analyzer.
2.2	✓	✓	✓	✓	✓	90	\$	\$	\$	\$	\$		Cache-on visibility of program; MMU and virtual memory visibility; remote telnet support over LAN; debug code in cache, ROM, RAM and flash; fast flash programming; memory diagnostics
Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com													
						365	U	\$	\$	\$	\$		JTAG Emulator attaches to USB port of Windows-based PC. Includes drivers for Code Composer and TMS320 Series DSP chips.
Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com													
						90	U	\$		\$	\$		
	✓	✓				90	U	\$		\$	\$		
	✓	✓				90	U	\$		\$	\$		
	✓	✓				90	U	\$		\$	\$		
2	✓	✓			✓	90	U	\$	\$	\$	\$		
Emutec Inc., Everett, WA, (425) 267-9604, www.emutec.com													
0.6	✓	✓	✓		✓		U	U	U	U	U	\$1,495	Advanced multi-protocol development tool used for testing and debugging of embedded systems. It connects to any host system (PC or Unix) via Ethernet.
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com													
0.1	✓	✓	✓	✓	✓	90	U	\$		U	\$	\$3,400	
FS FORTH-SYSTEME GmbH, Breisach, Germany, +49 7667 908 0, www.fsforth.de													
30	✓				✓							\$495	Supports over 50 different flash types, also SC400 and 386EX support.
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com													
<1	✓	✓	✓	✓	✓		\$	\$	\$	\$	\$	\$2,500	
Huntsville Microsystems Inc. (HMI), Huntsville, AL, (800) 448-8500, www.hmi.com													
	✓	✓			✓	180	U	\$	\$	\$	\$	\$895	USB and serial interface versions available.
IBM Microelectronics, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc													
	✓	✓					U	U	U		U	\$6,900 to \$9,900	
iSYSTEM USA, LLC, San Diego, CA, (619) 385-9100, www.isystem.com													
	✓	✓	✓	✓	✓	365	U	\$	\$	\$	\$	\$2,300+	
Lauterbach Inc., Marlborough, MA, (508) 303-6812, www.lauterbach.com													
1	✓	✓	✓	✓	✓	1,000	U	U		\$	U	\$3,000	
Macraigor Systems LLC, Brookline Village, MA, (617) 739-8693, www.macraigor.com													
	✓	✓			✓	90	U	U	U	U	\$	\$150	The OC Demon family of On-Chip Debug devices connect a host to the target via BDM or JTAG. Supported interfaces also include USB.

U - Unlimited free \$ - paid

BDM/JTAG-BASED EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	Serial interface available	Parallel interface available	SCSI interface available	TQ/10 interface available	Ethernet interface available	PC plug-in card
Microtek International, Hillsboro, OR, (503) 533-4463, www.microtekintl.com									
PowerPack ITP for ARM/StrongARM	ARM, StrongARM	Windows 3.1/95/98/NT	ARM, WindRiver Tornado					✓	
PowerPack ITP for EXACT	PMC Sierra EXACT Ethernet Chipset	Windows 3.1/95/98/NT	Microtek SLD	✓				✓	
PowerPack ITP for Pentium processors	x86 Protected Mode, x86 Real Mode, Pentium	Windows 3.1/95/98/NT	CAD-UL, Microtek, WindRiver Tornado	✓				✓	
PowerScope for Motorola	68HC16, 68K	Windows 3.1/95/98/NT	Microtek SLD	✓					
Momentum Data Systems, Fountain Valley, CA, (714) 378-5805, www.mds.com									
TM1X-JTAG	Philips TriMedia, Philips TriMedia TM1XX	Windows 3.1/95/98/NT	Philips Debugger, Metrowerks Code Warrior for TriMedia						✓
Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com									
Flex-BDM	68HC12, 68K, ColdFire, PowerPC	Windows 3.1/95/98/NT	Noral's Flex debugger, Hiware's Hiwave debugger, Cosmic's Zap debugger	✓					
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com									
EZlyzer	SPARC, M32R, SPARC Lite, Panasonic	Windows 3.1/95/98/NT, Solaris		✓			✓	✓	
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com									
fast-view66	C16x, EGOLD, TriCore	Windows 3.1/95/98/NT	fast-view66						✓
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com									
JDSnet-ARM	ARM	Windows 3.1/95/98/NT	Chameleon Multi-Core	✓	✓		✓	✓	
JDSnet-CPU32	68K	Windows 3.1/95/98/NT	Chameleon	✓	✓		✓	✓	
JDSnet-TMS320	TMS320 and other TI DSPs	Windows 3.1/95/98/NT	Code Composer, Chameleon Multi-Core	✓			✓	✓	✓
JDSnet-Tricore	TriCore	Windows 3.1/95/98/NT	Chameleon Multi-Core	✓	✓		✓	✓	
Spectrum Digital Inc., Houston, TX, (281) 561-6500, www.spectrumdigital.com									
SPI510	TMS320 and other TI DSPs	Windows 3.1/95/98/NT	Code Composer, Allant Aspx, TI High Level Language						✓
SPI520 JTAG Emulator with Data Logging									
SPI530 MPSP Scan Path Emulator	TMS320 and other TI DSPs	Windows 3.1/95/98/NT	Code Composer, TI High Level Language 'C' Debugger	✓					
SPI610 Portable JTAG Emulator for the Intel i960	i960	Windows 3.1/95/98/NT	Wind River Systems, Tornado I20 Debugger, i960 GDB debugger from Intel	✓					
XDS510PP JTAG Scan Path Emulator	ARM, TMS320 and other TI DSPs	Windows 3.1/95/98/NT	Code Composer, TI High Level Language 'C' debugger, Allant ASPEX	✓					
XDS510PP MPSP Scan Path Emulator Pod	TMS320 and other TI DSPs	Windows 3.1/95/98/NT	Code Composer, TI High Level Language 'C' Debugger	✓					
White Mountain DSP, Nashua, NH, (603) 883-2430, www.wmdsp.com									
Apex-ICE USB-Based Emulator	ADSP2106x, ADSP 2116x, New ADI JTAG DSPs	Windows 3.1/95/98/NT	Allant's ASPEX, Analog Devices VisualDSP						
Mountain-ICE ISA-Based Emulator	ADSP2106x, ADSP 2116x	Windows 3.1/95/98/NT	White Mountain DSP's Vista-ICE, Allant's ASPEX, Analog Devices VisualDSP						
Summit-ICE PCI-Based Emulator	ADSP2106x, ADSP 2116x	Windows 3.1/95/98/NT	White Mountain DSP's Vista-ICE, Allant's ASPEX, Analog Devices VisualDSP						
Trek-ICE Universal Ethernet Emulator	ADSP2106x, ADSP 2116x, New ADI JTAG DSPs	Windows 3.1/95/98/NT	Allant's ASPEX, Analog Devices VisualDSP					✓	

Technical Support												Price	Comments
Seconds to download &A program file													
Supports 3.3 volts													
Includes hardware breakpoints													
Upgrade path to real-time trace													
Performance analysis													
Flash programming													
Days of free phone support													
BOS/Win F402, bug lists, other													
Phone support, standard													
Phone support, 24-hour response													
Product updates													
Training													
Microtek International, Hillsboro, OR, (503) 533-4463, www.microtekintl.com													
	√			√	90	U	U	\$	\$	\$		USB interface.	
		√		√	90	U	U	\$	\$	\$	12,500	On-chip trace support. Ethernet option.	
7	√	√		√	90	U	U	\$	\$	\$	\$8,995+	Low-power Pentium, Ethernet option, C++ support.	
	√				90	U	U	\$	\$	\$	\$1,995		
Momentum Data Systems, Fountain Valley, CA, (714) 378-5805, www.mds.com													
					30	U		\$	\$	\$	\$1,995	Optimized for source level debugging and downloading software on the TriMedia IREF Design (TDK) or other stand-alone TriMedia systems.	
Noral Micrologics Inc., Natick, MA, (508) 647-0103, www.noral.com													
<2	√	√	√	√	90	\$	\$	\$	\$	\$	\$2,495	BDM hardware and software are fully integrated delivering maximum debug performance. Hot insert, time-stamped trace, access breakpoints, step execution of 'C' code in flash.	
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com													
	√	√				U	U		\$	\$		Supports up to 4 MB of ROM emulation. Facilities for run control, HW and SW breakpoints, and PC trace. Includes source-level debugger. Serial and Ethernet host interfaces standard.	
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com													
4		√		√	365	\$	\$	\$	\$	\$		Supports CASE, C++, RTOS, CAN. Integrated Development Environment.	
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com													
4	√	√	√	√	365	U		\$	\$	\$	\$2,995	Supports the ARM7 and ARM9 devices. Unit may be ordered with 128k or 256k trace buffer and Multi-Core Chameleon Debugger.	
2	√	√	√		365	U		\$	\$	\$	\$2,950	Unit supports all CPU-32 members and may be ordered with 128k trace buffer, Chameleon debugger, and various footprint adapters.	
6	√	√	√	√	365	U		\$	\$	\$	\$2,950	Supports the 320C2xx, 3x, 5x, 54x, and 6000 families. Unit may be ordered with 128K or 256K trace buffer, C compiler, Code Composer or Multi-Core Chameleon Debugger.	
4	√	√	√	√	365	U		\$	\$	\$	\$2,995	Available with 128k or 256k trace buffer, Chameleon Debugger and pod for connecting to non-standard packages or ASICs.	
Spectrum Digital Inc., Houston, TX, (281) 561-6500, www.spectrumdigital.com													
	√										699	Supports TI's DSPs/MCUs with JTAG interface, has input voltage range from 1-5 volts, incorporates EMU0/EMU1 hold/reset features for TMS27xx DSPs, power provided by adapter card.	
											\$3,499	Supports TI's DSPs and microcontrollers with JTAG interface, supports dual communication interface with host (serial, 9.6K-11.5K, parallel, SPPS, EPP, and ECP up to 1 Mb/sec transfer rates).	
	√	√		√							\$2,499	Supports TI's DSPs with MPSD interface, high-speed control processor, operates with parallel port, no internal card required, powered by supplied AC adapter.	
		√									\$1,500	Supports Intel's I960 microprocessors with JTAG interface, portable operation, no adapter card required, no target debug agent required, works without operating system or monitor present thereby reducing nonvolatile memory requirements.	
	√	√		√							\$1,299	Supports TI's DSPs and MCUs with JTAG interface. Operates with parallel port, no internal adapter required. Supports four-bit, eight-bit, and EPP transfers. Powered by target or supplied AC adapter. Compatible with XDS510 from TI.	
	√	√		√							\$1,299	Supports TI's DSP with MPSD interface. Operates with parallel port, no internal adapter required. Supports four-bit, eight-bit, and EPP transfers. Powered by target or supplied AC adapter. Compatible with XDS510 from TI.	
White Mountain DSP, Nashua, NH, (603) 883-2430, www.wmdsp.com													
					365	U	U				\$4,995	USB-based DSP emulator, portable solution designed to support ADI DSPs.	
	√				365	U	U				\$2,995	Scan-based, JTAG emulator to support emulation across multiple SHARC DSP processors. An enhanced 3V/5V JTAG pod and cable provide a nonintrusive interface to any ADSP-2106x and 2116x DSP.	
					365	U	U				\$3,995	Local Bus PCI card emulator to support emulation across Analog Devices Inc. SHARC DSPs. A shielded 3V/5V JTAG pod and cable provide an interface to any ADSP-2106x SHARC.	
					365	U	U				\$5,995	Connects via a 10/100BASE-T connection to an Ethernet-based local area network, allowing remote debugging between either PC or Sun workstation debug hosts and the target DSP system.	

ROM EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	ROM sizes available, K	One unit emulates a bus how wide	Units cascade to emulate bus how wide	Access time, ns	Serial interface	Parallel interface
ABI, Sunnyvale, CA, (408) 946-8710, www.abi-usa.com									
Micro Universal ROM/EPROM Emulation System		DOS, Windows 3.1/95/98/NT		8,192 K per unit	8, 16, 32	32	<100		
Ackerman Computer Sciences, Sarasota, FL, (941) 377-5775, www.acscontrol.com									
EPROM Emulator	29K, ARM, ColdFire, i960, MIPS, PowerPC, SH, SPARC, V800	DOS, Windows 3.1/95/98/NT		64K-1MB	8	8	70		✓
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com									
NetROM	Supports various memory devices	Windows 3.1/95/98/NT, Solaris	most	Up to 16MB	8, 16, 32	8, 16, 32	45	✓	
Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com									
NetICE-JR	Most	Windows 3.1/95/98/NT		1MB, 2MB	16	32	20		
Emutec Inc., Everett, WA, (425) 267-9604, www.emutec.com									
PROMJet In-Circuit Emulator	Most	DOS, Windows 3.1/95/98/NT, Linux, Solaris	XRAY, SDS, Wind River	1, 2, 4, 8, 16, 32, 64MB	8, 16	8, 16, 24, 32	85-25		✓
Grammar Engine Inc., Westerville, OH, (614) 899-7878, www.promice.com									
FlashICE	Most	DOS, UNIX, Windows 3.1/95/98/NT, Solaris		128K, 512K	8	32	45	✓	✓
PromICE and PromICE with Trace	Most	DOS, Windows 3.1/95/98/NT, UNIX, Solaris	Most	8K to 2 MB	16	32	90, 45, 35	✓	✓
Incept Ltd., Limerick, Ireland, +353 61 335800, www.incept.ie									
icePROM	6800, 68HC05, 68HC11, 68K, 80196, 8051 and derivatives, TMS320 and other TI DSPs, Z8, Z80/Z180	DOS, FreeBSD, Windows 3.1/95/98/NT, Linux		1MB to 2MB	8	8, 16, 24, 32	45, 60, 100		✓
J&M Microtek Inc., West Orange, NJ, (973) 325-1892, www.jm-micro.com									
ROMY-16 EPROM Emulator	6800, 6502, 6809, 68HC11, 68K, 80196, 8051 and derivatives, Z8, Z80/Z180	DOS, Windows version available soon	Most	up to 1MB	8, 16		75		✓
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com									
8620	M32R, SPARC Lite, Panasonic	DOS, Windows 3.1/95/98/NT		128K	8, 16	8, 16	160		✓
EZlyzer	Supports emulation of memory from 2764-27C020, 271024/27C2048	Windows 3.1/95/98/NT, Solaris	microVIEW-EZ	4MB	8, 16	8, 16, 24, 32	60	✓	
Softaid Inc., Rockport, ME, (207) 236-9055, www.softaid.com									
Cactus Logic	65816, 6502, 8048, 8085, 6809, 68HC11, 80251, 8051 and derivatives, Z80/Z180	DOS, Windows 2000, Windows 3.1/95/98/NT	Cactus IDE	4 to 128K	8	8			✓
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com									
EconoRom II	Supports all target CPUs with external memory	DOS, Windows 3.1/95/98/NT, Windows 2000	none	32 - 512K	16	32	45		✓
FlexROM II	Supports all target CPUs with external memory	DOS, Windows 3.1/95/98/NT, Windows 2000	none	128 - 1,024	16	32	45		✓

SCSI interface	TCP/IP interface	Ethernet interface	Seconds to download a 64K program file	Supports 3.3 volts	Supports TSP devices	Also emulates flash memory	Can change memory on the fly	Dual port RAM	Includes breakpoints	Upgrade path to real-time trace	Programs flash	Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Comments
ABI, Sunnyvale, CA, (408) 946-8710, www.abi-usa.com																			
			<1	✓		✓	✓	✓			U	U	U		U	U		\$275	Supports 3.3V in a 5V tolerant system. Cascade four units for 64-bit data bus.
Ackerman Computer Sciences, Sarasota, FL, (941) 377-5775, www.acscontrol.com																			
			3								365	U	U	U	U	U		\$108	
Applied Microsystems Corp., Redmond, WA, (800) 426-3925, www.amc.com																			
	✓	✓	3	✓	✓	✓		✓	✓		0	\$	\$	\$	\$	\$			
Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com																			
	✓		2	✓	✓	✓	✓	✓			30	U	\$	\$	\$	\$		\$5,950	
Emutec Inc., Everett, WA, (425) 267-9604, www.emutec.com																			
	✓	✓	0.5	✓	✓	✓	✓	✓	✓	✓	U	U	U	U	U	U		\$495	Replaces the EPROM or FLASH memory allowing the user to load, examine, modify, view and patch the program code directly into PROMJet's emulation memory.
Grammar Engine Inc., Westerville, OH, (614) 899-7878, www.promice.com																			
	✓	✓	1	✓	✓	✓					U	U	U	U	U	U		\$1,595	Recognizes and responds to embedded flash commands, allowing the diagnosis and correction in flash algorithms used to read and write to flash memory.
	✓	✓	1	✓	✓	✓	✓		✓	✓	U	U	U	U	U	U		\$645	Provides affordable memory emulation and source level debugging via a target's memory socket. Available with real time trace and codecoverage options.
Incept Ltd., Limerick, Ireland, +353 61 335800, www.incept.ie																			
			0.25	✓	✓	✓	✓	✓			U	U	U	U	U	U		\$550	Examine selected address accesses with a virtual port; allows communication with host.
J&M Microtek Inc., West Orange, NJ, (973) 325-1892, www.jm-micro.com																			
			16					✓				U	U		\$	\$		\$195	Both PC and target can read and write data to the ROMY-16 EPROM. The ROMY-16 can monitor address and data lines on the EPROM socket.
Orion Instruments Inc., Sunnyvale, CA, (408) 747-0440, www.oritools.com																			
			3			✓	✓		✓	✓	365	U	U	U	\$	\$			
	✓	✓		✓	✓	✓	✓		✓			U	U		\$	\$			Supports up to 4MB of ROM emulation. Facilities for run control, HW and SW breakpoints, and PC trace. Includes source level debugger.
Softaid Inc., Rockport, ME, (207) 236-9055, www.softaid.com																			
								✓			365	U	\$	\$	\$	\$			
TechTools, Garland, TX, (972) 272-9392, www.tech-tools.com																			
			2	✓							U	U	U		U			\$149	Command line, batchable software, 'one-click' Windows SW included. Daisy-chain supports extending data width, data depth.
			0.2	✓		✓	✓				U	U	U		U			\$349	Address SNAP-SHOT shows where the code is executing. Trigger circuit shows when a user-defined address is accessed. Includes batchable DOS software, 'one-click' Windows software.

U - Unlimited free \$ - paid

ROM EMULATORS

Product name	Target CPUs supported	Platforms supported	Debuggers supported	ROM sizes available, K	One unit emulates a bus how wide	Units cascade to emulate bus how wide	Access time, ns	Serial interface	Parallel interface
UniROM	Supports all target CPUs with external memory	DOS, Windows 2000, Windows 3.1/95/98/NT	All that communicate via a serial interface.	64K - 4,096	16	32	35	✓	✓
Tribal Microsystems Inc., Fremont, CA, (510) 623-8859, www.tribalmicro.com									
EML-ROM2M	29K, 68HC05, 68HC08, 68HC11, 68HC16, 68K, 80196, 80251, 8051 and derivatives, 8051XA, ColdFire, TMS320 and other TI DSPs, x86 Real Mode, Z80/Z180	DOS		8K - 256K	8, 16	32	120		✓
Wisch Communications, Carrollton, TX, (972) 417-3533, www.wischcomm.com									
SR256		DOS, Windows 3.1/95/98/NT		32K, 128K, 512K	8	32	70		✓

OSCILLOSCOPES

Product name	Scope type	Number of channels	Bandwidth	Sampling rate in millions of samples/s	Fastest sweep speed in ns	Slowest sweep speed in milliseconds	Memory depth/channel, 1,000s of samples	Edge	Line	Glitch	Patterns across channels	State	Clock	Delayed sweep	Delayed sweep, B triggered by A	Network interface available	Other connection to PC/workstation	Serial protocol analyzer available	Automatic time/period measurements	Automatic peak detection
Ackerman Computer Sciences, Sarasota, FL, (941) 377-5775, www.acscontrol.com																				
CEB Uslyzer	Digital, Analog	1	400KHz	1			32	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Fluke Corp., Everett, WA, (800) 443-5853, www.fluke.com																				
Fluke CombiScopes	Digital, Analog	2 to 4	60 to 200	200	2	500	32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com																				
HP 5464D Mixed Signal Oscilloscope	Digital	2	100	200	5	50,000	1,000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
HP Infinium Oscilloscope Family	Digital	2 or 4	500MHz - 1.5Ghz	1,000 to 8,000	0.1 to 0.5	20,000	32	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lg Precision, Cerritos, CA, (562) 404-0101, www.oscilloscope.com																				
OS-310M	Digital	2	100	5G			2													
National Instruments, Austin, TX, (800) 433 3488, www.natinst.com																				
NI 5102	Analog	2	15	20 - 1000	1	1,000	663K	✓							✓	✓		✓		
NI 5911	Analog	1	100	100 - 1000	1	1,000	4,000 - 16,000	✓							✓	✓		✓		
SAELIG Co. LLC, Victor, NY, (716) 425-3753, www.saelig.com																				
Pico Technology Virtual Instruments	Digital	2	up to 50	100	1000	5,000	32	✓	✓	✓		✓				✓				
Tektronix Inc., Beaverton, OR, (800) 426-2200, www.tektronix.com																				
TDS 3000 Family	Digital	4	500	5,000	4	10,000	10	✓	✓	✓		✓			✓	✓		✓	✓	
TDS 500D	Digital	4	2,000	4,000	0.2	10,000	8,000	✓	✓	✓		✓			✓			✓	✓	
TDS 700D	Digital	4	1,000	4,000	0.2	10,000	8,000	✓	✓	✓		✓			✓	✓		✓	✓	
Vector CANtech Inc., Novi, MI, (248) 449-9290, www.vector-cantech.com																				
CANscope	Digital	1	up to 1MB													✓				

SCSI interface	132/119 interface	Ethernet interface	Seconds to download a 64k program file	Supports 3.3 volts	Supports ICD devices	Also emulates flash memory	Can change memory on the fly	Dead port RAM	Includes breakpoints	Upgrade path to real-time trace	Programs flash	Days of free phone support	805/486 F400s, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Comments
		1	✓		✓	✓	✓				U	U	U		U			\$595	Bank Shadowing circuit provides communication path for SW debuggers. Includes a live editor to monitor and modify target memory while target executes from that memory.
Tribal Microsystems Inc., Fremont, CA, (510) 623-8859, www.tribalmicro.com																			
											U	U	U		U			\$395	Two 1MB ports to emulate up to 2 27C010 in 8-bit or 16-bit modes. Adapters can be used to support various packages.
Wisch Communications, Carrollton, TX, (972) 417-3533, www.wischcomm.com																			
		5									90	U	U		U			\$99	Single device bus loading, jumperless operation.

RMS/averaging calculations	TFT Calculations	Color display	Waveform comparison	Disk drive	Software available, if any	Days of free phone support	805/486 F400s, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	Price	Comments
Ackerman Computer Sciences, Sarasota, FL, (941) 377-5775, www.acscontrol.com													
✓	✓		✓		CEBus Spy	365	U	U	U	U	U		Handheld scope for CEBus Networks
Fluke Corp., Everett, WA, (800) 443-5853, www.fluke.com													
✓	✓		✓		FlukeView	U		U				\$3,000	
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com													
✓					HP BenchLink	U		U	U			\$4,995	Combines signal analysis of a scope with the multichannel timing measurements of a logic analyzer and deep memory.
✓	✓					U		U	U			\$9,995 to 29,995	Combines analog-like front panel, a Windows 95-based GUI, a built-in information system and LAN printing and file-sharing.
Lg Precision, Cerritos, CA, (562) 404-0101, www.oscilloscope.com													
					LG-View	U	U	U	\$	\$		\$1,695	Built in DVM.
National Instruments, Austin, TX, (800) 433 3488, www.natinst.com													
✓	✓	✓	✓	✓	LabVIEW, LabWindows/CVI, VBasic, VC	U	U	U	\$	\$	\$	\$1,295	PC plug-in for PCI/cPCI/USB/PCMCIA
✓	✓	✓	✓	✓	LabVIEW, LabWindows/CVI, VBasic, VC	U	U	U	\$	\$	\$	\$3,495	PCI/cPCI plug-in board with high-transfer to PC
SAELIG Co. LLC, Victor, NY, (716) 425-3753, www.saelig.com													
✓	✓	✓	✓	✓	Picoscope	U	U	U		\$		79 to \$799	PC connection, simultaneous spectrum display
Tektronix Inc., Beaverton, OR, (800) 426-2200, www.tektronix.com													
✓	✓	✓	✓	✓	Wavestar		U	U		\$		3,000 to \$10,000	Battery-operated, compact and lightweight, new digital phosphor oscilloscope (DPO) displays, stores, analyzes in real-time, using three dimensions of signal information: amplitude, time, distribution of amplitude over time.
✓	✓	✓	✓		Wavestar; Java-based applications		U	U		\$		9,750 to \$18,500	DPO displays, stores, and analyzes three dimensions of signal information: amplitude, time, and the distribution of amplitude over time.
✓	✓	✓	✓	✓	Wavestar; Java-based applications		U	U		\$		13,000 to \$30,000	DPO displays, stores, analyzes in real time, using three dimensions of signal information: amplitude, time, and the distribution of amplitude over time.
Vector CANtech Inc., Novi, MI, (248) 449-9290, www.vector-cantech.com													
	✓				SW config. via PC for CAN msg. masking/filtering.							\$3,980	Captures CAN message and displays CAN high, CAN low, Differential, and Stuff Bits.

LOGIC/BUS ANALYZERS

Product name	Min. number of channels state/triggering	Max. numbers of channels state/triggering	Number of oscilloscope channels	Max. clock rate (millions of samples/s) state/synchronous mode	Max. clock rate (in millions of samples/s) timing/asynchronous mode	Scope (channels) - digitizing rate (in millions of samples/s)	Scope Channels - Bandwidth	Memory depth/channel	Triggering levels	Min. detectable glitch width (in ns)	Network interface available	Other connection PC/workstation	Serial protocol analyzer available	Automatic measurements available	Inverse assembler available	Symbolic support	C++ source support available	Link to ROM/JTAG port
Catalyst Enterprises Inc., San Jose, CA, (408) 268-4145, www.catalyst-ent.com																		
TA660, PCI Bus Analyzer	109	109	0	66	100ps	0	0	1MB	32	1.5			✓		✓			
Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com																		
Corelis Inc./Logic Analyzers														✓				
dli digital logic instruments gmbh, Dietzenbach, Germany, +49 6074 4002 0, www.dli.de																		
proLine	64	512	0	180	720			4000	54	2.5	✓	✓	✓		✓	✓	✓	✓
Future Plus Systems Corp., Colorado Springs,, CO, (719) 380-7321, www.futureplus.com																		
Bus Analysis Probes	34	170	0	135	1,000	0		4000	10	1	✓	✓	✓	✓	✓	✓	✓	✓
Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com																		
HP 16700		1,020	20	333	4,000	2,000	500	4000	16	3.5	✓	✓	✓	✓	✓	✓	✓	✓
NCI, Huntsville, AL, (256) 837-6667, www.nci-usa.com																		
GoLogic-72/ PCI Bus Analyzer	36	72	0	125	500			1024K	15	3.5	✓	✓	✓		✓	✓	✓	✓
PC Engines, Sunnyvale, CA, (408) 733-3901, www.pcengines.com																		
PCI and ISA Test Adapters																		
SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com																		
WaveFormer Pro																		
Tektronix Inc., Beaverton, OR, (800) 426-2200, www.tektronix.com																		
TLA 6xx Logic Analyzer	34	136		200	2000			1,000	2	✓	✓			✓	✓	✓	✓	
TLA 714 Portable Mainframe										✓	✓			✓	✓	✓	✓	
TLA 720 Benchtop Mainframe										✓	✓			✓	✓	✓	✓	
TLA 7Dx DSO Module						2,500	500											
TLA 7Ex DSO Module						5,000	1,000											
TLA 7Nx Logic Analyzer Module	34	136	0	200	2000			4000	16	2	✓	✓		✓	✓	✓	✓	
TLA 7Px Logic Analyzer Module	68	136	0	200	2,000			16,000	16	2	✓	✓		✓	✓	✓	✓	
TLA7PG2 Pattern Generator Module																		
VMETRO Inc., Houston, TX, (281) 584-0728, www.vmetro.com																		
PBT-415 66MHz PCI Bus Analyzer/Exerciser	128	128		66MHz	400MHz			64K or 256K	16	2.5	✓		✓					
PBTM-315 PMC Bus Analyzer	128	128		33MHz	33MHz			64K or 256K	16		✓		✓					
VBT-325 VME Bus Analyzer	104	181		50MHz	200MHz			32K to 1M	16	5	✓		✓					

Target CPUs supported

Technical Support

Days of free phone support

800/900 FAX, bug lists, other

Phone support, standard

Phone support, 24-hour

Product updates

Training

Price

Comments

Catalyst Enterprises Inc., San Jose, CA, (408) 268-4145, www.catalyst-ent.com

360 U U U \$ \$11,900

Performance analysis and latencies measurement as well as bus exercising capability.

Corelis Inc., Cerritos, CA, (562) 926-6727, www.corelis.com

29K, 68K, ARM, PCI, i960, MIPS, MPC8xx, TMS320 and other TI DSPs

90 \$ \$ \$

dli digital logic instruments gmbh, Dietzenbach, Germany, +49 6074 4002 0, www.dli.de

68HC11, 68HC12, 68HC16, 68K, 80196, 8051 and derivatives, 8051XA, Alpha, ARM, C16x, ColdFire, H8, i860, i960, MELPS 7700, MIPS, MPC8xx, PowerPC, SH, SPARC, TLCS90/900, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode, Z80/Z180

U U U U \$

\$19,000+

Software link to debuggers.

Future Plus Systems Corp., Colorado Springs, CO, (719) 380-7321, www.futureplus.com

Standard industry buses

365 U U U U

\$2,000

Provides an electrical and mechanical connection from an HP logic analyzer to a standard industry bus. Inverse assembler software is also provided.

Hewlett-Packard Co., Cupertino, CA, (408) 447-1476, www.chai.hp.com

Most

30 U U \$ \$ \$

9,990

Remote operation over LAN dual analysis per pin.

NCI, Huntsville, AL, (256) 837-6667, www.nci-usa.com

All processors for which an ANSI compiler is available

U U U U

3,995

Transitional Sampling. Interfaces through EPP printer port. Very Compact only 6.3" x3.75"

PC Engines, Sunnyvale, CA, (408) 733-3901, www.pcengines.com

90 U U \$ \$ \$

\$79

PCI and ISA bus test adapters, will work with any logic analyzer.

SynaptiCAD Inc., Blacksburg, VA, (540) 953-3390, www.syncad.com

U U U \$

\$1,950

Tektronix Inc., Beaverton, OR, (800) 426-2200, www.tektronix.com

U U

7,000

The Tektronix Logic Analyzers support over 500 microprocessors and buses.

\$10,500

Can accommodate two modules.

16,500

The Tektronix Logic Analyzers support over 500 microprocessors and buses.

U U

\$9,000

U U

\$19,000

1750A, 29K, 68HC11, 68HC12, 68HC16, 68K, 80196, 80251, 8051 and derivatives, Alpha, ARM, ColdFire, i860, i960, MIPS, MPC8xx, PowerPC, SH, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode, Z80/Z180

5,000

The Tektronix Logic Analyzers support over 500 microprocessors and buses.

1750A, 29K, 68HC11, 68HC12, 68HC16, 68K, 80196, 80251, 8051 and derivatives, Alpha, ARM, ColdFire, i860, i960, MIPS, MPC8xx, PowerPC, SH, TMS320 and other TI DSPs, x86 Protected Mode, x86 Real Mode, Z80/Z180

23,750

The Tektronix Logic Analyzers support over 500 microprocessors and buses.

\$11,295

VMETRO Inc., Houston, TX, (281) 584-0728, www.vmetro.com

365 U U U \$ U

\$7,290

Captures 32- and 64-bit 66MHz PCI, onboard master/target and real-time statistics. The PTIMBAT400-PB is a 400MHz timing analyzer and anomaly trigger. Runs under BusView for Windows 95/98/NT.

365 U U U \$ U

\$7,785

Captures 32- and 64-bit 33MHz PMC analyzer with real-time statistics. Runs under BusView for Windows 95/98/NT.

365 U U U \$ U

\$8,790

Other options include VMEbus Anomaly Trigger, 200MHz timing analyzer, pattern generator, VMEbus Driver and System Controller. Runs under BusView for Windows 95/98/NT.

U - Unlimited free \$ - paid



**12-bit ADCs: Less than \$2.40. Op Amps: Below 40¢.
System Supervisors: About 39¢. Complete Design Solutions: Priceless.**

At Microchip, we understand the value of a complete signal chain solution. That's why we've launched analog ICs for both the analog *and* digital designer. No other company gives you the flexibility of choice: world-class 12-bit ADCs stand-alone or embedded in the popular 8-bit PICmicro® MCU. **FREE** tools such as the innovative FilterLab™ software help ease the job of filter design. Add rail-to-rail Op Amps and more than a hundred System Supervisor Options – now you've got end-to-end signal chain support.

All this backed by the same great technical service you've come to expect from Microchip. Visit our website or call to request the new Analog Design Pack CD-ROM featuring FilterLab, and put our specs to the test. Analog devices from Microchip. One more reason to explore the Universe of Embedded Control.

12-bit A/D Converters	Sample Rate	Channels	Interface	INL	DNL	THD (typ)	Package	Price
MCP320X Family	100 ksp/s	1, 2, 4, 8	SPI	±1 LSB	±1 LSB	-80 db	PDIP SOIC TSSOP	From \$2.37**
Op Amps	Channels	GBWP	Iq (typ)	Vos (max)	Op Voltage	Output	Package	Price
MCP60X Family	1, 2, 4, 1+ reset	2.8 MHz	230µA	±2mV	2.7V–5.5V	Rail-to-Rail	PDIP SOIC TSSOP	From \$0.39**
Precision System Supervisors	Vcc Range	Reset Voltages	Reset	Output	Trpu (typ)	Idd (typ)	Package	Price
MCP1XX/RXX Families	1.0V–5.5V	2.7V–4.85V	Active Low Active High	Push-Pull Open Drain	350ms	45µA	T0-92 SOT-23-3 8 SOIC	From \$0.39**

All products specified -40° to +85° C

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Browse through the next section and you'll get a capsule glance of the various trends in silicon. Processors for embedded systems span a much wider range of capabilities than that of desktop PCs or workstations and, so they illustrate the change in the silicon market.

No longer are 32-bit CPUs for high-end, high-cost applications. Cars, always one of the most price-sensitive markets, use 32-biters in engine controllers, ABS braking, radios, navigation systems, and the like. All products today are evolving towards increasing complexity, more features, faster performance. Address space requirements skyrocket, leaving 8- and 16-biters inadequate.

DSPs were once for elaborate signal processing, like reducing sonar data. The trend today is to eliminate analog electronics, to push the digital all the way out to the sensors. Even radios now use DSP to extract signals from RF; they make spread spectrum (like Bluetooth) communications possible and affordable. Now we push physical limits as never before: scientists manipulate individual atoms, radios operate well below the noise floor, analog/digital converters sample over vast resolution scales, instruments correlate tiny variables to large-scale events. All of this is made possible by maxing the math, by crunching data in real time at high rates. The DSPs listed here that perform billions of floating-point operations per second are the

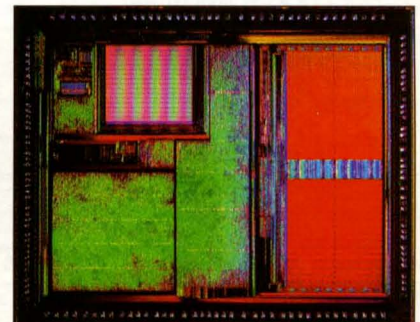
enablers of these math-intensive systems.

Despite the predicted death of 8-bit processors, the proliferation of these inexpensive chips is astounding. Very low-end apps will always exist, systems that need just a hint of brains. The future is clearly one of pervasive computing, where we're surrounded not by tens of embedded systems, but millions. The curtains in your living room will be an array of 100,000 CPUs that each drive a mini-transparency modulator. Your rugs or floors will sense who is where when. Everything from seatbelts to neckties will become smart.

Tiny microcomputers make this possible, systems with an 8-bitter coupled to memory and I/O. These pages show that such CPUs are already available for just about any custom app. Z8s and other highly integrated computers today cost just tens of cents. Tomorrow they'll be pennies. High-end CPUs will be hard-pressed to match these prices.

In the '80s and '90s, smaller IC companies went "fabless." They contracted with large IC manufacturers to build their particular chip. A new class of vendors doesn't even pretend to build chips. They offer virtual products, processor cores that you buy as a set of VHDL equations. Buy the core and it's delivered to you as an e-mail attachment (but this is not your traditional Internet transaction; don't expect to charge this on even the most generous of Gold Cards).

Given the core, you add your own



peripherals to create a custom ASIC that incorporates all or most of your product's logic. Some vendors even let you configure the core's instruction set: add new opcodes (perhaps a DSP-like multiply-accumulate) and the vendor-supplied tools automatically generate updated compilers!

The final part of this section covers flash memory, the now-ubiquitous ROM-replacement. The appeal of flash is undeniable; it's viewed as a schedule-cheater. We can download new code as the product is on the way out the door, or even e-mail updates to disgruntled customers. Is the project "almost done"? Why not ship today via UPS ground, giving us another three to five days while it's in transit to perfect the firmware?

Flash is a fabulous technology that carries with it extreme temptation. Fact is, an extra three to five days will never be enough. Flash makes sense for feature set enhancements, but should never be viewed as a way to ship buggy stuff today, figuring we can fix tomorrow.

It's harder than ever to choose a CPU, but the following pages should give some guidance. **esp**

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board flash/EEPROM in bytes	# of on-board counter/timers	No. on-board asynchronous serial ports
8 bits														
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com														
8051	8	16	2.7	6	25	100		33	512	1 to 32		1 to 32	3	UART
AVR	8	16	1.8	6	15	5	1	12	4k			128k	4	2
Cypress Semiconductor, San Jose, CA, (800) 541-4736, www.cypress.com														
Cypress USB M8 Microcontrollers	8	12	4	5.5	25	10	10	12 (USB Apps), 16 (General Purpose)	256	0	8K	0	5	1
Dallas Semiconductor, Dallas, TX, (972) 371-4000, www.dalsemi.com														
DS80C310/ DS80C320	8	16	4.5	5.5	30/4.5	15/25	1	33	256	0			3	1/2
DS80C390	8	20	4.5	5.5	35	15	1	40	4K				3	2
DS80C323	8	16	3	5.5	10	6	0.1	18	256	0			3	2
DS87C520	8	16	4.5	5.5	30	8	1	33	1,280		16K		3	2
DS87C530	8	16	4.5	5.5	30	8	1	33	1,280		16		3	2
DS87C550	8	16	4.5	5.5	30	8	1	33	1,280		8K		3	2
Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor														
H8/3887		16	1.8	5.5	1.5	2	500	6	2K	60K	60K	0	5	2
Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers														
C505	8, 16, 32, 24, 64	16	4.5	5.5				20	512	16K	32K OTP		3	1
C505CA	8, 16, 32, 24, 64	16	5	5				20	1280	32K	32K OTP		3	1
C505L	8, 16, 32, 24, 64	16	5	5					512	32K	32K OTP		3+1 RTC	1
C508	8		4.5	5.5				10	1280		32K OTP		4	1
C513A	8, 16, 32, 24, 64	16	5	5				16	512	16K	16K OTP		3	1
C515	8, 16, 32, 24, 64	16	5	5				24	256	8K			3	1
C515C	8, 16, 32, 24, 64	16	5	5				10	2304	64K	64K OTP		3	1
C517A	8, 16, 32, 24, 64	16	5	5				24	2304	32K			4	2
Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com														
PIC12CXXX	8	14	2.5	5.5	30	14	14	10	25-128	768	768-3584	16	1	
PIC14CXXX	8	14	2.7	6	30	19	19	20	192		7,168		2	
PIC16C5X	8	14	2	6.25	20	12	12	20	24-73	768-3,072	576-3,072		1	
PIC16C6XX	8	14	2.5	6.25	30	19	19	20	80-368	896-7,168	896-14K	128	1 to 3	1
PIC16C7X	8	14	2.5	6.25	30	19	19	20	36-368	3,584	896-14K		1 to 2	1
PIC16C92X	8	14	2.5	6	8	20	20	8	176		7.2K		3	
PIC16F87X	8	14	2	5.5	20	16	16	20	192-368			4K-8K	3	1
PIC16F8X	8	14	2	6	20	10	10	10	36-368	896-1,792	896-14K	68-256	1	

on-board synchronous serial ports
 Number of on-board ADCs
 Number of bits of resolution per ADC
 Maximum number parallel I/O pins
 Number of PWM outputs
 Number of watchdog timers
 Maximum number of chip select outputs
 Number of interrupt pins to chip
 Number of interrupt priority levels
 Number of DMA channels
 Typical price per 1,000
 Package available

Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com

SPI			32	1	1		2	3	\$2.00	20/40/44/48 PDIP, TQFP, PLCC, SOIP
2	8 channel	10	64	4	1	2	10	1	\$1 to \$10	8/20/28/32/40/44/64 PDIP, SSOP, SOIC, TQFP, PLCC, VQFP

Cypress Semiconductor, San Jose, CA, (800) 541-4736, www.cypress.com

1	0		40 (GPIOs)	2	1	40 (GPIOs)	40 (GPIOs)	10	\$2 to \$7	20/24/28/40/48/56 SOIC, PDIP, SSOP, QSOP, Windowed CerDIP, Sidebraced
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Dallas Semiconductor, Dallas, TX, (972) 371-4000, www.dalsemi.com

			24		1		6	3	\$3.70+	40 DIP, 44 PLCC, 44 TQFP
2			40		1	8	6	3	\$9.30	68 PLCC, 64 PQFP
			24		1		6	3	\$5.10	40 DIP, 44 PLCC, 44 TQFP
			32		1		6	3	\$8.40	Windowed 40 DIP, 40 DIP, 44 PLCC, 44 TQFP
			32		1		6	3	\$9.50	Windowed 52 PLCC, 52 PLCC, 52 TQFP
	8	10	52	4	1		6	3	\$11.00	Windowed 68 PLCC, 68 PLCC, 80 PQFP

Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor

	12	10		1	1	8	13	3	\$13.00 for EPROM	100/80 pin QFP/TQFP
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Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers

1	8	8	34	4	2		6	4	\$3.85	44 MQFP
1 Full-CAN	8	10	34	4	2		6	4	\$5.71	44 MQFP
	8	10	46	4	2		6	4	\$6.12	80 MQFP with LCD interface
	8	10	48	10	2		10	4		64-pin MQFP and S-DIP
1			32		2		2	2	\$2.78	40 DIP, 44 PLCC, 44 MQFP
	8	8	56	4	1		7	4	\$4.52	68 PLCC, 80 MQFP
2 SPI + Full-CAN	8	10	57	4	2		9	4	\$6.45	
	12	10	68	21	2		7	4	\$8.08	

Microchip Technology Inc., Chandler, AZ, (480) 786-7200, www.microchip.com

	4	8	6		1		4	1	\$0.79+	8 PDIP, SOIC
1	8	16	20		1		11	1	\$6.11+	28 SOIP, SOIC, SSOP
			12 to 20		1				\$0.85+	18/28 DIP, SOIC, 20 SSOP
2			13-33	1 to 2	1		12	1	\$1.25+	18 PDIP, SOIC, 20 SSOP, 28 SOIC, SSOP, DIP, 40 DIP, QFP, PLCC
1	4 to 10	12	13-33	1 to 2	1		12	1	\$1.93+	18 PDIP, SOIC, 20 SSOP, 28 SOIC, SSOP, DIP, 40 PDIP, 44 PLCC, QFP
1	5	10	52	1	1		11	1	\$6.88+	68 DIP, PLCC, QFP
1	5 to 8	10	22-33	2	1		14	1	\$6.11+	28 DIP, SOIC, SSOP, 40 DIP, 44 PLCC, TQFP
			13-33		1		4	1	\$3.12+	18 SOIC, PDIP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board Flash/EEPROM in bytes	# of on-board counter/timers	No. on-board synchronous serial ports
PIC17CXXX	8	16	2.5	6	38	40	40	33	232-902	4K-8K	4K-32K		4	1
PIC18CXXX	8	16	2.5	5.5	20	16	16	40	512-1,536		16K-32K		2	1
Micromint Inc., Vernon, CT, (860) 871-6170, www.micromint.com														
80C52-BASIC	8	16	4.5	6	15	200		12						
Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com														
M37510 (LCD: 16 x 80)	8	16	2.5	5.5	13 (5V at 8 MHz)	20	0.1	8	512	24K or 60K	60K		2/3	2 UART
M37529 (LCD: 16 x 52 or 32 x 36) (with x2 or x3 charge pump)	8	16	2.5	5.5	15	23	0.1	8	2K	60K	60K		2/3	2 UART
M37531	8	16	2.2	5.5	8	200	0.1	8	256 or 384	8K or 16K	16K		3	1 UART
M37532 (USB)	8	16	4.1	5.5	10	1,600	0.1	6	256 or 384	8K or 16K	16K		3	1 UART or 1 USB
M37536 (USB)	8	16	4.1	5.5	10	1,600	0.1	6	256 or 384	8K or 16K	16K		3	1 UART or 1 USB
M37640 (USB) (Also has MBI, EDMA, and dedicated USB port)	8	16	4.15	5.25	90	10	0.1	24	1K	32K	32K		2/3	2 UART
M38207 (LCD: 4 x 40)	8	16	2.5	5.5	13	4.5	0.1	8	1K	32K	32K		2/3	1 UART
M38227 (LCD: 4 x 32)	8	16	2.5	5.5	13	4.5	0.1	8	1K	48K	48K		2/3	1 UART
M38259 (LCD: 4 x 40)	8	16	2.5	5.5	13	4.5	0.1	8	2K	60K	60K		2/3	1 UART
M38503	8	16	2.7	5.5	13	5	0.1	8	512 or 640	8K, 16K, or 24K	24K		4	1 UART
M38513	8	16	2.7	5.5	13	5	0.1	8	512	16K	16K		4	1 UART

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Packages available
1 to 2	16	10	33-66	2 to 3	1	12	4			\$6.01+	40 DIP, 44 PLCC, QFP, 64 DIP, 68 PLCC, QFP, 80 QFP, 84 PLCC
1	5 to 8	10	22-33	2	1	17	2			\$6.50+	28 DIP, SOIC, 40 DIP, 44 PLCC, TQFP
Micromint Inc., Vernon, CT, (860) 871-6170, www.micromint.com											
										\$9.00	44 PLCC, 40 DIP
Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com											
2 UART or Synchronous			41			5	15				176-pin QFP
2 UART or Synchronous			44			5	9				100-pin QFP
1 Synchronous	8-channel	10	29		1 x 16-bit	4	12				32-pin QFP; 32-pin SDIP; 36-pin SSOP
1 Synchronous	8-channel	10	28		1 x 16-bit	3	11				36-pin SSOP
1 Synchronous	8-channel	10	33		1 x 16-bit	4	8				42-pin SDIP
1 Synchronous	8-channel	10	66			4	19	2			80-pin QFP
1 UART or Synchronous			43		1 x 15-bit	7	16				80-pin QFP
1 UART or Synchronous	8-channel	8	49			8	17				80-pin QFP
1 UART or Synchronous	8-channel	8	43			8	17				100-pin QFP
1 UART or Synchronous	5-channel	10	34	1	1 x 16-bit	6	14				42 SDIP, 42 SSOP
1 UART or Synchronous	5-channel	10	34	1	1 x 16-bit	7	16				42 SDIP, 42 SSOP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. stby. current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board Flash/EPROM in bytes	# of on-board counter/timers	No. on-board asynchronous serial ports
M38869FFAHP	8	16	2.7	5.5	15	20	0.1	10	2K			60K Flash	4	1 UART
Motorola, Austin, TX, (512) 895-2000, www.motorola.com														
68HC05	8	16	1.8	5.5	10	500	0.1	8	0-512	0-32	0-32	0-512	3	1
68HC08	8	16	1.8	5.5	30	1,000	0.2	32	0-1	0-60		0-60	up to 4	1
68HC11	8	16	3	5.5	40	20	50	8	0-1	0-32	0-32	0-64	3	1 to 3
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com														
51LPC	8	12	2.7	6	25	4,000	5	20	128		4K	0	2	1
80C51	8	16	1.8	5.5	15	4,000	50	33	64K to 2K	1K to 64K	1K to 64K	8K to 64K	2 to 5	1 to 2
Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com														
SX Series	8		2.5	5			<1	100	136/256			3K/6K	1 to 3	Up to 8
SX28AC	8	12	2.5	5.5	1mA/MIPS		<1	50	136			3K		Up to 8
SX28AC100	8	12	4.5	5.5	1mA/MIPS		<1	100	136			3K	Up to 8	Up to 8
SX28AC75	8	12	4.5	5.5	1mA/MIPS		<1	75	136			3K	Up to 8	Up to 8
SX52BD100	8	12	2.5	5.5	1mA/MIPS		<1	100	256			6K	3 on-	Up to 8
SX52BD50	8	12	2.5	5.5	1mA/MIPS		<1	50	256			6K	3 on-	Up to 8
Sensory Inc., Sunnyvale, CA, (408) 744-9000, www.voiceactivation.com														
RSC-300/364			2.4	5.25	10	5								
Silicon Storage Technology Inc., Sunnyvale, CA, (408) 369-1500, www.ssti.com														
FlashFlex51	8	16	2.7	5.5	25	100	40	33	256			20 or 36	3	1
Triscend Corp., Mountain View, CA, (650) 968-8668, www.triscend.com														
E5 Configurable System-on-Chip (with embedded Programmable Logic)	8	32	3.0V	3.6V			10	40	8K-64K	0	0	0	2	1
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com														
W65C02	8	16	1.2	5.25	30	5	1	20	0	0	0	0	0	0
W65C134	8	16	2.8	5.5	32	5	1	8	192	4K	0	0	4	1
XEMICS SA, Neuchatel, Switzerland, +41 32 720 5511, www.xemics.ch														
XE8301 MTP	8	16	1.2	5.5	1.2	1	1	4	512			22k	4	1
XE8301 ROM	8	16	1.2	5.5	1.2	1	1	4	512	22k			4	1
XE8851 MTP	8	16	2.4	5.5	1.2	1	1	4	512			22k	4	1
XE8851 ROM	8	16	2.4	5.5	1.2	1	1	4	512	22k			4	1
Zilog, Campbell, CA, (408) 558-8599, www.zilog.com														
	8	16	3.3	5				33		32K			2	2

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Packages available
2 Synchronous	2-channel	10	72	2	1 x 16-bit		9	16			80 LQFP
Motorola, Austin, TX, (512) 895-2000, www.motorola.com											
1	8	8	33	up to 4	1	up to 2	1	0			16-80 pin/all pin types
1		10	33	up to 6	1	up to 2	up to 2	24	0		28-100 pin/all pin types
1	8	8	62	up to 4	1	4	2	21	0		40-84 pin/all pin types
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com											
1	0	0	18	0	1	0	10	4	0	\$1.15	20 SOIC, PDIP
1	1	8- and 10-bit	19 to 56	1 to 9	1.2	0	2 to 7	2.4	0	\$1 to \$2	241 SSOP, DIP, 281 SSOP, DIP, PLCC, 401 DIP, 441 PQFD, LQFP, PLCC, 868 PLCC, 801 PQFP
Scenix Inc., Mountain View, CA, (650) 210-1500, www.scenix.com											
Up to 8	Up to 8	8	40	Up to 10	1	20	9 to 11	1			18/20/28 DP, SO, SS, 48/52 TQ
Up to 8	Up to 8	8	20	Up to 10	1	20	8	1		\$5.00	18/28 DIP, SO, 20/28 SSOP
Up to 8	Up to 8	8	20	Up to 10	1	20	8	1		\$7.40	18/20 DIP, SOIC, 20/28 SSOP
Up to 8	Up to 8	8	20	Up to 10	1	20	8	1		\$6.20	18/28 DIP, SOIC, 20/28 SSOP
Up to 8	Up to 8	8	40	Up to 10	1	20	8	1			48 TQFP, 52 PQFP
Up to 8	Up to 8	8	40	Up to 10	1	20	8	1			48 TQFP, 52 PQFP
Sensory Inc., Sunnyvale, CA, (408) 744-9000, www.voiceactivation.com											
										<\$4.00/100K	
Silicon Storage Technology Inc., Sunnyvale, CA, (408) 369-1500, www.ssti.com											
1	0		32	0	1	0	2	2	0	\$3.64	40 PDIP, 44 PLCC, 44 TQFP
Triscend Corp., Mountain View, CA, (650) 968-8668, www.triscend.com											
0	0	0	316	User Definable	1	up to max. PIO count		Same as 8051	2	\$20+	128LQFP, 208QFP
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com											
0	0	0	0	0	0	0	2	2	0	\$3.45	40 DIP, 44 PLCC, 44 QFP
0	0	0	56	0	1	8	15	22	0	\$8.00	68 PLCC, 80 QFP
			20	2	1	0	16	3			20 SO, 28 SO
			20	2	1	0	16	3			20 SO, 28 SO
	1	16	24	2+2 DACs	1		16	3			64 TQFP
	1	16	24	2+2 DACs	1		16	3			64 TQFP
Zilog, Campbell, CA, (408) 558-8599, www.zilog.com											
2			16		1	2		2			64 DIP, 68 PLCC, 80 QFP, 100 QFP, 100 TQFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board flash/EEPROM in bytes	# of on-board counters/timers	No. on-board asynchronous serial ports
16 bits														
Advanced Micro Devices, Sunnyvale, CA, (800) 538-8450, www.amd.com														
Am186CC	16	32	3.3	3.3	200	Static Core Design	Static Core Design	50	0	0	0	0	3	2
Am186CH (HDLC only, no USB)	16	32	3.3	3.3	200	Static Core Design	Static Core Design	50	0	0	0	0	3	2
Am186CU (USB only, no HDLC)	16	32	3.3	3.3	200	Static Core Design	Static Core Design	50	0	0	0	0	3	2
Am186ED/Am186EDLV (Low Voltage, 3.3V)	16	32	3.3	5	200	Power Save Clock Divider	Power Save Clock Divider	40	0	0	0	0	3	2
Am186EM/Am186EMLV (Low Voltage, 3.3V)	32	16	3.3	5	200	Power Save Clock Divider	Power Save Clock Divider	40	0	0	0	0	3	1
Am186ER	16	32	3.3	3.3	200	Power Save Clock Divider	Power Save Clock Divider	50	32K	0	0	0	3	1
Am186ES/Am186ESLV (Low Voltage, 3.3V)	16	32	3.3	5	200	Power Save Clock Divider	Power Save Clock Divider	40	0	0	0	0	3	2
Am188EM/Am188EMLV (Low Voltage, 3.3V)	8	32	3.3	5	200	Power Save Clock Divider	Power Save Clock Divider	40	0	0	0	0	3	1
Am188ER	8	32	3.3	3.3	200	Power Save Clock Divider	Power Save Clock Divider	50	32K	0	0	0	3	1
Am188ES/Am188ESLV (Low Voltage, 3.3V)	8	32	3.3	5	200	Power Save Clock Divider	Power Save Clock Divider	40	0	0	0	0	3	2
Connect One Ltd., Israel, www.connectone.com														
iChip	16	32	3.3	5	200	750		20	28			512		
Fujitsu Microelectronics Inc., San Jose, CA, (800) 866-8608, www.fujitsu-micro.com														
MB90240	16	16						64	1,500			192,000		
MB90520	16	16						16	4,000			128,000		
MB90540	16	16						16	6,000			128,000		
MB90550 (1)	16	16						16	2,000			64,000		
MB90550 (2)	16	16						16	4,000			128,000		
MB90570	16	16						16	10,000			256,000		
MB90580	16	16						16	6,000			128,000		
MB90590	16	16						16	6,000			256,000		
MB90595	16	16							4,000			128,000		
MB90650	16	16						16	8,000			256,000		
Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor														
H8/2148	16	24	2.7	5.5	100	5	85,000	20	4K	128K	0	128K	5	3
H8/3067	16		3	5.5	51/100	5	37mA/51mA	25	12K	256K	0	256K	6	3
H8/3664	16	16	2.7	5.5	22.5	5	17,000	16	1K	32K	0	32K	3	1
Hitachi H8S/2357	16		2.7	5.5	62/122	5	42/84	20	8K	128K	128K	128K	6 16-bit, 2	3

on-board synchronous serial ports

Number of on-board ADCs

Number of bits of resolution per ADC

Maximum number parallel I/O pins

Number of PWM outputs

Number of watchdog timers

Maximum number of chip select outputs

Number of interrupt pins to chip

Number of interrupt priority levels

Number of DMA channels

Typical price per 1,000

Packages available

Advanced Micro Devices, Sunnyvale, CA, (800) 538-8450, www.amd.com

1	0	0	48	3	1	14	17	to 128	12	\$14.75	160 PQFP
1	0	0	48	2	1	14	17	to 128	12	\$11.20	160 PQFP
1	0	0	48	2	1	14	17	to 128	12	\$11.25	160 PQFP
0	0	0	32	3	1	12	8	9	2	\$10.33	100 TQFP, PQFP
1	0	0	32	2	1	12	6	9	2	\$7.37	100 PQFP, TQFP
1	0	0	32	3	1	13	6	9	2	\$9.95	100 TQFP, PQFP
0	0	0	32	2	3	12	8	9	2	\$7.37	100 TQFP, PQFP
1	0	0	32	2	1	12	6	9	2	\$7.00	100 TQFP, PQFP
1	0	0	32	3	1	13	6	9	2	\$9.45	100 TQFP, PQFP
0	0	0	32	3	1	12	8	9	2	\$7.00	100 TQFP, PQFP

Connect One Ltd., Israel, www.connectone.com

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Fujitsu Microelectronics Inc., San Jose, CA, (800) 866-8608, www.fujitsumicro.com

QFP, LQFP

QFP

QFP, LQFP, SH-DIP

QFP

QFP, LQFP

QFP, LQFP

QFP

QFP

QFP, LQFP

Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor

8	10	18	2	8	9	3	0	\$15.50 for flash version	100/80/64 pin QFP/TQFP
3	16	10-bit	79	5	1	8	7	\$18.00 for flash version	100 QFP, TQFP
8	10	0	1	0	4	3	0	\$7.95 for flash version	
3	8	10	87	17	1	8	9	\$16.00 for flash version	128 QFP, 120 TQFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board Flash EPROM in bytes	# of on-board counter/timers	No. on-board synchronous serial ports
Hitachi H8S/2623	16	3.0	3.6/5.5		5			25	4/8/12K	64/128/256K	0	256K	6 16-	3
Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers														
80C166	8, 16, 32, 64, 24	5	5					20	1024	32K			7	2
C161O	8, 16, 32, 64, 24	3	5					25	2048				5	1
C161PI	8, 16, 32, 64, 24	3	5					25	3072				5 + RTC	1
C161V	8, 16, 32, 64, 24	3	5					25	1024				3	1
C163-L	8, 16, 32, 64, 24	3	5					25	1024				5	1
C164CI-8EM	8, 16, 32, 64, 24	5	5					20	2048	64K	64K OTP		5	1
C165	8, 16, 32, 64, 24	3	5					25	2048				5	1
C167CR	8, 16, 32, 64, 24	5	5					25	4096	up to 128 KBytes			13	1
Intel Corp., Santa Clara, CA, (800) 628-8686, www.intel.com														
Intel Celeron Processor (300-433Mhz)	64	32	1.856	2.144				433	L1 Cache: 32K					
Low Power Embedded Pentium processor with MMX Technology (166-266Mhz)	64	32						266	L1 Cache: 32K					
Mobile Pentium II Processor - Low Power Module	64	32	5	21				266	L1 Cache : 32K					
Mobile Pentium II Processor in BGA Package (266-333Mhz)	64	32	1.465	1.805				333	L1 Cache: 32K L2 Cache: 256K					
Pentium II Processor with On Die Cache - Low Power Module	64	32	5	21				333	L1 Cache: 32K L2 Cache: 256K					
Pentium processor with MMX Technology (200-233Mhz)	64	32	2.7/3.135	2.9/3.6				233	L1 Cache: 32K					
Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com														
M30201 (M16C/20)	16	20	2.7/4.0	5.5	38 (5V at 10 MHz)	4 (typical)	1 (5V)	10	512 or 1K/2K	16K or 32K		48K (Flash Version)	3 x 16-bit	1 UART
M30240 (M16C/24)	16	20	4.1	5.5	83	10	1	12	3K to 5K	40K/48K	128K		8 x 16-bit	3 UART

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Packages available
3	16	10	54	15	1	8	7	8	0	\$22.00 for flash ver-	100 QFP, TQFP
Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers											
	10	10	76	16	1		19	16	8 with PEC	\$13.92	100 MQFP
1 SPI			63		1	4	9	16	8 with PEC	\$5.92	80 MQFP
2 SPI + I2C	4	10	76		1	5	10	16	8 with PEC	\$5.96	100 MQFP, 100 TQFP
1 SPI			63		1		9	16	8 with PEC	\$4.92	80 MQFP
1 SSP			77		1	5	11	16	8 with PEC	\$7.25	100 MQFP, 100 TQFP
1 SPI	8	10	59	14	2	4	12	16	8 with PEC	\$13.98	80 MQFP
1 SPI			77		1	5	11	16	8 with PEC	\$9.69	100 MQFP, 100 TQFP
2 SPI + Full CAN	16	10	111	36	2	5	36	16	8 with PEC	\$16.51	100 MQFP
Intel Corp., Santa Clara, CA, (800) 628-8686, www.intel.com											
							3	2			370L PPGA
							3	2			296L PPGA 352L HL-PBGA
							3	2			Mobile Module Connector 2 - 400 Pin
							3	2			615 BGA1
							3	2			Mobile Module Connector 2 - 400 Pin
							3	2			296L PPGA
Mitsubishi Electronics America Inc, Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com											
1 UART or Synchronous	8-channel	10	43		1 x 15-bit		9 internal; 3 external	7			52 SDIP, 56 QFP
3 UART or Synchronous	8-channel	10	63	5	1 x 15-bit		21 internal; 4 external	7	2	\$5.30/10K	80 QFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. sleep current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board flash/EEPROM in bytes	# of on-board counter/timers	No. on-board synchronous serial ports
M3061X (M16C/61)	16	20	2.7	5.5	6	4	1 (5V)	10	10K	128K	128K		8 x 16-bit	3 UART
M3062X (M16C/62)	16	20	2.7	5.5	6 (typical) (3V at 7 MHz)	4 (typical) (5V at 32 kHz)	1 (5V)	16	3K to 20K/10K or 20K	128K	128K	256K DINOR Flash	11 x 16-bit	3 UART
M30800 (M16C/80)	16	20	2.7	5.5	7			20	10K	128K			11 x 16-bit	5 UART
M37702	16	16	2.7	5.5	38 (5V at 25 MHz)		1 (5V)	25	2K	60K	60K		8 x 16-bit	2 UART
Motorola, Austin, TX, (512) 895-2000, www.motorola.com														
68HC12	16	16	3	5.5	35	60	60	8	0-1	0-32	0-32	0-4	3	1 to 2
68HC160Y3	16	20	4.5	5.5	125		350		4	96	0	0	GPT & TPU	3 SCI
68HC160Z1	16	20	2.7	5.5	110		350	25	1	0	0	0	GPT	SCI
68HC160Z2	16	20	4.5	5.5	110		350	25	2	8	0	0	GPT	SCI
68HC160Z3	16	20	4.5	5.5	110		350	25	4	8	0	0	GPT	SCI
68HC169Y3	16	20	4.5	5.5	125		350	25	4	0	0	96	GPT & TPU	3 SCI
MC68302	16		3.3	5	231	3	20	33						
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com														
XA	16		2.7	5.5	80,000	30,000	50	30	512 to 2,048	8K to 32K	8K to 32K	64K	3	2
XA-SCC	16	24	3	5.5	120	65,000	500	30	256	0	0	0	2	4
TERN Inc., Davis, CA, (530) 758-0180, www.tern.com														
TERN Inc./MCUs/MPUs	16	32	5	30	250	1000	10	40	1.5 M	512K	1.5M	1.5M	3	5
VAutomation Inc., Nashua, NH, (603) 882-2282, www.vautomation.com														
V186 - Intel 80C186EC and AMD Am186EM compatible Synthesizable Core	16	32	Varies	Varies	Varies	Varies	Varies	Varies					3	1
V8086 - Intel 8086 compatible Synthesizable Core	16	32											0	0
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com														
W65C265	8	24	2.8	5.5	38	5	1	8	576	8K	0	0	8	4
W65C816	8	24	1.2	6	42	5	1	14	0	0	0	0	0	0

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Packages available
3 UART or Synchronous	8-channel	10	87	5	1 x 15-bit	4	20 internal; 5 external	7	2		100 QFP, TQFP, LCC
2 Synchronous	10-channel	10	87	5	1 x 15-bit	4	25 internal; 8 external	7	2		100 QFP, TQFP, LCC
5 UART or Synchronous	10-channel	10	87	8	1 x 15-bit	4	29 internal; 8 external	7	4		100 QFP, 144 QFP
2 UART or Synchronous	8-channel	8	68		1 x 12-bit		16 internal; 3 external	7			80 QFP
Motorola, Austin, TX, (512) 895-2000, www.motorola.com											
1	1	8	91	0-4	1	6	1	28			112 LQFP, 80 QFP
QSPI & SPI	1	8 to 10	84	2 on GPT, 16 on TPU	1	10	7	8			160 QFP
QSPI	1	8 to 10	46	2	1	12	7	8			132 PQFP, 133 TQFP
QSPI	1	8 to 10	46	2	1	12	7	8			132 PQFP, 144 TQFP
QSPI	1	8 to 10	46	2	1	12	7	8			132 PQFP, 144 TQFP
QSPI & SPI	1	8 to 10	84	2 on GPT, 16 on TPU	1	10	7	8			160 QFP
					1		11	7			132 PQFP
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com											
1	8	10	32 to 50	2 to 5	1	0	2	16	0	\$4 - \$6	44 PLCC, 44 LQFP, 68 PLCC, 80 LQFP
4	0	0	32	0	1	6	3	16	8	\$17.06	100 LQFP
TERN Inc., Davis, CA, (530) 758-0180, www.tern.com											
1	22+2	24/16/12	300	2	2	6	10	2		\$69.00	
VAutomation Inc., Nashua, NH, (603) 882-2282, www.vautomation.com											
1	0	0	P1284 optional	2	Opti onal	13	7		2+		
0	0	0	0	0	0	0	1	1	0		
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignc.com											
0	0	0	64	0	1	8	8	29	0	\$17.00	84 PLCC, 100 QFP
0	0	0	0	0	0	0	3	2	0	\$4.20	40 DIP, 44 PLCC, 44 QFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board flash/EPROM in bytes	# of on-board timer/counters	No. on-board synchronous serial ports
32 bits													
Advanced Micro Devices, Sunnyvale, CA, (800) 538-8450, www.amd.com													
AMD-K6-2E Std Power 233-400MHz	64	32	2.1	2.3	10,000		400	32K istr \$ 32K data				1	
Elan	32	20	2.7	3.6	665	19000	10	100	8K bytes cache			3	1
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com													
AT91F40416 ARM Thumb-based MCU	32	32	2.7	3.6	30	30	25	4096	0	0	2M	3	2
AT91M40400 ARM Thumb-based MCU	32	32	1.8	3.6	40	30	40	4096	0	0	0	3	2
AT91M40807 ARM Thumb-based MCU	32	32	2.7	3.6	40	30	33	8192	128K	0	0	3	2
AT91M63200 ARM Thumb-based MCU	32	32	2.7	3.6	30	30	25	2048	0	0	0	6	3
Fujitsu Microelectronics Inc., San Jose, CA, (800) 866-8608, www.fujitsumicro.com													
MB86831	32	32	3	3.3			66MHz					1	
MB86831-66	32	32	3	3.3			66 mhz					1	
MB86831-80	32	32	3	3.3			80					1	
MB86832-100	32	32	3	3.3			100					1	
MB86832-66	32	32	3	3.3			66					1	
MB86832-80	32	32	3	3.3			80					1	
MB86833-66	32	32	3	3.3			66					1	
MB86860-200	64	64	3.15	3.3			200						
Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor													
Hitachi SH7708	32		3	3.3	195	15	95	60	0	0	0	3 32-	1
Hitachi SH7729	32		1.9	3.3			133	8K	0	0	0	3 32-	1
Hitachi SH7750	64		1.5	3.3	840		150	200	16K/ 8K	0	0	3 32-	1
SH7017	16	24	4.5	5.5	140	5	28.7	4K	64K, 128K	0	128K	5	2
SH7045	16, 32		4.5	5.5	230	5	28.7	4K	256K	0	256K	7	2
SH7709A	16, 32		3.0/ 1.75	3.6/ 2.05	390	140	133	16K	0	0	0	3	3
IBM Microelectronics, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc													
401GF	32	32	3.14	3.47	180	6,000	6	50	2KI, 1KD			4	
IBM PowerPC 403GA, 403GB, 403GC	32	32	3.14	3.47	180	9,000	30	40	2KI, 1KD			4	1
IBM PowerPC 403GCX	32	32	3.3	3.5	500	25,000	80	80	16KI, 8KD			4	1
IBM PowerPC 405GP	32	32	2.3	2.7	900	50,000	150	266	16KI, 8KD			4	2
IBM PowerPC 603e/EM603e	64	32	2.37/ 5	2.62	1,200	360,000	2,000	200	16KI, 16KD			2	
IBM PowerPC 740, 750	64	32	2.37/ 1.9	2.62/ 2.1	3,200			466	32KI, 32KD			2	

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Package available
Advanced Micro Devices, Sunnyvale, CA, (800) 538-8450, www.amd.com											
						3	3			\$53.00-\$61.00	321 PGA
		32 max			16	15 internal + 8 external	15	7		\$30.00	292 BGA
Atmel Corp., San Jose, CA, (408) 441-0311, www.atmel.com											
2	0	32	6	1	8	32	8	4		\$20.00	120 BGA
2	0	32	6	1	8	32	8	4		\$10.00	6100 TQFP
2	0	32	6	1	8	32	8	4			100 TQFP
4	0	58	12	1	8	58	8	8		\$12.50	176 TQFP
Fujitsu Microelectronics Inc., San Jose, CA, (800) 866-8608, www.fujitsumicro.com											
										\$15.00	176 PQFP
										\$15.00	
										\$17.00	
										\$22.00	
										\$17.00	
										\$19.00	
										\$12.00	144 LQFP
				4				2		\$75.00	352 BGA
Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor											
1	0	8	0	1	7	5	15			\$15.30	144 QFP, TQFP
1	8	10	16	0	1	6	11	16	4	\$20.60	208 LQFP, 216 CSP
1	0	16	0	1	7	5	15	4		\$31.25	256 BGA, 208 QFP
	8	10	82	8	1	4	7	16	2	\$17.00	112QFP
	8	10	106	8	1	4	9	16	4	\$25.00	144QFP
	8	10	96	0	0	6	11	16	4	\$20.00	208LQFP, 216CSP
IBM Microelectronics, Research Triangle Park, NC, (919) 543-5701, www.chips.ibm.com/products/powerpc											
										\$7.40	80 TQFP
				1	8	6	2	4/2		\$12.88 - \$16.90	160 PQFP, 128 LQFP
				1	8	6	2	4		\$17.60 - \$24.00	160 PQFP, 160 PBGA
		23 (multiplexed)		1	8	7	2	4		\$48 (200MHz)	456-Ball E-PBGA
						4	1			\$30.30-\$56.40	255 CBGA, 240 PQFP
						4	1			\$70.90 - \$235.50	255 CBGA (740) 360 CBGA (750)

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board flash/EEPROM in bytes	# of on-board counter/timers	No. on-board synchronous serial ports
Integrated Device Technology Inc. (IDT), Santa Clara, CA, (408) 727-6116, www.idt.com														
RISController RC3041	32	32	3.13 5	3.46 5	370			33	Cache: 2.5K				1	
RISController RC32364	32	32	3.13 5	3.46 5	500	90 mA	40 mA	133	Cache: 10K				1	
Kg Systems Inc., East Hanover, NJ, (973) 515-4664, www.industrialcontroller.com														
BASIC/Tiny Tiger Multitasking Industrial Controllers			4.7	5.5	45-100		50-100		32K-1Meg			128K-2Meg Flash	2x15 3K Baud	
Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com														
M32000D3 (M32R/D with on-chip 1-MB DRAM)	16 external; 128 internal	32/ 24	3	3.6	200	1,500	150,000	66.6/16.6	1M					
M32000D4 (M32R/D with on-chip 2-MB DRAM)	16 external; 128 internal	32/ 24	3	3.6	220	2,000	170,000	66.6/16.6	2M					
Motorola, Austin, TX, (512) 895-2000, www.motorola.com														
68331	16	24	2.7	5.5	50 mA @ 3.6V/ 16MHz		50 A @ 3.6V/16 MHz	25	0	0	0	0	GPI	SCI
68332	16	24	2.7	5.5	50 mA @ 3.6V/ 16MHz		50 A @ 3.6V/16 MHz	25	2	0	0	0	TPU	SCI
68336	16	24	4.5	5.5	125		350	25	7.5	0	0	0	TPU & CTM	SCI
68376	16	24	4.5	5.5	125		350	25	7.5	0	0	0	TPU & CTM	SCI
MCF5206e	32	64	3	3.6	111		79	54	8K				2	2
MCF5307 (1)	32	32	3	3.6	265	220 mA	60.5 mA (typ.)	90	SRAM, 8K cache				2	2
MMC2001	32	32	1.8	3.3	68	6,000	272	33	32	256	0	0	PIT &	
MPC509	32	32	3	3.6	167			33	28, 4 cache	0	0	0	3	0
MPC555	32	32	3.0, 4.75	3.6, 5.25	302			40	26, 6 for TPUs	0	0	0	448	
MPC850					100									
MPC860	32	32	3.14	3.46	100	10	3,000	66	5K	6K	0	0	24	6
PowerPC 603e	64	32	2.5	3.3	2,400	84	60	300						
PowerPC 604e	64	32	2.5	3.3	7,200	52	44	233						
PowerPC 740	64	32	2.5	3.3	3,160	84	40	266						
PowerPC 750	64	32	2.5	3.3	3,560	96	40	300						
PowerPC EC603e	64	32	2.5	3.3	2,400	84	72	300						
NEC Electronics Inc., Santa Clara, CA, (408) 588-6000, www.necel.com														
V830	32	32	3	3.6	170	18	150	100	16K	0	0	0	0	0

on-board synchronous serial ports
 Number of on-board ADCs
 Number of bits of resolution per ADC
 Maximum number parallel I/O pins
 Number of PWM outputs
 Number of watchdog timers
 Maximum number of chip select outputs
 Number of interrupt pins to chip
 Number of interrupt priority levels
 Number of DMA channels
 Typical ipwca per 1,000
 Packages available

Integrated Device Technology Inc. (IDT), Santa Clara, CA, (408) 727-6116, www.idt.com

6 1 \$9.50 84 PLCC, 100 TQFP

7 1 \$18.60 144 TQFP

Kg Systems Inc., East Hanover, NJ, (973) 515-4664, www.industrialcontroller.com

4 10 to 12 36 2 1 \$59+ 44/46

Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com

2 5 2 \$18/10K 80 QFP

2 5 1 \$22/10K 80 QFP

Motorola, Austin, TX, (512) 895-2000, www.motorola.com

QSPI 0 43 2 1 12 7 8 0 132 PQFP, 144 TQFP

QSPI 0 47 16 on TPU 1 12 7 8 0 132 PQFP, 144 TQFP

QSPI 1 10 32 64 TPU, 4 CTM4 1 12 7 8 0 160 QFP

QSPI 1 10 32 16 TPU, 4 CTM4 1 12 7 8 0 160 QFP

8 1 8 3 7 2 \$9.14 160 QFP

16 1 8 4 7 4 \$16.51 208 QFP

ISPI 0 32 6 2 4 8 32 6 144 TQFP

0 0 0 58 0 2 13 7 32 0 1-160 pin PQFP

up to 32 32 10 65 up to 32 2 8 8 32 0 1 272 PBGA

1 8 8 7 2 256-pin BGA

8 0 59 8 1 8 20 7 2 357-pin BGA

1 1 1 240 CQFP, 255 CBGA

1 1 1 255 CBGA

1 1 1 255 CBGA

1 1 1 360 CBGA

1 1 1 255 CBGA

NEC Electronics Inc., Santa Clara, CA, (408) 588-6000, www.necel.com

0 0 0 0 0 0 4 16 16 0 \$9/10K 144 LQFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. standby current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board Flash/EEPROM in bytes	# of on-board counter/timers	No. on-board peripherals
V831	32	3	3.6	230	60	180	100	16K	0	0	0	2	1	
V832	32	2.3/3.0	2.7/3.6				140	16K	0	0	0	2	1	
V850/SA1	16	2.7	3.3	Varies	Varies	Varies	17	4K/8K	256K	0	256K	6	2	
V850E/MA1	16	3	3.6	Varies	Varies	Varies	50	4K/10K	128K/256K		256K	8	2	
V850E/MS1	16	3.0/4.5	3.6/5.5	Varies	Varies	Varies	40	4K	128K	0	128K	8	2	
V853A	16	4.5	5.5	Varies	Varies	Varies	33	4K/8K	128K	0	256K	5	2	
NETsilicon Inc., Waltham, MA, (781) 647-1234, www.netsilicon.com														
NET+ARM 5 and 10T	32	32	3	3.6	150	150	150	33	0	0	0	0	2	2
NET+ARM-12		32	32 bits	3	3.6	150	150	150	33	0	0	0	0	2
NET+ARM-15		32	32 bits	3	3.6	150	150	150	33	0	0	0	0	2
NET+ARM-40		32	32 bits	3	3.6	150	150	150	33	0	0	0	0	2
Parallax Inc., Rocklin, CA, (916) 624-8333, www.parallaxinc.com														
Basic Stamp														
Patriot Scientific Corp., San Diego, CA, (858) 674-5000, www.ptsc.com														
PSC1000	32	32	4.5	5.5	100	70	70	80	0	0	0	0	8	1
PSC1000A	32	32	3.0	3.6	75	50	50	100	0	0	0	0	8	1
PLX Technology, Sunnyvale, CA, (408) 774-9060, www.plxtech.com														
IOP 480	32	32	3.3	3.3	300			66					4	1
Tensilica Inc., Santa Clara, CA, (408) 986-8000, www.tensilica.com														
Xtensa			2.3, 1.6	2.8, 1.9	0.4mW/MHz	0.4mW/MHz	0.4mW/MHz	320MHz	16KB	16KB			3	
64 bits														
Integrated Device Technology Inc. (IDT), Santa Clara, CA, (408) 727-6116, www.idt.com														
RISController RC4640	32	32	3.135	3.465	1,200	110 mA	110 mA	267	Cache: 16K				1	
RISController RC4650	32, 64	32, 64	3.135	3.465	2,000	200 mA	200 mA	267	Cache: 16K				1	
RISController RC5000	32, 64	36	3.135	3.465	1,500	110 mA	120 mA	250	Cache: 64K				1	
RISController RC64474	32, 64	32, 64	3.135	3.465	1400	110 mA	110 mA	250	32K				1	
RISController RC64475	32, 64	32, 64	3.135	3.465	1600	110 mA	110 mA	250	32K				1	
RISController RC64574	32	32	2.38	2.63	880	120	120	250	64K				1	
NEC Electronics Inc., Santa Clara, CA, (408) 588-6000, www.necel.com														
VR4111	32	32	2.2/3.0	2.8/3.6	106	38	5	100					4	
VR4121	32	32	2.2/3.0	2.8/3.6	340	100	500	168					4	
VR4181	32	32	2.3/3.0	2.7/3.6	100	33	5	66	0	0	0	0	4	

# on-board synchronous serial ports	Number of on-board ADCs	Number of bits of resolution per ADC	Maximum number parallel I/O pins	Number of PWM outputs	Number of watchdog timers	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Typical price per 1,000	Packages available
1	0	3	0	0	8	9	16	4		\$14.50/10K	160 LQFP
1	0	22	0	0	8	9	16	4		\$16/10K	160 LQFP
4	12	10	85	0	1	0	8	3		\$7.50-\$25/10K	100 LQFP
2	8	10	106	0	0	0	25	8	4	\$10-\$30/10K	144 LQFP
2	8	10	100	0	0	0	25	8	4	\$9-\$28/10K	144 LQFP
2	0	10	85	2	0	0	17	8	0	\$7.50-\$25/10K	100 LQFP
NETsilicon Inc., Waltham, MA, (781) 647-1234, www.netsilicon.com											
2	0	0	24	0	1	5	4	1	5	\$12.50/10K	208 PQFP
2	2	0	0	24	0	1	5	4	1	\$27.50/10K	10
2	2	0	0	24	0	1	5	4	1	\$22.95/10K	10
2	2	0	0	24	0	1	5	4	1	\$24.95/10K	10
Parallax Inc., Rocklin, CA, (916) 624-8333, www.parallaxinc.com											
										\$34-\$59	
Patriot Scientific Corp., San Diego, CA, (858) 674-5000, www.ptsc.com											
1	1	8	8	1	0	4	8	8	8	\$11.50	100 PQFP
1	1	8	8	1	0	8	8	8	8	\$11.50	100 PQFP
PLX Technology, Sunnyvale, CA, (408) 774-9060, www.plxtech.com											
			32 PCI; 32 local		1	4	3	2	3	\$32.00/ \$37.00	208 PQFP/225 PBGA
Tensilica Inc., Santa Clara, CA, (408) 986-8000, www.tensilica.com											
							32	6			
Integrated Device Technology Inc. (IDT), Santa Clara, CA, (408) 727-6116, www.idt.com											
							7	1		\$33.10	128 PQFP
							7	1		\$43.95 @ 267 MHZ	208 QFP
							7	1		\$134.50	272 SBGA
							7	1		\$37.05	128 QFP
							7	1		\$44.50	208 QFP
										\$37.30	128 QFP
NEC Electronics Inc., Santa Clara, CA, (408) 588-6000, www.necel.com											
2	1	10				GPIO	GPIO		5	\$20/10K	224 FPBGA
2	1	10				GPIO	GPIO		5	\$25/10K	224 FPBGA
2	1	12				GPIO	GPIO		4	\$19 /10K	160 LQFP

MICROCONTROLLERS/EMBEDDED MICROPROCESSORS

Product name	Data bus width, in bits	Address bus width, in bits	Supply voltage, minimum	Supply voltage, maximum	Maximum current consumption in mA	Max. static current consumption, μ A	Max. sleep current consumption, μ A	Maximum clock speed	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes	Size of on-board EPROM in bytes	Size of on-board Flash EPROM in bytes	# of on-board counter/timers	No. on-board synchronous serial ports
VR4300	32	32	3	3.5	900	675,000		133	24KB cache				1	
VR4305	32	32	3	3.6	600	450,000		80	24KB cache				1	
VR4310	32	32	3	3.5	850	637,500		167	24KB cache				1	
VR5000	64	64	3.135	3.465	2,790			250	64KB cache				1	
VR5432	32	32	2.35/ 3.0	2.65/ 3.6				167	64KB cache				1	
VR5464	64	64	2.35/ 3.0	2.65/ 3.6				250	64KB cache				1	
Quantum Effect Design Inc., Santa Clara, CA, (408) 565-0300, www.qedinc.com														
RM5230 Microprocessor	32	32	3.135	3.465	2,250	120,000		175	16K icache/ 16K dcache				1	
RM5231 Microprocessor	32	32	2.375	2.625	2,170	140,000			32K icache/ 32K dcache				1	
RM5261 Microprocessor	64	64	2.375	2.625	2,750	150,000		266	32K icache/ 32K dcache				1	
RM5271 Microprocessor	64	64	2.375	2.625	2,750	150,000			32K icache/ 32K dcache / L2 inter- face				1	
RM7000 Microprocessor	64	64	2.375	2.625	4,925	176,000		263	16K icache/ 16K dcache / 256K L2 / L3 interface				2	



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on-board synchronous serial ports
 Number of on-board ADCs
 Number of bits of resolution per ADC
 Maximum number parallel I/O pins
 Number of PWM outputs
 Number of watchdog timers
 Maximum number of chip select outputs
 Number of interrupt pins to chip
 Number of interrupt priority levels
 Number of DMA channels
 Typical price per 1,000
 Packages available

						6	1 + NMI	\$16- \$18/10K	120 PQFP
						6	1 + NMI	\$9/100K	120 PQFP
						6	1 + NMI	\$18-\$22/ 10K	120 PQFP
						7	1 + NMI	\$80-\$110/ 10K	272 ABGA, 223 PGA
						6	1 + NMI	\$45/10K	208 PQFP
						6	1 + NMI	\$75-\$95/ 10K	272 ABGA
Quantum Effect Design Inc., Santa Clara, CA, (408) 565-0300, www.qedinc.com									
						7	1		128 P-Quad
						7	1		128 P-Quad
						7	1		208 P-Quad
						7	1		304 SBGA
						11	16		304 SBGA

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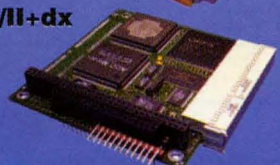
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DIGITAL SIGNAL PROCESSORS

Processor family name	This processor is, in bits	External data bus width is, in bits	External address bus width is, in bits	Supply voltage, minimum	Supply voltage, maximum	Max. current consumption (in milliamperes)	Max. current cons., standby, microamps	Max. current cons., sleep, microamps	Maximum clock speed, Mhz	Instructions executed per clock	Scheduled MIPS rate	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes
Analog Devices, Norwood, MA, (781) 329-4700, www.analog.com													
ADSP-21060L	32 bits floating point	48	32	3.15-4.75	3.45-5.25	475-670	180mA-200mA		40	1	40	512k	0
ADSP-21061	32 bits floating point	48	32	4.75	5.25	670	55 mA		50	1	50	128k	0
ADSP-21061L	32 bits floating point	48	32	3.15	3.45	425	50mA	16	44	1	44	128K	0
ADSP-21062 SHARC 32-bit DSP	32 bits floating point	48	32	3.15-4.75	3.45-5.25	475-670	180mA-200mA		40	1	40	256k	0
ADSP-21065L SHARC	32 bits floating point	32	24	3.13	3.6	270	20mA		66	1	66	68k	0
ADSP-21160	32 bits floating point	64	32	3.13/2.37	3.47/2.63				100	1	100	512k	0
ADSP-2181	16	24	16	4.5	5.5				40	1	40	80K	
ADSP-2183	16	24	16	3	3.6	42			52	1	52	80K	
ADSP-2184	16	16	24	4.5	5.5	64	12000	100	40	1	40	20k	0
ADSP-2184L	16	16	24	3	3.6	48	8600	100	40	1	40	20k	0
ADSP-2185	16	24	16	4.5	5.5	72			33	1	33	80K	
ADSP-2185L	16	24	16	3	3.6	42			52	1	52	80K	
ADSP-2186	16	24	16	4.5	5.5	72			40	1	40	40K	
ADSP-2186L	16	24	16	3	3.6	42			40	1	40	40K	
ADSP-2187L	16	24	16	3	3.6	42			52	1	52	160K	
ADSP-2189L	16	24	16	2.25	3.6	26.4			66	1	66	192K	
DSP Group Inc., Santa Clara, CA, (408) 986-4300, www.dspg.com													
OakDSPCore	16	16	16	1.8	5.5	0.6		0.5	95	1	95		
PalmDSPCore (actually 3 cores: 16, 20, 24-bit) fixed point DSP	16	16	16	1.8	5.5			0.2	200	Up to 18	450		
Teak - DSP Core	16	16	16	1.8	5.5	0.25		0.15	140	Up to 2	180		
TeakLite DSP Core	16	16	16	1.8	5.5	0.2		0.1	140	1	140		
Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers													
Carmel	16 bits	16	24	2.25	2.75				120	15	1800		
Lucent Technologies, Murray Hill, NJ, (908) 582-2334, www.lucent-inferno.com													
DSP1604/1606	16	16	16	3.3, 5		100	38 mA		40	1	32/33/40	512-word dual-port	16K and 24K-word
DSP1605/1607	16	16	16	5		100			40	1	32/33/40	1K-word, dual-port	16K-word
DSP1609	16	16	16	3.3, 5		100	136mA/5.9mA		80/100	1	80/100	2K-word	24K-word
DSP1610	16	16	16	4.75		90	12mA	12 mA	40	1	40	4K-word, 8K-word	512-word
DSP1611	16	16	16	2.7, 5		85@5V, 32@2.7V			26/50	1	26/30/50	124K-word	2K-word

Number of on-board routines/routers	# on-board synchronous serial ports	# on-board synchronous serial ports	Number of on-board ADCs	Maximum number of chip-select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Packages available (pin count and type)	Typical price in 1,000 quantities	Intended application
Analog Devices, Norwood, MA, (781) 329-4700, www.analog.com										
1	0	2	4	3	29		10	240 PQFP, 225 PBGA	\$258	Multiprocessing
1	0	2	4	3	25		6	240 PQFP	\$52	General Purpose DSP for audio, multi-axis motor control and factory automation, medical imaging, telecomm infrastructure.
1	0	2	4	3	25		6	240 PQFP, 225 PBGA	\$35	Audio, telecomm infrastructure, industrial motor control and factory automation, medical imaging.
1	0	2	4	3	29		10	240 PQFP, 225 PBGA	\$89	Multiprocessing
2	0	2	4	3	29		10	208 PQFP, 196 BGA	\$30	Audio, automotive, industrial, biometrics, Desktop and central office communications.
1	0	2	4	3	32		14	400 PBGA	\$180	Multiprocessing, telecomm, biomedical, imaging, and audio.
1			5	4	1		2	128 PQFP, TQFP	\$17	General Purpose 16-bit DSP.
1		2	5	4	1		2	128 TQFP, 144 mini-BGA	\$18	General Purpose 16-bit, portable applications.
1	0	2	0	5	4	1	2	100 LQFP	\$9	General Purpose 16-bit applications.
1	0	2	0	0	4	1	2	100 LQFP	\$9	General Purpose 16-bit applications.
		2	5	4	1		2	100 TQFP	\$18	General Purpose 16-bit DSP.
1		2	5	4	1		2	100 TQFP	\$18	General Purpose 16-bit DSP.
1		2	5	4	1		2	100 TQFP	\$12	General Purpose 16-bit DSP.
1		2	5	4	1		2	100 TQFP	\$14	General Purpose 16-bit DSP, portable applications.
1		2	5	4	1		2	100 TQFP	\$31	
1		2	5	4	1		2	100 TQFP	\$39	General Purpose 16-bit, portable applications.
DSP Group Inc., Santa Clara, CA, (408) 986-4300, www.dspg.com										
				5	5		Varies			Speech and audio processing, wireless and telephony communications, modems and many other embedded control applications.
				6	4		Varies			
				6	6		Varies			Designed for low-power speech and audio processing, multimedia and wireless communications, high-speed modems, advanced telecommunication systems and various embedded control applications.
				5	5		Varies			
Infineon Technologies, San Jose, CA, (408) 501-6385, www.infineon.com/microcontrollers										
				8	8		8	447 CPGA		UMTS, ADSL
Lucent Technologies, Murray Hill, NJ, (908) 582-2334, www.lucent-inferno.com										
2	1			1	0 nesting/ 19 interrupts					Consumer
2				1	0 nesting/ 19 interrupts			80 MQFP		Consumer
2	1	1		1	0 nesting/ 17 interrupts			28 SOJ, 44 PLCC		Consumer
1	2			4	0 nesting/ 19 interrupts			132 PQFP		Wireless
1	2			2	0 nesting/ 19 interrupts			100 BQFP, TQFP		Wireless

DIGITAL SIGNAL PROCESSORS

Processor family name	This processor is, in bits	External data bus width is, in bits	External address bus width is, in bits	Supply voltage, minimum	Supply voltage, maximum	Max. current consumption (in milliamperes)	Max. current cons., standby, microamps	Max. current cons., sleep, microamps	Maximum clock speed, MHz	Instructions executed per clock	Sustained MIPS rate	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes
DSP1616	16	16	16	2.7		32@2.7V			50	1	26/50	2K-word	12K-word
DSP1617	16	16	16	2.7, 5		100@5V, 32 @ 2.7V			30/50	1	26/50	4K-word	24K-word
DSP1618	16	16	16	2.7, 5		75@5V, 34@2.7V			30/50	1	26/50	4K-word	12K-word, 16K-word
DSP1620	16	16	16	3, 5		105/133			90/120	1	90/120	32K-word	4K-word
DSP1627	16	16	16	2.7, 5		98mA@5V, 39mA@2.7			50/70	1	80/90/100	6K-word	32K-word, 36K-word
DSP1628	16	16	16	2.7		66mA@ 2.7V			78	1	78	16K-word	48K-word
DSP1629	16	16	16	2.7, 3		63mA@ 3V	80MHz, 78mA@3V		80/100	1		10K-word, 16K-word	48K-word
Motorola, Austin, TX, (512) 895-2000, www.motorola.com													
DSP56300		24	24	3.14	3.46	84-160	5000	100	66 - 150	1 to 2	66 - 255	24 - 384K	0
DSP56362		24		3.14	3.46	181	11	150	100	1 per clock	100	42k	126k
DSP56364		24		3.14	3.46	181	11	150	100	1 per clock	100	9k	24k
DSP56800		16		3.3V					40		20		
Oxford Micro Devices, Monroe, CT, (203) 445-0562, www.oxfordmicrodevices.com													
Ax36	16	24	24	4.75	5.5 core	400			40 CPU, 100 memory	12-100	480-4000		
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com													
R.E.A.L. DSP Core	16	16	16	1.5	3.3/2.8	20			90		150	64K	
Sharp, Mahwah, NJ, (201) 529-8200, www.sharp-usa.com													
Butterfly DSP BDSP91V24	24 bit block floating point	48		3	3.6	1000			80	1.9 BOPs	1.9 BOPs		
STMicroelectronics, Grenoble, France, +33 4 76 58 58 00, www.st.com													
D950 DSP CORE	16	16	16	2.25	2.8				100	1	100 Mips WC (125°C,		
ST100 DSP-MCU Core	16	32	32	1	2	1			300	8 operations	600MACS / 2400		
Texas Instruments Inc., Stafford, TX, (800) 477-8924, www.ti.com													
TMS320C24x	16	16	16	4.5	5.5	80	7000	400	20	1	20	1088	8K-32K
TMS320C3x	32 bits floating point	32	24	3.3v I/O, 1.8v core	5	80 to 250	50 to 150	50	60	1	75	2-136K	16K
TMS320C4x	32 bits floating point	32	32	5	5	100 to 325	50 to 150mA	50	60	1	25 to 30	8K	Boot loader
TMS320C54x	16	16	16	1.8	3.3	.32mAA/ mip	1 micramp	1µA	100	1	200	200K words	48K words
TMS320C5x	16	16	16	3.3	5	94 mA @ 5 V	5 A @ 5 V	10mA @5 V	100	1	50	10K words	32K words

Number of on-board counter/timers	# on-board synchronous serial ports	# on-board asynchronous serial ports	Number of on-board ADCs	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Packages available (pin count and type)	Typical price in 1,000 quantities	Intended application
1	2			2	0 nesting/ 19 interrupts			100 TQFP		Wireless
1	2			2	0 nesting/ 19 interrupts			100 TQFP		Wireless
1	2			2	0 nesting/ 19 interrupts			100 TQFP		Wireless
1	2			4	0 nesting/ 19 interrupts		2	132 BQFP, 144 TQFP		Wireless
1	2			2	0 nesting/ 19 interrupts			100 TQFP		Wireless
1	2			2	0 nesting/ 19 interrupts			100 TQFP, 144 BGA		Wireless
1	2			2	0 nesting/ 19 interrupts			144 PBGA, 100 TQFP		Wireless
Motorola, Austin, TX, (512) 895-2000, www.motorola.com										
3	1	2	0	4	4	4	6	196 PBGA, 252 PBGA, 144 TQFP, 208 TQFP	\$48.90	Wireless infrastructure, Internet telephony, multi-channel wireless local loop, network interface cards, high-speed modem banks, DSP resource boards.
3	0	8		4	4	4	6	144 LQFP	\$21	Consumer audio apps. A general purpose DSP56362, a multimode, multichannel, and audio decoder for consumer apps are also available.
0	0	8		2	3	4	6	100 TQFP, 112 QFP	\$11	Consumer audio apps, provides a silicon solution for receivers, TVs, minisystems, automotive and portable minisystems.
	2	1								Digital cordless, advanced paging, DATD.
Oxford Micro Devices, Monroe, CT, (203) 445-0562, www.oxfordmicrodevices.com										
1	1	1			5	5	3	208 PQFP	\$30	Optimized for simultaneous and continuous image capture, processing, display and communications at low-cost in mass market applications.
Philips Semiconductors, Sunnyvale, CA, (408) 991-2000, www.semiconductors.philips.com										
				16	1		1 to 16	DSP Core to be used within an ASIC design		Cellular phones, consumer devices
Sharp, Mahwah, NJ, (201) 529-8200, www.sharp-usa.com										
								352 SBGA		Frequency domain processing, adaptive FIR filtering, image processing, radar, sonar, spectral analysis.
STMicroelectronics, Grenoble, France, +33 4 76 58 58 00, www.st.com										
										Telecom, datacom, multimedia embedded applications.
										Cellular phones, telecom, datacom, hard disk drive, multimedia, engine management.
Texas Instruments Inc., Stafford, TX, (800) 477-8924, www.ti.com										
3	1 SCI	1 SPI	2		6	6		64 PQFP, 68 PLCC, 132 PQFP, 144 TQFP	\$3 to \$15	Digital motor control systems, industrial automation, white goods, UPS systems, HVAC systems.
2		2		4	11	11	1 to 2	181 CPGA, 132 PQFP, 144 PQFP, 144 TQFP	\$5 to \$25	Embedded control, audio, 3-D graphics, scanners, voice mail.
2				4	14	22	6	325 CPGA, 304 PQFP, 388 BGA	\$20	3-D graphics, virtual reality, high-speed communications.
2	0	3	0		5	11	12	100 TQFP, 128 TQFP, 132 PQFP, 144 TQFP, 128 PBK, 144 BGA, 176 BGA	\$5 to \$50	Telecommunications, voice/speech, industrial, control, portable, wireless, wireline communications, consumer.
1		1 to 2			5	11		100 TQFP, 128 TQFP, 132 PQFP, 144 TQFP	\$9.95 to \$150	Telecommunications, voice/speech, industrial, control.

DIGITAL SIGNAL PROCESSORS

Processor family name	This processor is, in bits	External data bus width is, in bits	External address bus width is, in bits	Supply voltage, minimum	Supply voltage, maximum	Max. current consumption (in milliamperes)	Max. current cons., standby, microamps	Max. current cons., sleep, microamps	Maximum clock speed, MHz	Instructions executed per clock	Subtotal MIPS rate	Size of on-board RAM in bytes	Size of on-board masked ROM in bytes
TMS320C62x	16	32	24	1.8v core	3.3v I/O	2.5A	850 typical	300mA	250	8	2,000	384K, 72K Li/L2 cache memory	
TMS320C67x	32 bits floating point	32	24	1.8	3.3	2.5A	254 mA	less than 10 mA	167	8	1,336	128K	
TMS320C8x	64 bits fixed point	64	32	3.3	3.3	3.3	1.4mA		60	1	60 (for master processor)	44-50K	
TMS320X24x	16	16	16	3	3.6				30	1	30	5.0K	512
ZiLOG, Campbell, CA, (408) 558-8599, www.zilog.com													
Z893x1 DSP Family	16	16		4.5	5.5	55			20	1	20	1024 (2x 256 word banks)	8192 (4k words)
Z893x3 DSP Family	16	16		4.5	5.5	55	250	50	20	1	20	1024 (2x 256 word banks)	16384 (8k words)
ZSP Corp., Santa Clara, CA, (408) 986-1686, www.zsp.com													
ZSP16400	16	16	16	<1.8	3.6	1.8V+	<50	0	200	up to 4	400 DSP MIPS	<124K	4K

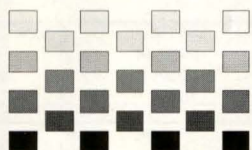
Number of on-board counter/timers	# on-board synchronous serial ports	# on-board synchronous serial ports	Number of on-board ADCs	Maximum number of chip select outputs	Number of interrupt pins to chip	Number of interrupt priority levels	Number of DMA channels	Packages available (pin count and type)	Typical price in 1,000 quantities	Intended application
2	0	3	0		5	14	4, 16	352 BGA, 35mm/27mm/18mm, 256 BGA	\$21 to \$246	Wireless base stations, RAS, ADSL, imaging, voice over network, multi-channel telephony.
2	0	2	0	4	4	14	16	352 BGA, Military version: 429 ceramic BGA, 256 BGA	\$22 to \$140 in 25K units	Wireless local loop and beam-forming base stations, 3-D graphics, medical imaging, virtual reality, speech recognition, audio, radar, CAT scan, MRI.
1 to 3					4	2		305 CPGA, 352 BGA	\$128	Image processing, videoconferencing, high-speed telecommunications.
4	1	1	2	3	4	6	0	144 TQFP, 100 TQFP, 64 TQFP, 132 PQFP, 68 PLCC, 64 PQFP	\$3 to \$18	Targeted at three end-equipments: Hi-End Industrial Systems, Multi-Function Motor Control, and Appliances and Consumer. Inclusive to these three market segments are Industrial drives, HVAC, Washing machines and UPS.
ZiLOG, Campbell, CA, (408) 558-8599, www.zilog.com										
1		1		7	3	3		40 PDIP, 44 PLCC, 44 PQFP	\$3.84 in 5ku 44 PLCC ROM	Security, wireless communications, medical, industrial & military measurement and control, voice recognition, audio, UPS and power converters.
3		1 SPI port	4-channel half-flash	7	3	3		44 PLCC, 44 PQFP, 64 TQFP, 68 PLCC, 80 PQFP	\$4.49 in 5ku 44 PLCC ROM	Security, wireless communications, medical, industrial & military measurement and control, voice recognition, audio, UPS and power converters.
ZSP Corp., Santa Clara, CA, (408) 986-1686, www.zsp.com										
2	2	0	0	12	6	6	16401 1DMA, 16402 8DMA	16401 160 PQFP, 16402 208 PQFP	\$65 to \$85	High-performance communications infrastructure.

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- Power PC
- M-Core
- PCI

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FLASH MEMORY

Device name	Configuration, in # of words by word size	Max. access time, in nanoseconds	Minimum access time	Supply voltage, minimum	Supply voltage, maximum	Max. active current consumption, in mA	Max. standby current consumption, in μ A	Block size, bytes	Write protect - whole chip	Write protect - individual blocks	Serial data access	Random data access	Packages available	Process technology	Mean # times device can be programmed (in thousands)	Typical price	Comments
Advanced Micro Devices, Sunnyvale, CA, (800) 538-8450, www.amd.com																	
Am28Fxxx	256K - 2MB; x8	250	75	10.8	13.2	30	1	bulk			✓		PDIP, PLCC, TSOP	0.85	100		Not recommended for new designs.
Am29BLxxx	8MB - 16MB; x16	120(26)	65(18)	2.7	3.6	40	10		✓	✓	✓	✓	SSOP	0.32	1K		Compatible with burst enabled processors for high-performance systems.
Am29DLxxx	8MB - 32MB; x8/x16	120	70	2.7	3.6	45	5		✓	✓		✓	TSOP, SSOP, FBGA	0.32	1K		Simultaneous Read/Write Flash allows the reading of one memory bank while writing or erasing the other memory bank with zero latency when switching between banks.
Am29Fxxx	1MB - 32MB; x8/x16	150	45	4.5	5.5	50	5		✓	✓		✓	PDIP, PLCC, TSOP, SOIC	0.32	1K		Broad standard product offering.
Am29LVxxx	1MB - 64MB; x8/x16	120	45	2.7	3.6	30	5		✓	✓		✓	TSOP, PLCC, FBGA	0.23	1K		Automatic Sleep mode reduces current consumption to 200nA.
Am29PLxxx	16MB; x8/x16	120(30)	60(25)	2.7	3.6	50	5		✓	✓	✓	✓	TSOP, SOIC	0.32	1K		Compatible with page MROM.
Am29SLxxx	8MB - 16MB; x8/x16	150	100	1.8	2.2	25	5		✓	✓		✓	TSOP, FBGA	0.32	1K		
Centennial Technologies Inc., Wilmington, MA, (978) 988-8848, www.cent-tech.com																	
	Varies								✓		✓	✓	Varies	Linear Flash			Memory solutions for many apps including ATA, Linear Flash, DRAM, SIMMs and DIMMs. Our line includes PC Cards, as well as Compact and Miniature Cards.
Hitachi Semiconductor (America) Inc., San Jose, CA, (408) 433-1990, www.hitachi.com/semiconductor																	
128MB AND-type Flash Memory		5 μ s	50ns	3.3	5	120	200	512			✓		48 TSOP II	0.35	300	\$27.00	
256MB AND-type Flash Memory		50 μ s	50	3.3	5	60	100	2048			✓		48 TSOP I	0.25	100	\$50	
64MB AND-type Flash Memory		5 μ s	50ns	3.3	5	60	100	512			✓		48 TSOP II	0.35	300	\$15.00	
Intel Corp., Santa Clara, CA, (800) 628-8686, www.intel.com																	
1.8V Adv Boot Block	16MB (x16)	90	45	1.65	1.95	15	15	64K	✓	✓		✓	55 uBGA, 48 TSOP	.25 μ m	100K		128-bit Protection Register.
2.4V Adv+ Boot Block	8, 16, 32MB (x16)	100	30	2.4	3	12	25	64K	✓	✓		✓	48 TSOP, uBGA	.25 μ m	100K		
3.0V Adv Boot Block	8, 16, 32MB (x8 and x16)	80	30	2.7	3.6	18	35	64K	✓	✓		✓	48 TSOP, uBGA, 40 TSOP	.25 μ m	100K		
3.0V Adv+ Boot Block	8, 16, 32MB(x16)	80	30	2.7	3.6	18	25	64K	✓	✓		✓	48 TSOP, uBGA	.25 μ m	100K		128-bit Protection Register.
3/5V FlashFile Memory	4, 8, 16, 32MB (x8 and x16)	65	30	2.7	5.5	50	100	64K	✓	✓		✓	56 TSOP/SSOP, 44 PSOP, 40/48	.4 μ m	100K		Some have fast page-buffer writes.
3V Fast Boot Block	8 and 16MB (x16)	14	25	2.7	3.6	55	50	64K	✓	✓		✓	56 TSOP, SSOP, uBGA, 64 Easy BGA	.4 μ m	100K		Burst and Page Mode Reads.
5V Boot Block	2,4 and 8MB (x8 and x16)	55	30	4.5	5.5	65	150	128K	✓	✓		✓	44 PSOP, 40/48 TSOP	.4 μ m	100K		16K Boot Block, 8Kbyte Parameter Blocks (2 each).

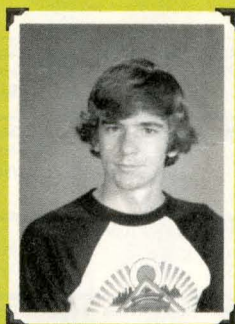
FLASH MEMORY

Device name	Configuration, in # of words by word size	Max. access time, in nanoseconds	Minimum access time	Supply voltage, minimum	Supply voltage, maximum	Max. active current consumption, in mA	Max. standby current consumption, in μ A	Block size, in bytes	Write protect - whole chip	Write protect - individual blocks	Serial data access	Random data access	Packages available	Process technology	Mean # time device can be programmed (in thousands)	Typical price	Comments
5V Intel StrataFlash	32 and 64Mbit (x8 and x16)	120	50	4.5	5.5	55 (CM OS)	150 (CM OS)	128K	✓	✓	✓	✓	56 SSOP, TSOP, uBGA	0.4 μ m	100K		
Mitsubishi Electronics America Inc., Sunnyvale, CA, (408) 730-5900, www.mitsubishichips.com																	
M5M29GT/B61BWG	1-mega-word x 16-bit (1M x 16); 2 megaword x 8-bit (2M x 8)	70	100	2.7	3.6	15	5	64K	✓	✓	✓	✓	32 TSOP, PLCC, PDIP	.45 μ m	100	\$7.80/10K	This third-generation 16-Megabit Alternating BGO (BackGround Operation) DINOR Flash Memory product can perform program or erase operations in one bank, in the background, while code fetching.
Samsung Semiconductor, San Jose, CA, (408) 544-4000, www.usa.samsungsemi.com																	
NAND-based flash		50 to 120		2.7	3.6 to 5.5	20 to 40	50 to 100	4K to 16K		✓			48 pin chip scale package	0.25 μ m	1K		
Silicon Storage Technology Inc., Sunnyvale, CA, (408) 369-1500, www.ssti.com																	
High Speed Multi-Purpose Flash (MPF) Memory	x8	55	30	3	3.6	25	20	4K or 64K			✓		44 TSOP2		100K		Separate sector erase (4K) and block erase (64K) commands. 5V I/O interface.
High Speed Multi-Purpose Flash (MPF) Memory 39LH200/400/400Q/800	x16	55	30	3	3.6	25	20	4K or 64K			✓		40 TSOP	.33 μ	100K		Separate sector erase (4K) and block erase (64K) Commands 5V I/O interface with Vddq pin on Q parts.
High Speed Multi-Purpose Flash (MPF) Memory	x8	45	30	3	3.6	12	15	4K			✓		48 TSOP, TFBGA	0.33	100K		
Many Time Programmable (MTP) SuperFlash Memory 27SF256/512/010/020	x8	70	35	4.5	5.5	30	50				✓		32 TSOP, PLCC, PDIP	0.33	1K	\$0.85-\$1.50	EPROM/OTP pin compatibility. Programmed using programmer.
Many Time Programmable (MTP) SuperFlash Memory 37VF512/010/020/040	x8	70	35	2.7	3.6	12	15				✓		32 TSOP, PLCC, PDIP for 27 SF010/020, 32 TSOP, PLCC, 28 PDIP for 27 SF256/512	0.45	1K	\$0.95-\$2.30	Programmed using programmer.
Multi-Purpose Flash (MPF) Memory 39SF512/010/020	x8	70	35	4.5	5.5	30	50	4K			✓		32 TSOP, PLCC, PDIP	.33 μ	100K	\$1.10-\$1.80	
Multi-Purpose Flash (MPF) Memory 39VF080Q/016Q	x8	70	35	2.7	3.6	20	10	4K or 64K			✓		32 TSOP, PLCC, PDIP	0.45	100K		Separate sector erase (4K) and block erase (64K) commands. 5V I/O interface.
Multi-Purpose Flash (MPF) Memory 39VF200/400/400Q/800 Q/160/160Q	x16	70	35	2.7	3.6	20	10	4K or 64K			✓		40 TSOP	.33 μ	100K		Separate sector erase (4K) and block erase (64K) commands. 5V I/O interface with Vddq pin on Q parts.
Multi-Purpose Flash (MPF) Memory 39VF512/010/020/040	x8	70	35	2.7	3.6	12	15	4K			✓		48 TSOP, TFBGA	0.33	100K	\$1.15-\$2.70	
Page Mode SuperFlash EEPROM 29EE512/010/020	x8	70	30	4.5	5.5	30	50	128			✓		32 TSOP, PLCC, PDIP	0.33	100K	\$1.20-\$2.00	Page program, no sector erase command needed.
Page Mode SuperFlash EEPROM 29LE512/010/020	x8	150	60	3	3.6	12	15	128			✓		32 TSOP, PLCC, PDIP	.6, .5	100K	1.20-\$2.00	Page program, no sector erase command needed.
Page Mode SuperFlash EEPROM 29VE512/010/020	x8	200	100	2.7	3.6	12	15	128			✓		32 TSOP, PLCC, PDIP	.6, .5	100K	\$1.20-\$2.00	Page program, no sector erase command needed.
Sector Erase, Byte Program SuperFlash EEPROM 28SF040A	x8	90	45	4.5	5.5	32	20	256			✓		32 TSOP, PLCC, PDIP	.6, .5	100K	\$2.50-\$3.50	

FLASH MEMORY

Device name	Configuration, in # of words by word size	Max. access time, in nanoseconds	Minimum access time	Supply voltage, minimum	Supply voltage, maximum	Max. active current consumption, in mA	Max. standby current consumption, in μ A	Block size, bytes	Write protect - whole chip	Write protect - individual blocks	Serial data access	Random data access	Packages available	Process technology	Mean # times device can be programmed (in thousands)	Typical price	Comments
Sector Erase, Byte Program SuperFlash EEPROM 28VF040A	x8	150	75	2.7	3.6	10	20	256					32 TSOP, PLCC, PDIP	.45 μ	100K	\$2.50-\$3.50	
SMART Modular Technologies, Inc., Fremont, CA, (510) 623-1231, www.smartmodulartech.com																	
Compact Flash Cards	65,536K x 8	255ns	< 8	3.3	5	80	6	512					50	CMOS	300		
Flash Miniature Cards	8,192K x 8	150	120	3.3	5	80	6	64,000					60 minicard	CMOS	1 million		
High Density IDE Flash Drives	262,144K x 8	255	< 8	3.3	5	80	6	512					44 IDE interface	CMOS	300		
Linear Flash PC Cards	65,536K x 8	150	90	3.3	12	80	6	128,000					68 Type I	CMOS	1 million		
Low Density ATA and IDE Flash PC Cards	262,144K x 8	255	< 8	3.3	5 + or - 5%	80	6	512					68 Type II	CMOS	300		
Waferscale Integration Inc., Fremont, CA, (510) 656-5400, www.waferscale.com																	
EasyFLASH 9XX Family		90		4.5	5.5	30	200		✓	✓		✓		.35 μ CMOS	100	\$6.62	Integrates up to 512K x 8 Flash, a second 32K x 8 concurrent Flash, up to 8K x 8 SRAM programmable logic, and JTAG ISP programming onto a single 8-Bit MCU companion IC.
EasyFLASH PSD8XX Family		90		3.0	5.5				✓	✓		✓				\$7.53	Integrates up to 512K x 8 Flash, a second 32K x 8 concurrent Flash, up to 8K x 8 SRAM programmable logic, and JTAG ISP programming onto a single 8-Bit MCU companion IC.

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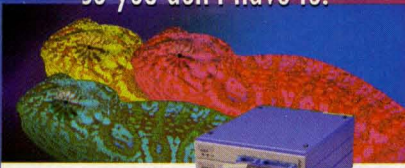


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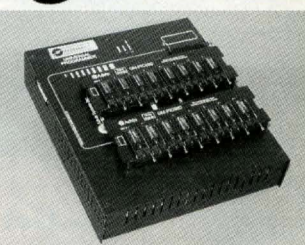
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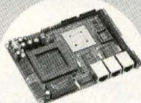
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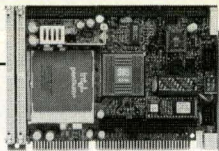
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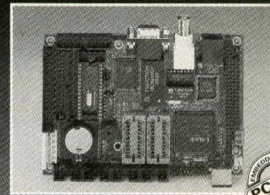
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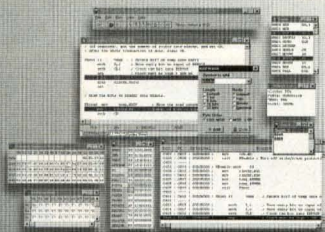
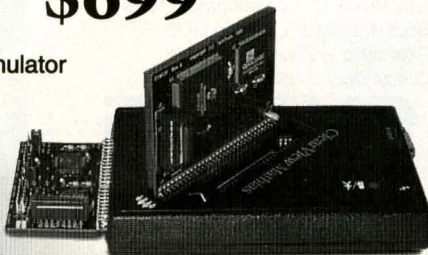
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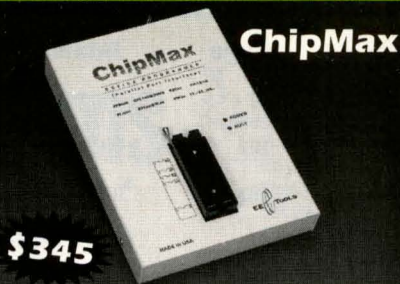
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- 62 ☐ Hardware/Software Co-Verification Tools
- 63 ☐ None of the above

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- 07 ☐ Industrial Controls
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- 10 ☐ Other: (please specify) _____

6. What is your engineering/development responsibility? (Please check only one)

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By buying, rather than building, you can literally have much of the hardware working in days.

Though the recurring cost of the scope might be somewhat higher, in this case it was offset by lower engineering dollars and faster time to market.

The cost to design, produce, and repair custom computer boards is astronomical. Especially in low-volume applications, wise designers will consider buying an off-the-shelf computer. There are so many choices, from PC-104 for smaller form factors to VME for high-end computing. By buying, rather than building, you can literally have much of the hardware working in

days. Roll your own and it'll be months before any hardware is ready for the firmware folks.

You'll find just about any I/O board imaginable in these pages. Data acquisition cards, for example, will support 20+ bits of A/D resolution at just about any desired conversion speed. DSP add-ons let you offload signal processing chores to a separate processor. Digital I/O, communications controllers, and hundreds of other choices exist.

Many of these offerings come with quite complete software support. If you want to boot Windows CE, Linux, or a commercial RTOS, you'll find that vendors offer "board support packages" (BSPs) that include all of

the custom code needed to tie the software to the hardware. Internet connectivity, data processing algorithms, and the like come pre-tuned to particular cards. These are complete systems, ready to go. Build your own, and it's up to you to get memory chip selects working, the C startup code going, and a lot more before even a simple null loop works, let alone something as complex as Linux.

I've seen demos at shows where the real brains of the system live in a rack



of boards hidden under the draped table—the tricky engineers satisfy marketing's show frenzy by getting something working using standard cards. Sometimes off-the-shelf boards are the best solution for prototypes, since speed is more important than cost.

In the industrial controls market, standard boards are sometimes the preferred solution: they're modularly replaceable in the field, so union-scale workers can keep the system alive using a relatively small set of spares; the cards can be purchased, meeting stringent environmental specs; and at times a single set of spares can support many different instruments. Never underestimate the importance of repairs to factory process control people. A system that's down waiting for parts might cost the customer millions of dollars per day.

Though using standard boards may give a somewhat larger form factor and higher recurring cost (at least in high volumes), they offer reliability, performance, lower depot repair costs, and immediacy. If HP, a company renowned for engineering excellence, uses standard cards, surely it's something we all should consider.

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	Data acquisition boards										Days of free phone support						
	Daughter cards and modules										BBS/Web FAQs, bug fixes, other						
	I/O boards										Phone support, standard						
	DSB boards										Phone support, 24-hour response						
	Special purpose boards										Product updates						
	Full custom boards										Training						
AAEON Electronics, Inc., Hazlet, NJ, (732) 203-9300, www.aaeon.com																	
ISA, Other											U	U	U				
Accelent Systems Inc., Akron, OH, (330) 864-2300, www.accelent.com																	
PCMCIA, Other	√		√	√	√			√	√							2,995	
ACT/Technico, Ivyland, PA, (215) 957-9071, www.acttechnico.com																	
VME, PCI, PC/104, ISA, PCMCIA, CompactPCI	√	√	√	√	√	√	√	√	√								
Adastra Systems Corp., Hayward, CA, (510) 732-6900, www.adastra.com																	
PC/104	√		√	√	√			√	√		U	U	U				
ADPI (Analog & Digital Peripherals Inc.), Troy, OH, (937) 339-2241, www.adpi.com																	
PC/104, ISA, PCMCIA	√	√	√	√	√			√	√	U						\$395	
Advantech Technologies Inc., Irvine, CA, (949) 789-7178, www.advantech-direct.com																	
PCI, PC/104, ISA, PCMCIA, Other	√	√	√	√	√	√	√	√	√	U	U	U		U			
Aerotech World Trade Ltd., Westlake Village, CA, (818) 991-2972, www.aerotechusa.com																	
VME, PCI, ISA, CompactPCI, Other	√	√	√	√	√	√	√	√									
Alacron Inc., Nashua, NH, (603) 891-2750, www.alacron.com																	
VME, PCI, Other			√			√	√	√									
Algorithms Ltd., London, England, UK, +44 171 700 3301, www.algor.co.uk																	
PCI, ISA, PCMCIA	√									60	U	\$	\$	\$	\$	\$3,950	
Allant Software Corp., Walnut Creek, CA, (925) 944-9690, www.allant.com																	
Other	√									90	\$	\$	\$	\$	\$	\$250	
Allen Systems, Columbus, OH, (614) 488-7122, http://members.aol.com/allensys																	
Other	√	√	√	√	√			√		U	U	U		U	U	\$39	
Alta Technology/Linux NetworX, Sandy, UT, (801) 562-1010, www.altatech.com																	
PCI, CompactPCI	√									365		U	\$	\$		\$11,500	
Ampro Computers Inc., San Jose, CA, (408) 360-0200, www.ampro.com																	
PC/104	√		√	√	√			√			U	U	U	U		\$300	
ANT Computer Inc., Walnut, CA, (909) 598-3315, www.antcomputer.com																	
Other												U		U			
Applied Data Systems, Columbia, MD, (301) 490-4007, www.flatpanels.com ; www.applieddata.net																	
PCI, STD, PCMCIA, CompactPCI, Other	√							√		90		U	\$	\$	\$	\$325	
Arcom Control Systems, Kansas City, MO, (816) 941-7025, www.arcomcontrols.com																	
PCI, PC/104, ISA	√	√	√	√	√			√	√		U	U		U		\$195	
Ariel Corp., Cranbury, NJ, (609) 860-2900, www.ariel.com																	
PCI, ISA, CompactPCI		√				√	√			30	U	\$	\$	\$	\$		
Artesyn Communication Products, Madison, WI, (608) 831-5500, www.artesyn.com/cp																	
VME, PCI, PC/104, CompactPCI	√	√	√	√				√		U							
Atlas Communication Engines, Santa Barbara, CA, (805) 898-2450, www.ace360.com																	
PCI, ISA, Other	√		√	√	√			√				U					
Axiom Manufacturing, Richardson, TX, (972) 994-9676, www.axman.com																	
STD, Other	√	√						√	√	90	U	U					
Axiom Technology Inc., City of Industry, CA, (626) 934-1199, www.axiomtek.com																	
PCI, PC/104, STD, ISA, PCMCIA, CompactPCI, Other	√	√	√	√	√			√			U	U	U	U			

U - Unlimited free \$ - paid



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SINGLE-BOARD COMPUTERS

Box		Single board computers	Data acquisition boards	Daughter cards and modules	I/O boards	DSP boards	Special purpose boards	Full custom boards	Technical Support						Price
									Days of free phone support	BBS/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training	
	Bagotronix Inc., Tallahassee, FL, (850) 942-7905, www.bagotronix.com														
	PC/104, Other	✓			✓			✓		U	U		U	\$	\$99
	Blackhawk, Marlton, NJ, (856) 983-4514, www.blackhawk-dsp.com														
	VME, PCI		✓			✓	✓	✓	365	U	\$	\$	\$	\$	
	Blue Earth Research LLC, Mankato, MN, (507) 387-4001, www.BlueEarthResearch.com														
	Other	✓			✓		✓	✓	U	U	U				\$60-\$300
	BWI, Monroe, CT, (203) 261-6027, www.bwi.com														
	VME, PCI, ISA, CompactPCI	✓	✓	✓	✓		✓								
	Cell Computing Inc., San Jose, CA, (877) CAR-DPCI, www.cellcomputing.com														
	PCI, PC/104, ISA, PCMCIA	✓		✓						U	U				
	Cetia, Burlington, MA, (781) 229-7930, www.cetia.com														
	VME	✓		✓			✓			\$					
	Chase Scientific Co., Aptos, CA, (831) 464-2584, www.chase2000.com														
	VME, PCI, PC/104, ISA, CompactPCI, Other		✓		✓		✓	✓	90	U	U	U	U	\$	\$1,495+
	Cimetrix Inc., Boston, MA, (617) 350-7550, www.cimetrix.com														
	PC/104	✓							90	U	U	\$	\$	\$	\$1,500
	Coactive Networks, Sausalito, CA, (415) 289-1722, www.coactive.com														
	PC/104	✓							30	\$	\$	\$	\$	\$	
	Comark, Medfield, MA, (508) 359-8161, www.comarkcorp.com														
	PCI, PC/104, ISA	✓	✓		✓		✓	✓	U		U		U		
	Compaq Computer, Shrewsbury, MA, (800) 297-4863, www.digital.com/oem														
	VME, PCI, ISA, CompactPCI	✓			✓										
	Computer Dynamics, Greenville, SC, (864) 627-8800, www.cdynamics.com														
	PCI, PC/104, STD, ISA	✓								U	U				
	ComputerBoards Inc., Middleboro, MA, (508) 946-5100, www.computerboards.com														
	PCI, PC/104, ISA, PCMCIA, CompactPCI, Other		✓		✓		✓	✓	U		U	U		\$	
	Connect Tech Inc., Guelph, ON, Canada, (519) 836-1291, www.connecttech.com														
	PCI, PC/104, ISA, Other				✓					U	U	U			
	Coreco, St. Laurent, Canada, (514) 333-1301, www.coreco.com														
	PCI	✓					✓	✓	520	U	U	U	U	\$	
	Cyclone Microsystems, New Haven, CT, (203) 786-5536, www.cyclone.com														
	VME, PCI, CompactPCI, Other	✓	✓	✓			✓		U		U		\$		
	Dalanco Spry, Rochester, NY, (716) 473-3610, www.dalanco.com														
	PCI, PC/104, ISA	✓	✓			✓		✓	365	U	U		U		
	Digital Voice Systems Inc., Burlington, MA, (781) 270-1030, www.dvsinc.com														
	PCI, Other				✓	✓	✓			U	U	U	\$	U	\$645
	DSPeCialists, Berlin, Germany, +49-30-467 805-0, www.dspeCialists.de														
	VME, PCI, STD, ISA, CompactPCI, Other			✓	✓	✓	✓	✓	U	U	U	\$	\$	\$	
	DY 4 Systems Inc., Kanata, ON, Canada, (613) 599-9191, www.dy4.com														
	VME, PCI	✓		✓	✓	✓				U	U	U		\$	
	Dynateme Inc., Mission Viejo, CA, (949) 855-3235, www.dynateme.com														
	VME, PCI, CompactPCI	✓		✓	✓		✓	✓							

SINGLE-BOARD COMPUTERS

Bus											Technical Support						Price
	Single board computers	Data acquisition boards	Daughter cards and modules	I/O boards	DSP boards	Special purpose boards	Full custom boards	Days of free phone support	800/Web FAQs, bug lists, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training				
Eclipse International Inc., Mountain View, CA, (650) 691-6400, www.eclipseint.com																	
Other	✓		✓						\$	\$	\$	U	\$	\$	\$695		
EMAC Inc., Carbondale, IL, (618) 529-4525, www.emacinc.com																	
PCI, PC/104, ISA, Other	✓	✓	✓	✓	✓	✓	✓	365	U	U	U	\$	\$	\$	\$130		
Embedded Performance Inc., Milpitas, CA, (408) 957-0350, www.epitools.com																	
Other			✓	✓		✓	✓		\$	\$	\$	\$	\$	\$			
Embedtec Corporation, Cupertino, CA, (408) 253-0250, www.embedtec.com																	
PCI, PC/104, ISA, PCMCIA, Other	✓	✓	✓	✓	✓	✓	✓	U	U	U		\$	\$				
Eonic Systems, Aarschot, Belgium, +32 16 621 585, www.eonic.com																	
CompactPCI	✓				✓												
EST (Embedded Support Tools) Corp., Canton, MA, (781) 828-5588, www.estc.com																	
PCI, STD, PCMCIA	✓							90	U	\$		U	\$	\$	\$795		
Force Computers, San Jose, CA, (408) 369-6000, www.forcecomputers.com																	
VME, PCI, CompactPCI	✓						✓										
FS FORTH-SYSTEME GmbH, Breisach, Germany, +49 7667 908 0, www.fsforth.de																	
PCI, PC/104, ISA, PCMCIA	✓			✓		✓	✓										
General Micro Systems Inc., Rancho Cucamonga, CA, (909) 980-4863, www.gms4vme.com																	
VME, PCI, CompactPCI, Other	✓	✓	✓	✓	✓	✓	✓	30	U	\$	\$	\$	\$	\$	\$2,000		
Gespac Inc., Mesa, AZ, (480) 962-5559, www.gespac.com																	
PCI, CompactPCI, Other	✓	✓	✓	✓	✓		✓	365	U			\$					
Granite Microsystems, Mequon, WI, (414) 242-8800, www.granitem.com																	
PCI, ISA, PCMCIA, CompactPCI, Other	✓	✓	✓	✓	✓	✓	✓			U		U					
HighTec EDV-Systeme GmbH, Saarbruecken, Germany, +49 (0)681 92613-0, www.hightec-rt.com																	
Other	✓					✓	✓	0							DM1,540,00		
HiTech Equipment Corp., San Diego, CA, (619) 566-1892, www.hte.com																	
PC/104, Other	✓	✓	✓	✓	✓	✓	✓		U	U	U	U	U	U	\$99		
Hyperception Inc., Dallas, TX, (214) 343-8525, www.hyperception.com																	
PCI, PC/104, STD, ISA, PCMCIA, CompactPCI, Other	✓	✓	✓		✓				U	U		\$	\$				
I-Bus Inc., San Diego, CA, (800) 382-4229, www.ibus.com																	
PCI, ISA, CompactPCI	✓			✓		✓	✓	U		U		\$					
Industrial Computer Source, San Diego, CA, (619) 677-0877, www.indcompsrc.com																	
PCI, ISA, Other	✓	✓		✓		✓	✓	U	U	U	U	U	U				
ITOX Inc., East Brunswick, NJ, (732) 390-2815, www.itox.com																	
PCI, ISA	✓						✓	730	U	U	U	U			\$549		
J&M Microtek Inc., West Orange, NJ, (973) 325-1892, www.jm-micro.com																	
Other	✓								U	U		\$	\$				
JK microsystems, Davis, CA, (530) 297-6073, www.jkmicro.com																	
Other	✓	✓		✓		✓		120		U					\$119+		
JUMPTec Industrial Computers, San Diego, CA, (800) 586-7025, www.jumptec.com																	
PCI, PC/104, ISA, Other	✓		✓	✓					U	U		\$	\$				
Kg Systems Inc., East Hanover, NJ, (973) 515-4664, www.industrialcontroller.com																	
Other	✓					✓	✓	U	U	U		U	U		\$59		

SINGLE-BOARD COMPUTERS

Bus	Technical Support										
	Single board computers	Data acquisition boards	Daughter cards and modules	I/O boards	DSR boards	Special purpose boards	Full custom boards	Days of free phone support	855/Web FAQs, bug fixes, other	Phone support, standard	Phone support, 24-hour response
Lantronix, Irvine, CA, (949) 453-3990, www.lantronix.com											
PCI, Other			✓								\$200
Mandeno Granville Electronics Ltd., Auckland, New Zealand, 64 9 6300 558, www.designtools.co.nz											
Other	✓					✓					
Mango Computers Ltd., Jerusalem, Israel, 972-2-532-8706, www.mangocom.com											
VME, PCI, CompactPCI	✓	✓			✓		✓	30	U	\$	U
MATRIX Corp., Raleigh, NC, (919) 231-8000, www.matrix.com											
VME, PCI, STD, CompactPCI	✓	✓	✓	✓		✓	✓	90	U	\$	\$
MCSI, Vista, CA, (760) 598-2177, www.mcsi.com											
PCI, PC/104, ISA, Other	✓							U	U	U	U
Megatel Computer Corp., Weston, ON, Canada, (888) smallpc, www.megatel.ca											
PC/104	✓							365	U	U	U
MEN Mikro Elektronik GmbH, Carrollton, TX, (972) 939-2675, www.men.de											
VME, PCI, CompactPCI, Other	✓	✓	✓	✓	✓	✓	✓	365	U	U	U
Mercury Computer Systems Inc., Chelmsford, MA, (978) 256-1300, www.mc.com											
VME, PCI			✓	✓	✓	✓	✓	90	U	\$	\$
Micro/sys Inc., Montrose, CA, (818) 244-4600, www.embeddedsys.com											
PC/104, STD, PCMCIA	✓	✓	✓	✓				U	U	U	U
Micromint Inc., Vernon, CT, (860) 871-6170, www.micromint.com											
VME, PCI, PC/104, STD, ISA, PCMCIA, CompactPCI, Other	✓	✓	✓	✓	✓	✓	✓	U	U	U	U
Midwest Micro-Tek, Brookings, (605) 697-8521, www.midwestmicro-tek.com											
PC/104, ISA, Other	✓	✓	✓	✓		✓	✓	U	U	U	U
Mosaic Industries Inc., Newark, CA, (510) 790-1255, www.mosaic-industries.com											
Other	✓		✓			✓	✓	U	U	U	\$
NetBurner, San Diego, CA, (858) 530-0293, www.netburner.com											
Other	✓		✓	✓			✓	90	U	\$	\$
Omnibyte Corp., West Chicago, IL, (630) 231-6880, www.omnibyte.com											
VME, Other	✓	✓	✓	✓			✓	90	U	U	U
Onset Computer Corp., Bourne, MA, (508) 759-9500, www.onsetcomp.com											
	✓								U	U	\$295
PC Engines, Sunnyvale, CA, (408) 733-3901, www.pcengines.com											
PCI, PC/104, ISA, CompactPCI						✓		180	\$	U	\$
Performance Technologies Inc., Rochester, NY, (716) 256-0200, www.pt.com											
VME, PCI, PCMCIA, CompactPCI, Other			✓	✓		✓		U	U	U	\$
Phytec America LLC, Bainbridge Island, WA, (206) 780-9047, www.phytec.com											
PC/104, ISA, PCMCIA, Other	✓		✓	✓		✓	✓	U	U	U	\$115
pls Programmierbare Logik & Systeme GmbH, Lautz, Germany, 49-35722-384-0, www.pls-mc.com											
ISA, PCMCIA, Other	✓			✓		✓		365	\$	\$	\$
PLX Technology, Sunnyvale, CA, (408) 774-9060, www.plxtech.com											
PCI, CompactPCI					✓			U	U	U	U
Practical Micro Design Inc., Springfield, VA, (703) 912-4991, www.pmdinc.com											
PC/104, ISA						✓		365	U		

SINGLE-BOARD COMPUTERS

Bus											Technical Support					Price
	Single board computers	Data acquisition boards	Daughter cards and modules	I/O boards	DSP boards	Special purpose boards	Full custom boards	Days of free phone support	BBS/Web FAE, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates	Training			
Radisys Corp., Hillsboro, OR, (503) 615-1100, www.radisys.com																
VME, PCI, PC/104, ISA, CompactPCI	✓	✓	✓	✓	✓	✓	✓									
Remote Processing, Denver, CO, (303) 690-1588, www.rp3.com																
Other	✓	✓					✓	U		U		U				
SAELIG Co. LLC, Victor, NY, (716) 425-3753, www.saelig.com																
PC/104, PCMCIA, Other	✓	✓	✓	✓		✓		U	U	U		\$				\$59 to \$499
SBS Technologies, Raleigh, NC, (919) 851-1101, www.sbs-embedded.com																
VME, PCI, PC/104, STD, ISA, PCMCIA, CompactPCI, Other	✓	✓	✓	✓		✓	✓	U	U	U		U				
SCIDYNE, Pembroke, MA, (781) 293-3059, www.scidyne.com																
PC/104, ISA, Other	✓	✓	✓	✓	✓	✓	✓	U	U	U		\$	\$			
Signum Systems Corp., Moorpark, CA, (805) 523-9774, www.signum.com																
ISA, Other	✓				✓	✓		365	U	\$	\$	\$	\$			\$195 to \$2,200
SMART Modular Technologies, Inc., Fremont, CA, (510) 623-1231, www.smartmodulartech.com																
VME, PCI, ISA, PCMCIA, CompactPCI, Other	✓			✓		✓	✓									
Spectrum Digital Inc., Houston, TX, (281) 561-6500, www.spectrumdigital.com																
Other				✓												\$895
Spectrum Signal Processing, Burnaby, BC, (604) 421-5422, www.spectrumsignal.com																
VME, PCI, ISA, CompactPCI, Other	✓		✓	✓	✓		✓	365	U	U	U	\$	\$			
SSV EMBEDDED SYSTEMS, Hannover, GE, Germany, +49 511 40000 0, www.ssv-embedded.de																
PC/104, ISA	✓	✓		✓		✓	✓	U	U	U						
Sun Microsystems Inc., Palo Alto, CA, (800) 786-0404, www.java.sun.com																
PCI	✓		✓	✓				365	U	\$	\$	U	U			\$1,100
Symmetric Research, Kirkland, WA, (702) 341-9325, www.symres.com																
ISA, Other		✓			✓				U	U						\$800+
Syndetix Inc., Las Cruces, (505) 522-8762, www.syndetix.com																
VME, ISA, Other	✓		✓			✓	✓			U						
Technoland Inc., Sunnyvale, CA, (408) 992-0888, www.technoland.com																
PCI, PC/104, ISA, PCMCIA, CompactPCI	✓						✓	U	U	U		U	U			
Teknor Industrial Computers Inc., Boisbriand, PQ, (800) 387-4222, www.teknor.com																
PCI, PC/104, ISA, CompactPCI	✓		✓					730	U	U	U	U	U			
TERN Inc., Davis, CA, (530) 758-0180, www.tern.com																
PC/104, ISA, PCMCIA, Other	✓	✓	✓	✓	✓	✓	✓	U	U	U	U	U				\$99
Texas Micro, Houston, TX, (713) 541-8200, www.texasmicro.com																
PCI, ISA, PCMCIA, CompactPCI, Other	✓		✓				✓	U	U	U		U				
Themis Computer, Fremont, CA, (510) 252-0870, www.themis.com																
VME	✓															\$8,360+
Toronto MicroElectronics Inc., Mississauga, ON, Canada, (905) 625-3203, www.tme-inc.com																
PCI, PC/104, ISA, PCMCIA, CompactPCI	✓		✓	✓		✓	✓		U	U	U	\$				\$100 to \$2,000
Transtech DSP Corp., Ithaca, NY, (607) 257-8678, www.transtech-dsp.com																
VME, PCI, ISA, CompactPCI, Other		✓			✓		✓	365	\$	\$		\$	\$			\$1,995
Trenton Technology Inc., Gainesville, GA, (770) 287-3100, www.trentonprocessors.com																
PCI, ISA	✓							U	U	U		U				

SINGLE-BOARD COMPUTERS

Bus	Single board computers	Data acquisition boards	Daughter cards and modules	I/O boards	DSP boards	Special purpose boards	Full custom boards	Technical Support					Price
								Days of free phone support	BBS/Web FAQs, bug fixes, other	Phone support, standard	Phone support, 24-hour response	Product updates	
Trillium Digital Systems Inc., Los Angeles, CA, (310) 442-9222, www.trillium.com													
VME, PCI, CompactPCI, Other							60	\$		\$			
Vector Electronic Co., N. Hollywood, CA, (818) 985-8208, www.vectorelect.com													
VME, PCI, STD, ISA, PCMCIA, CompactPCI			✓			✓							
VersaLogic Corp., Eugene, OR, (541) 485-8575, www.versalogic.com													
PC/104	✓	✓		✓			✓	U	U	U		U	
Vesta Technology Inc., Wheat Ridge, CO, (303) 422-8088, www.VestaTech.com													
PC/104, Other	✓							365	U	\$	U	U	
VisiCom, San Diego, CA, (619) 457-2111, www.visicom.com													
VME, PCI, Other				✓		✓		90		\$			
VMETRO Inc., Houston, TX, (281) 584-0728, www.vmetro.com													
VME, Other			✓	✓		✓		182					
VMIC, Huntsville, AL, (256) 880-0444, www.vmic.com													
VME, PCI, PC/104, ISA, CompactPCI, Other	✓	✓		✓		✓	✓						
Western Design Center, Mesa, AZ, (602) 962-4545, www.wdesignnc.com													
Other	✓					✓			U	U		U	
Western Wares, Norwood, CO, (970) 327-4898, www.westernwares.com													
PCI, PC/104, ISA, Other	✓	✓		✓				U	U	U	U	U	
WinSystems Inc., Arlington, TX, (817) 274-7553, www.winsystems.com													
PC/104, STD	✓	✓	✓	✓		✓		U	U	U	U	U	
Wisch Communications, Carrollton, TX, (972) 417-3533, www.wischcomm.com													
PCI, ISA, Other						✓	✓		U			U	
Wuerz elektronik, Weilmuenster, GE, Germany, 496475912944, www.wuerz-elektronik.com													
Other	✓			✓			✓	180					
ZF Microsystems Inc., Palo Alto, CA, (650) 965-3800, www.zfmicro.com													
PC/104, ISA	✓		✓				✓	U	U	U		\$	
Ziatech Corp., San Luis Obispo, CA, (805) 541-0488, www.ziatech.com													
PCI, STD, CompactPCI	✓		✓	✓		✓	✓	U	U	U	\$	\$	
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