

Details

ON SIGNAL PROCESSING

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SEPTEMBER 1996	ISSUE 45



'C24x DSP controller

An optimized DSP Solution for digital motor control

To meet the need for more advanced digital motor-control solutions, TI has announced the TMS320C24x DSP controller, the first DSP optimized for motor-control systems. The new device supports motor commutation, command generation, control algorithm processing, data communications, and system monitoring functions.

Leveraging TI's DSP core technology, the 'C24x integrates a 20-MIPS TMS320C2xx 16-bit, fixed-point core to provide enough processing for the modern control algorithms that support a motor-industry trend

TI introduces 0.18-micron Timeline Technology cDSP™ in the 100-million transistor era

Employing 0.18-micron technology (left-effective gate length), TI's recently announced Timeline Technology can pack 125 million transistors onto a single piece of silicon, shaping the most advanced systems integration platform ever available. This platform extends TI's five years of leadership in building application specific integrated circuit (ASIC)-based customizable DSP (cDSP) solutions and slashing time to market for TMS320 customers.

As DSP becomes more widespread in consumer, communications, computer, and automotive applications, the need for application-specific and custom devices increases. TI's cDSP technology, along with Timeline Technology, surpasses all other technology available today in meeting this need.

The density achieved with TI's 0.18-micron technology means that dynamic random-access memory (DRAM), static random-access memory (SRAM), Flash memory, and read-only memory (ROM) can reside on the same chip with DSPs, communications interfaces, analog-to-digital and digital-to-analog converters, and other peripherals. The result is a true, single-chip DSP Solution for many high-volume communications, computing, and high-performance applications.

Equally important, the enormous integration capacity achieved with TI's Timeline Technology—more than twice that available with current 0.25-micron

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'C24x DSP controller

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toward the use of brushless motors in a broad range of control applications. The 'C240 also integrates a unique motor-control event manager whose features allow the device to generate outputs which can robustly drive all motor types.

The 'C240 highlights TI's expertise at producing application-targeted DSP solutions by integrating a DSP core with digital and mixed-signal peripherals on a single chip. The device includes the DSP core, the event manager, two serial interfaces, a pair of 10-bit A/D converters, 32 bits of digital I/O, a watchdog timer, and 16K words of ROM. Also announced is the TMS320F240, which replaces the ROM with 16K words of flash EPROM memory.

"Because this device integrates a DSP core with a comprehensive set of motor-control peripherals, the 'C240 represents a major breakthrough toward enabling low-cost, closed-loop motor-control designs," said Gregg Bennett, TI DSP digital motor control marketing manager.

Improves efficiency

The 'C240's integrated event manager is key to providing designers with a complete motor-control solution. It features three up/down timers and nine comparators which, when coupled with flexible waveform generation logic, can create up to 12 pulse-width-modulation (PWM) outputs. Also included is dead-band generation logic and a state-space vector PWM generator for optimized transistor switching, and four capture inputs, two of which can serve as direct inputs for optical-encoder quadrature pulses. All these features help the 'C240 reduce power consumption, vibration, and system component count.

Eliminate automotive hydraulics

In automotive applications, the 'C240's control capabilities can help automotive engineers improve system performance and decrease cost through the elimination of hydraulic subsystems for steering and braking.

In these systems, inexpensive brushless motors can now be connected directly to mechanical actuators, therefore allowing removal of the hydraulics. These direct-

drive electronic systems are more reliable and cleaner and also remove the engine load incurred when driving hydraulic pumps. Also, electronic controls weigh far less, are easier to install, and occupy less physical space.

Electronic brake controllers can use the 'C240 to directly drive high-torque motors, allowing a localized, intelligent control loop for advanced anti-lock brake systems. In electrical power steering designs, the 'C240 can be programmed to exhibit a variable steering profile, with relatively light steering response at very low speeds, and tight, sporting response at highway speeds.

"The performance and peripheral integration of the 'C240 is driving enhancements in TRW power steering products," said Joe Miller, project manager for electronic power steering at TRW, Inc.

Increased industrial reliability

The 'C240 allows controllers for industrial applications to be made smaller, cheaper, quieter, and more energy efficient through the elimination of mechanical coupling equipment. For example, motors

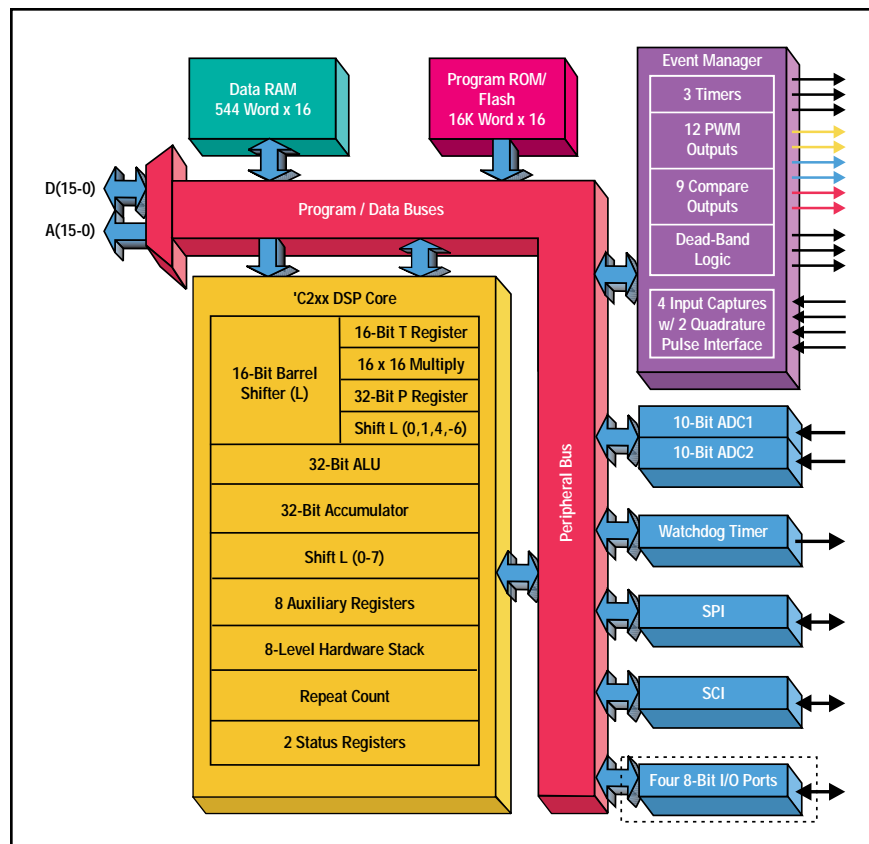
can now be connected directly to paper production, textile manufacturing, and food-processing systems that have traditionally used hydraulics or single-speed motors coupled to belts and pulleys to collectively vary controller speeds.

Appliances get quieter

Today, washing machines, heating/ventilation/air-conditioning (HVAC) systems, and other major appliances typically use mechanical linkages to achieve variable speed and direction. Once again, the 'C240 will help eliminate these noisy maintenance-prone parts through variable-speed, direct-drive electric motor control.

"TEMIC microelectronic found the TMS320C240 DSP to be the best solution for improving the performance and cost of our single and three-phase inverters in our next generation of motor controllers for HVAC heat pumps," said Reinhold Sedlmeier of TEMIC Telefunken microelectronic GmbH. "The DSP core in combination with the optimized peripheral set

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The 'C240 and 'F240 provide a single-chip DSP Solution optimized for digital motor control.

'C24x DSP controller

(Continued from page 2)

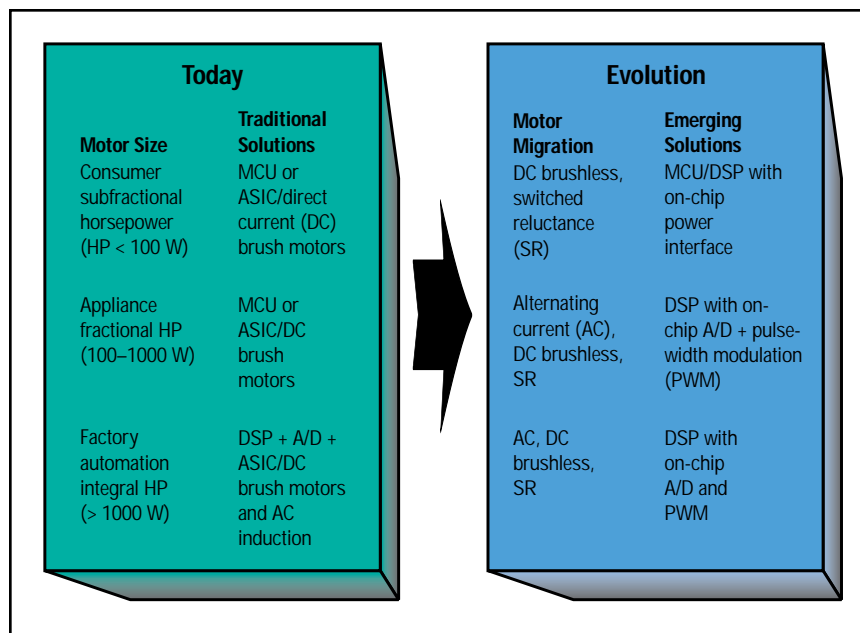
for PWM generation is the reason we chose the 'C240 DSP at TEMIC."

'C240 programmability lets designers produce smarter appliances. In a horizontal-axis washing machine, a wash cycle can use electronically-programmed speed changes to optimize wash and spin cycles to get clothes cleaner using less detergent and water. Also, when starting a cycle, DSP algorithms allow for gradual acceleration after each motor direction reversal, reducing noise and wear on parts.

"The performance and peripheral integration of TI's 'C240 fully meets the technical requirements of motion-control systems for Electrolux products," said Erio Reniero, field engineering manager for Electrolux-Zeltron. "The architecture can easily implement smarter Electrolux appliance-control algorithms which are requiring higher computing capabilities than what we have available."

Development support, pricing

The 'C240 is code compatible with TI's 'C1x, 'C2x, 'C2xx, and upward code compatible to the 'C5x DSP device genera-



Digital motor control systems are moving to less complex motors with advanced controllers.

tions. The device leverages TMS320 fixed-point DSP software development tools and JTAG emulation support for ease of development. Third-party products featuring 'C24x support are also planned.

US suggested resale pricing for the TMS320C240 is planned for less than \$10

in high-volume production (100,000 units), while the 'F240 with on-chip flash will be 30-50% higher. The 'F240 will sample in the first quarter of 1997, with volume production in late 1997. Production of the 'C240 is planned for 1Q98. ■

TI symposium at Electronica

Learn about the 'C24x

As part of TI's participation at Electronica (November 12-15 in Munich, Germany), TI will present DSP, ASIC, memory, microcontrollers, and mixed-signal products, along with a three-day symposium (see agenda below). Look for TI at booth #18B8 in Hall 18.

Texas Instruments Symposium

Venue: Congress Centre, located on the fair grounds, in room K2.

November 12

5:00 PM-8:00 PM

"Digital Motion Control System Cost Reduction Using the 'C24x DSP Controller"

Specific topics include: intelligent approaches for cost reduction, TMS320C24x architecture and integrated peripherals, and development tools.

November 13

5:00 PM-8:00 PM

"DSP Solutions for Visual Communication"

November 14

10:00 AM-1:00 PM

"1394 Serial Bus - Fire Wire - Multimedia Networking"

5:00 PM-8:00 PM

"Desktop and Enterprise Networking" ■

'C8x devices now sampling

The 'C82 is now sampling in a low-cost, surface-mountable ball grid array (BGA) package, which uses solder balls as leads attached to the bottom of the package.

The 'C82, which features a 32-bit RISC master processor with IEEE-754 floating-point hardware and two 32-bit parallel, advanced DSPs on the same piece of silicon, will be in a 352-pin plastic BGA. This package will allow for future 'C8x device offerings using the same package.

Also, the new 60-MHz 'C80 device is sampling in the 305-pin PGA package.

Planned production dates for both devices are 1Q97. ■

TI announces '97 DSP Solutions Challenge

Grand prize remains US \$100,000!

TI has announced it will once again host the DSP Solutions Challenge in 1997, the project-based contest for university students around the world. The contest entry requires an original TMS320 DSP design, which must operate as a functional application, and an original software program (if applicable) to be submitted to TI. The '97 contest is open to full-time university students at the undergraduate, graduate, or Ph.D. level, 18 years of age or older.

Prizes for the contest are:

- Grand Prize – US \$100,000
- Finalist Prize – US \$10,000
- Semi-final Prize – US \$1,000

The advising professor of the grand-prize winning team also receives US \$15,000 and a six-month sabbatical with TI DSP.

Also, just by being a participant, TI will include your résumé into the DSP Talent™ database service. This service provides prospective employers with résumés of students with DSP experience who can fill summer, co-op, and full-time positions.

Attention professional engineers— Get your alma mater involved!

The '95 Challenge, the first ever worldwide contest of its kind, received entries from more than 230 teams representing more than 700 students in 26 countries. The grand-prize-winning entry was from Nanyang Technological University in Singapore.

To get more information, see

http://www.ti.com/sc/dsp_challenge

or contact your local design contest headquarters listed below for complete rules and conditions. Contest dates are October 1, 1996–October 31, 1997.

Abstracts are due by May 31, 1997, and final projects are due October 31, 1997.

Contest headquarters locations and divisions:

Territory I – North America/Canada/ Latin America

TI DSP Solutions Challenge
12203 Southwest Freeway, MS 722
Stafford, TX 77477 USA
Phone: (713) 274-2288
Fax: (713) 274-2279
e-mail: univ@msg.ti.com

Territory II - Europe

TI Europe
University Programme
Avenue Jack Kilby, PO Box 5
06271 Villeneuve-Loubet Cedex, France
Phone: +33-93-222109
Fax: +33-93-222298
e-mail: 2dc@msg.ti.com

Territory III - Asia

TI
University Program
24F, Tun Hua S. Rd,
Taipei 106, Taiwan
Phone: 886-2-376-2579
Fax: 886-2-377-5624
e-mail: khho@msg.ti.com

Territory III - Japan

TI Japan, Ltd.
University Program
MS-Shibaura Bldg.,
13-23, 4-Chome, Shibaura
Minato-ku, Tokyo 108 Japan
Phone: 813-3769-8743
Fax: 813-3457-7344
e-mail: kato@msg.ti.com ■

TMS320 Third-Party Program Competence Centers *Dates, topics set for European trade shows*

TI has organized TMS320 DSP Competence Centers in cooperation with several TMS320 third-party members. The Competence Centers are designed to feature TMS320 third-party products focused on various popular and emerging application areas, allowing attendees to gain insight into upcoming designs from specialists in the field. To date, 57 companies will be participating on the various topics at the locations listed below.

	Exhibition	Competence Center Focus	Location	Date
France	DSP '96	General DSP	Paris	Oct. 9–11
Germany	DSP '96	General DSP	Munich	Oct. 1–2
	Systems	Multimedia, Industrial Solutions	Munich	Oct. 21–25
Italy	DSP '96	General DSP	Milan	Nov. 26–29
	BIAS	Automation, Micro Electronic	Milan	Nov. 26–29
United Kingdom	DSP '96	General DSP	London	Dec. 3–4

For more information on the TMS320 Third-Party Competence Centers in Europe, send an e-mail to bg@msg.ti.com or fax at +49 8161 80 4841. ■

DSP Workshops planned for Mexico, Latin America

As part of the TMS320 University Program and in conjunction with the distributor Electronica Seta, TMS320 DSP workshops are planned for the second half of 1996 and 1997. These workshops are designed for university professors and cover the latest devices and techniques. The workshops are scheduled at various universities in Mexico and Latin America and cost approximately US \$200 to attend. The next workshop is scheduled for the Universidad Nacional Autonoma de Mexico in October. Contact Sylvain Martini at 011-525-6399740, ext. 110 for more information. ■

New digital encoder offers flexibility for consumer applications

'AV410 supports NTSC, PAL

Texas Instruments has announced a digital encoder for consumer electronics equipment that cost-effectively supports the NTSC and PAL regional standards.

The TMS320AV410 is well-suited for digital set-top boxes and DVD players, and implements the Macrovision™ anti-taping function, which many content providers now require in consumer electronics. Also available is the functionally-equivalent 'AV411, where Macrovision anti-taping is not supported.

Features for both devices include HSYNC and VSYNC signal generation both on- and off-chip, closed-caption encoding, and 16-color overlay with color look-up table.

To provide system design flexibility, the 'AV410 supports numerous data I/O formats. For example, the user can input

on a single port either multiplexed digital RGB or YCbCr data, or the luminance and chrominance data (CCIR601 specification) can be demultiplexed and input via two separate data ports, i.e., Y, CbCr.

Three on-chip, 9-bit D/A converters enable the user to independently select three different analog data output formats: RGB or Y/C (S-video) and composite video. Although the 'AV410 outputs analog data, all processing is performed digitally thereby maximizing the quality of the video.

Samples are available now with production scheduled for 4Q96. Suggested resale pricing (1,000-piece quantities) for the TMS320AV410 and TMS320AV411 in 100-pin PQFP is US \$5.77. For more information, see www.ti.com/sc/docs/prodinfo/newavxx.htm ■

0.18-μ Timeline Technology (Continued from page 1)

technologies—can slash development cycles by as much as half. Rather than struggle for devices that fit within semiconductor limitations, designers can select DSPs and other modules from TI libraries or select their own logic to create a unique proprietary solution. An important part of TI's strategy of providing comprehensive DSP solutions, cDSP technology uses industry-standard ASIC design tools to combine DSP cores and peripherals with TI's gate array and standard cell ASIC libraries.

cDSP roadmap puts designer's needs first

Designing with cDSP benefits customers throughout multiple stages in the product roadmap. Engineers can choose one of TI's standard or application-specific DSPs that offers quick time to market and a low investment risk for many emerging markets. Since few original equipment manufacturers (OEMs) have both the DSP design expertise and the ASIC expertise required to create these devices, TI can save cost and time by providing them with tailored products.

Designers that begin with standard TMS320 DSPs may find that as their products become successful, they want to customize their processors as they move into higher volumes. For these designers, cDSP offers a way to migrate the same standard TMS320 core to greater levels of system integration, while shrinking time to market and lowering costs.

Capacity, capacity, capacity ...

TI's multiple wafer fabs, seven devoted to DSP production, allow for rapid response to production increases and long-term supply in tight markets. With 50 designs already complete and more than 30 million units shipped to date, cDSP is a proven technology. Also, the addition of 0.18-micron technology to TI's 0.65-micron, 0.5-micron, 0.35-micron, and 0.25-micron capabilities, along with the \$2 billion DMOS 6 megafab complex in Dallas, gives Texas Instruments the most complete submicron technology portfolio in the industry. Initial design engagements employing the Timeline Technology are currently in progress and TI plans to begin work with beta customers in the third quarter of 1996. Production is scheduled to begin in 1997. ■

TMS320 WORKSHOPS

The Texas Instruments technical training organization offers hands-on workshops designed to help speed designs into production.

To register or for more information, call central registration at (214) 644-5580. Course descriptions can be found on the TI worldwide web site (see back cover).

West Coast, Canada
(Beth Rea) (408) 383-2363
Northeast and Southeast
(Kim Rutherford) (617) 895-9185
Mid-America
(Ron Birkett) (214) 917-3894

USA WORKSHOP SCHEDULE			
City	'C2xx	'C5x	'C54x
Boston			12/17
Dallas	11/12	11/5	
Denver	12/3	10/15	
Irvine		12/10	
San Jose	10/22		11/5
City	'C3x	'C4x	'C8x
Boston		12/3	11/12
Dallas	10/15	12/10	10/22 12/3
Irvine	11/12	10/8	
San Jose	12/3	11/12	11/19

TI also provides excellent training support in Europe. For more information, send inquiries to the European customer training fax helpline at +49 8161 804010.

EUROPEAN WORKSHOP SCHEDULE			
City	'C2xx	'C5x	'C54x
Freising	10/29	12/17	10/8
Northampton		11/19	
Paris	11/26	10/22 12/17	11/12
City	'C3x	'C4x	'C8x
Cranfield		12/3	
Freising	10/15 11/26	11/5	12/3
Milano	11/12		10/15
Northampton			12/10
Paris	11/19	10/8 12/3	10/15 12/10

NEW THIRD-PARTY HARDWARE AND SOFTWARE



This section features new development and application support available through TMS320 Third Parties.

'C80 PCI interface

Tundra Semiconductor has announced the Eighty-X™, a DSP-to-PCI interface device targeted at the TMS320C80 DSP.

Developed as part of a strategic partnership with TI, the Eighty-X is intended for such 'C80 applications as videoconferencing, computer telephony, and image processing. The architecture of the Eighty-X is specifically intended to maximize the full bandwidth of the 'C80 bus (over 400 MBytes/second) without compromising PCI system requirements. Samples, in 208-pin PQFP packages, will be available 1Q97. Scheduled pricing in 10,000-piece quantities will be less than US \$25.00.

Tundra Semiconductor
Phone: (613) 592-0714
fax: (613) 592-1320
Web: <http://www.tundra.com/Tundra>

'C8x development software

ORINCON Technologies has announced the immediate availability of its RIPPEN® graphical development software for Mizar Corporation's MZ 4700 dual-TMS320C80 ('C80)-based DSP boards. RIPPEN is a graphical programming environment that greatly enhances application development productivity for real-time multiprocessor systems. RIPPEN also provides a library of easy-to-use DSP software function modules and by handling all system issues for the user, allowing the user to concentrate on the application itself.

ORINCON Technologies
Phone: (619) 455-5025
or (800) 4-RIPPEN
e-mail: rippen@orincon.com

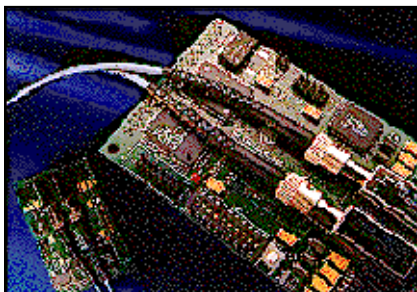
TMS320-based preprocessor interface

Corelis has announced preprocessor interfaces between any 'C52 or 'C40 DSP target system and a variety of Hewlett-Packard logic analyzers. The interfaces

provide complete mnemonic disassembly, quick and easy connection between the target system and logic analyzer pods, and low-capacitance probing for complete timing and state analysis for both hardware and software real-time applications. For more product or pricing information, contact Corelis.

Corelis
Phone: (310) 926-6727
e-mail: sales@corelis.com
Web: <http://www.corelis.com>

'C4x comm port fiberoptic/coaxial interface



The TIM-40-based TDM432 by Transtech

Transtech Parallel Systems has developed the TDM432, a TIM-40 module which achieves 16 Mbytes/sec. bidirectional 'C40 or 'C44 comm port communications across fiberoptic or coaxial cable. 'C40 or 'C44 comm ports can now be interconnected up to 2 kilometers through the fiber optic version, and up to 20 meters in the less expensive coaxial versions. TDM432s are also transparent to a parallel 'C4x system. Pricing starts at US \$1,475.

Transtech Parallel Systems Corp.
Phone: (800) 836-1012
or (607) 257-6502
Fax: (607) 257-3980
Web: <http://www.transtech.com>

LSI/Spectron form 'C4x partnership

Loughborough Sound Images plc., together with Spectron Microsystems have announced a partnership to provide a comprehensive, low-cost software development environment for LSI's family of TMS320C40 DSP boards. To solve real-world problems for DSP application developers, Spectron is providing the DSP Toolchest, which includes the SPOX®

real-time development environment, GO DSP's Code Composer™, and TI's 'C40 C compiler, assembler, and linker.

The development environment is initially available for LSI's quad-'C4x boards for the PC™, available with PCI and ISA host interfaces. Windows™ 3.1 and Windows 95 host environments are supported.

For further information on LSI's products, see

<http://www.lsi-dsp.co.uk/>.

For more information on Spectron's products, see

<http://www.spectron.com>.

Loughborough Sound Images, plc.

Phone: +44 (0)1509 634300

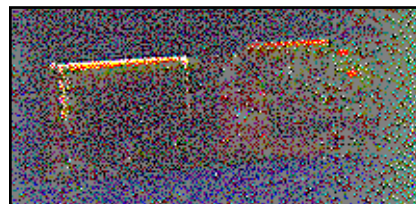
Fax: +44 (0)1509 634333

'C40-based PCI bus image-processing board

Dipix Technologies has announced the PCI XPG-1000 Power Grabber, a 'C40-based, high-end image-processing board for the PC platform using fast PCI bus performance. The board features up to 256 Mbytes of flexible image memory, optional SRAM, flexible frame grabbing, and a modular camera interface.

Also available is an optional display board for single or dual monitors, a power-processing module for more image acceleration, and an extended-vision library for application development.

For pricing information and options, contact Dipix.



Dipix Technologies' PCI Power Grabber

Dipix Technologies Inc.
Phone: (800) 724-5929
or (613) 596-4942
Fax: (613) 596-4914

Quad-'C44 PCI bus board

Coreco has released the MDSP-C44, a multiple 'C44 board delivering transfer rates of 132 Mbytes/second through the PCI bus. Combining up to four 'C44s on a

single circuit board with up to 6 Mbytes of zero-wait-state SRAM per DSP, the MDSP-C44 accelerates signal, graphics, and image-processing applications.

The MDSP-C44 is available in one, two, or four DSP configurations. For pricing information, contact Coreco.

Coreco Inc.

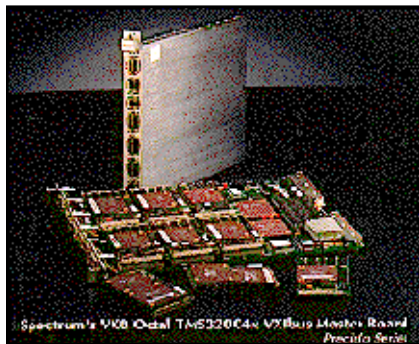
Phone: (800) 361-4914

or (514) 333-1301

Fax: (514) 333-1388

'C4x-based VXI board

Spectrum Signal Processing has announced the VX8, a VXI form factor board delivering up to 480 MFLOPS with multiple 'C4x DSPs. The VX8 was designed, in conjunction with Hewlett-Packard, for military, aerospace, and test and measurement industries.



Standard processor options are two 60-MHz 'C40s, but the board can host up to six single-width or four double-width 'C40 or 'C44 TIM-40 Modules, along with TIM-40 SRAM, DRAM, EDRAM, or I/O modules.

Base price without modules is US \$14,500.

Spectrum Signal Processing Inc.

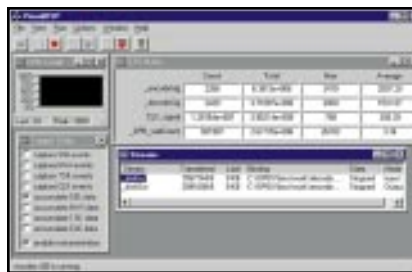
Phone: (604) 421-5422

Fax: (604) 421-1764

Web: <http://www.spectrumsignal.com>

Real-time analysis software for 'C3x DSK

Spectron Microsystems has announced DSP Connex, a low-cost software tool for TI's new TMS320C31 DSP Starter Kit (DSK). Spectron has created the Windows 95-based DSP Connex that allows the user to load and execute programs on the DSK, transfer data between Windows applications and the DSK, and read and



DSP Connex from Spectron Microsystems

modify 'C31 registers and memory. The software also supports real-time program trace, which enables DSK users to debug and analyze their DSK programs.

DSP Connex can be downloaded from Spectron's web site or purchased directly for US \$49.

Spectron Microsystems, Inc.

Phone: (805) 968-5100

e-mail: info@spectron.com

Web: <http://www.spectron.com>

'C3x DSK debugging software

GO DSP has announced Code Explorer™, an enhanced debugging environment for the TI 'C3x DSK based on the popular Code Composer software. Features include signal analysis, basic debugger functions, color syntax highlighting and symbol information, C-style disassembly, source/symbol information, graphical display of signals/data in time domain and frequency domain, animated run, and on-line help for the DSP instruction set.

For pricing information, contact GO DSP.

GO DSP Corporation

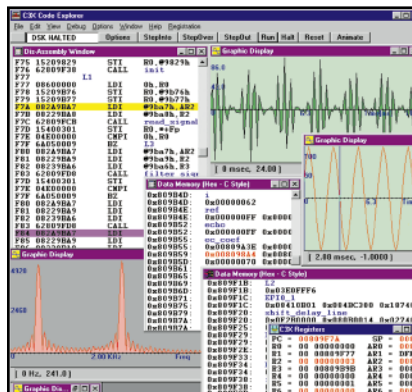
Phone: (800) 440-2728

or (416) 214-1919

Fax: (416) 214-1920

e-mail: godsp@io.org

Web: <http://www.go-dsp.com>



GO DSP's Code Explorer

'C31 speech-coding subsystem

DSP Research has announced the P3112, an enhanced version of Piranha, a complete speech-coding subsystem on a single plug-in module. The module targets videoconferencing, voice-over-data, and secure voice communications.

The P3112 features a 60-MHz 'C31, along with a full-duplex analog interface, on-module A/D-D/A conversion with filters, an externally-clocked serial interface, and 512 K of zero-wait-state SRAM.

For pricing information on the P3112, contact DSP Research.

DSP Research

Phone: (408) 773-1042

Fax: (408) 736-3451

e-mail: info@dspr.com

Web: <http://www.dspr.com>

Motion/Motor-control development system

Portescap has announced the System Optimization Assistance Program (S.O.A.P.), a graphical design and programming software development tool. The S.O.A.P. tools enable the designer to define the specifications for the motion system, select and evaluate an adequate system architecture, select and optimize different hardware components, model and simulate system behavior, and implement real-time control.

Two S.O.A.P. packages are currently available. The educational package features a specific software version for simulation, a 'C31-based MTC31 experimentation board, tutorial and examples, a set of DC and stepper motors, and amplifiers and cables. The professional package includes a full software version, the MTC31 board, and full technical documentation. Supported processors include the 'C1x, 'C2x, 'C2xx (upcoming versions will fully support the recently-announced 'C24x DSP controller), and 'C3x DSPs.

For pricing information, contact Portescap.

Portescap Motion Solutions Division

Phone: +41/ 39 256 111

or after 11/9/96, use

+41/ 32 925 61 11

e-mail: soap@portescap.com