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CONCURRENT ENGINEERING FOR THE 90'S

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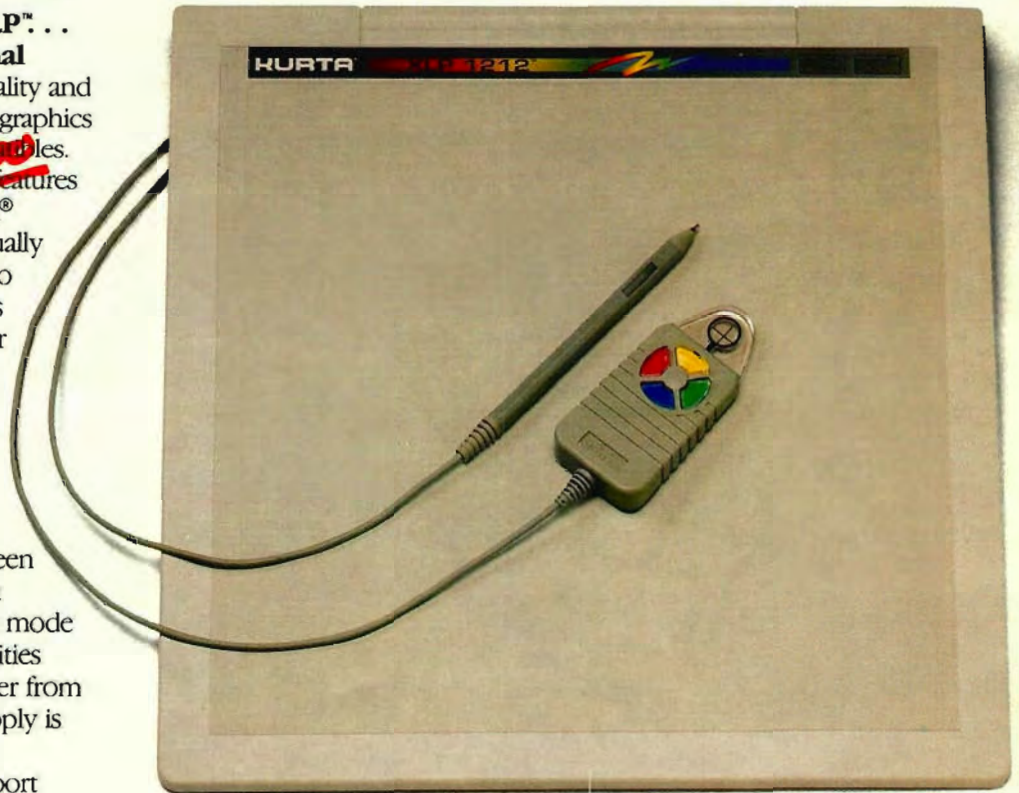
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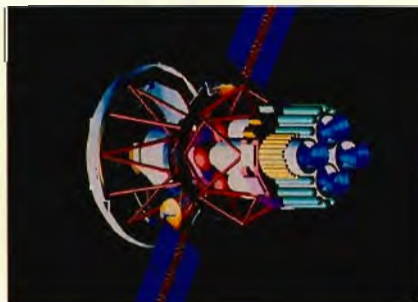
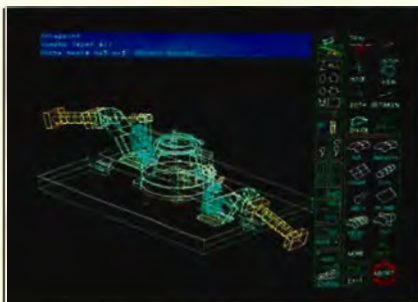
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CONCURRENT ENGINEERING SOLUTIONS

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Geometric Surface Model of hobby kit Camaro.
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SOME OF OUR CONTRIBUTORS

Jack Bilderback, Business Manager with Value Engineering Associates, has been a materials professional for 17 years in high-tech and Aerospace/Defense contract environments. His positions have included Production and Inventory Control Manager at Output Technology Corp. and Director of Materials at Key Tronic Corp. He is a member and certified practitioner of Production and Inventory Management with the American Production and Inventory Control Society.



Chavdar Popov has been involved in the development of CADKEY applications software since 1986. He currently works for Merit Computer Solutions Ltd., the CADKEY distributor in the UK. He is the author of the CAMLight CAM system, written in CADL, used in several colleges and schools in the UK. He has also been a researcher at the Bulgarian Academy of Science, Institute of Cybernetics and Robotics, where he worked on the integration of CAD and numerical control systems.



Martin van der Roest is president and founder of The van der Roest Group, Inc., a software publisher/developer and consulting firm. He formed the Corporate Partners in Development program which investigates solutions for the management, access and control of documents and drawings in distributed environments. He has authored a book on this subject to be released by Prentice Hall later this year.



Usman Rashid is currently Manager of Applications Development at Cadkey, Inc. He is also the technical liaison for CADKEY 3rd Party Developers, and supervises the CADKEY Software Developer's Kit (SDK) for developing add-on applications using the CDE technology. He joined Cadkey in 1988 as a trainer for CADL and wrote the first CADKEY Tutor, an interactive on-line tutorial that guides the user through 2D and 3D design and layout exercises.

On the Cover:

* A CADKEY .PRT file of a scale model Camaro. **Inscale design engineering** uses CADKEY and FastSURF to create design and surface files for mold and machine production.

KEY SOLUTIONS

Concurrent Engineering for the 90's

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KEY TALK

So many things are happening that this is a "mixed bag" - a little of this and a little of that. First topic - **KEYSOLUTIONS**. This is the fourth issue and response has been superb. We appreciate your letters and calls. You're telling us you're satisfied with the publication, but as our own severest critics, we continually analyze and critique our output and strive for perfection. Our attitude towards our product probably reflects our engineering, quality, and manufacturing backgrounds. We want **KEYSOLUTIONS** to address customer needs and surpass the highest standards for professional publications.

To this end, we have added some new columns. One is called KeyMail and features reader letters. If you have any issues, ideas or questions you think other readers would be interested in, or if you want to help us critique and analyze our work, be sure to write. We will print as many letters as possible and respond to all. The other is a column on document and drawing management issues. This area is often taken for granted and/or allowed to develop haphazardly, but deserves concentrated attention in a true concurrent engineering environment.

Second topic. We are delving into CADKEY@6 seriously and are especially impressed with its ability to read competitive drawings directly in their native format. It's a mystery to me why this simple concept took so long. Spreadsheets have done it for a long time, but Cadkey's first in the CAD world! We applaud their courage in challenging Autodesk's dominant market presence and addressing the awkwardness of their de facto DXF standard. This promises to be a long term benefit to all.

Great news is the addition of Varimetrix to the Cadkey family of products. The Varimetrix software stands head and shoulders above competitive packages like SDRC and ProEngineer. Best of all, this move gives CADKEY users the ability to step up to a workstation product more extensive than CADKEY for Unix and still stay within the Cadkey product line. I know there are other exciting developments to look forward to. In fact, I was told by key management folks at Cadkey that moves of earth-shaking proportion are afoot in coming months - but they weren't ready to release the information to the press - even to **KEYSOLUTIONS**.

Last issue I gave credit to Cadkey staff members who provided "above-and-beyond" help with the article on CADKEY 6. I inadvertently overlooked some "behind-the-scenes" efforts and wish now to also thank Bruce Polderman, Cadkey application engineer, who supplied much valuable information; Steve Falusi who helped secure the screen grabs; and Gary Magoon who helped familiarize me and my staff with CADKEY 6 enough to be able to get the last issue out the door.

A final thought. We too will miss Jay Hirth, Cadkey sales manager for CADKEY@NC (CUTTING EDGE), who passed away in February. I only met him in person once, though we talked often by phone. In these brief encounters, he left a lasting impression on me as a fine human being. We at **KEYSOLUTIONS** wish to extend our deepest regrets to Jay's family and friends for their loss and remind you that a memorial fund has been established for Jay's family.



Robert Martin
Technical Editor

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KEY NOTES

CADKEY in the News

Cadkey Merges With Varimetrix

Cadkey Inc. announced a February 22nd merger agreement with Varimetrix Corporation, a Florida-based developer of parametric surface/solid modeling software for high-end CAD, manufacturing and engineering applications.

According to Malcolm Davies, Cadkey president and chief executive officer, Varimetrix will remain in Palm Bay, Florida as a unit of Cadkey, Inc., and Forrest Blair, president of Varimetrix, will become a vice president of Cadkey, Inc. Cadkey will begin sales and marketing of Varimetrix's intelligent 2D drafting, 3D mechanical design, modeling, manufacturing and conversion software immediately. Cadkey will also distribute Varimetrix products through its dealer and distributor network in America and in Europe. The Varimetrix unit will continue to manage product development and new product planning functions.

"The advanced functionality of Varimetrix products ensures that our mid-range to high-end customers can manage their own growth knowing that Cadkey has solutions that fit their requirements," said Davies. "This product line expansion also gives us pricing flexibility across these segments of the market." According to Forrest Blair, "Another benefit of our merger is the opportunity to tap the rapidly expanding Unix market. Workstations running Unix are the predominant platform of choice for high-end applications."

Ingram Micro to Distribute CADKEY

Cadkey, Inc. will be providing introductory-level 3D products through mass distribution channels at prices under \$100. An agreement signed between Cadkey and Ingram Micro authorizes the latter to sell CADKEY@Light and DataCAD@128 to any resellers. The manufacturer's suggested retail price is \$99 for each application.

(continued on next page)

INDUSTRY

How to Access Federal Research

Companies with small research and development budgets now have access to research information from federal laboratories through the federal government's National Technology Transfer Center (NTTC). This research is performed at 700 federal laboratories by about 100,000 researchers and is worth nearly \$22 billion yearly.

By dialing a toll-free number - (800) 678-6882 - individuals can talk to agents who access a database to pinpoint relevant research that's underway at the labs. The NTTC is an independent nonprofit organization created by Congress and funded under a five-year agreement between NASA and Wheeling Jesuit College. Contact the NTTC at 316 Washington Ave., Wheeling, WV 26003; 304/243-2455, or Fax 304/243-2457.

CAD Market - 1992

Total revenues for computer-aided design, manufacturing and engineering inched up just 1% in 1992 and added up to \$7.4 million according to Daratech Inc. These revenues were dampened by economic downturns in Japan, France, Germany, and the U.K.

AT & T Plans ATM

AT&T's ATM (Asynchronous Transfer Mode) service is due in 1994 and will be set up much like a conventional telephone service. Basically, customers will hook into high speed data transfer services (150 to 600 megabits per second) with their own or rented AT&T equipment. Greg Cline, analyst with International Data Corp., Vienna, Va. said "The ATM market will likely evolve in phases, starting with power users, moving to a private LAN/WAN backbone, to public WAN backbones, and possibly onto the desktop. I believe (ATM) will reach critical mass by 1995."

AutoCAD Update

David Cohn, editor of CADalyst magazine, discussed AutoCAD futures in his March 1993 editorial. "Rumors have circulated lately regarding an AutoCAD Release 12.5 as well as a scaling back of the company's two year old plans to completely restructure its flagship product with Release 13. But the Release 12 Windows version looks to be right on schedule. There is still no work on an OS/2 version of AutoCAD, although a number of people are beginning to look toward IBM with the latest delays in Windows NT."

EPA and Printers

The Environmental Protection Agency has expanded its Energy Star program to include printer manufacturers. Lexmark, Dataproducts, and the printer divisions of Apple, Hewlett Packard Co., Compaq Computer, and Bull Italia all now promise to deliver energy efficient products under the EPA's guidelines.

Stac Sues Microsoft

Stac Electronics is suing Microsoft for patent infringements in the latest version, DOS 6.0. Stac claims that Microsoft knowingly infringed two of its file compression patents. Stac's accusations are similar to complaints from many third party developers that are at the heart of the Federal Trade Commission's investigation of Microsoft.

Pentium and Software

Intel's eagerly awaited Pentium chip, introduced in March, is a 60MHz chip with a full 64 bit data path, 16K cache, and superscalar design. However, early testers of the system reported that to realize the speed gains promised by this configuration, existing software must be recompiled. Otherwise, users won't see much difference between the Pentium and the older 486 chips. Companies such as Hewlett Packard Co., IBM, Compaq, AST Research, NEC, and Unisys all have introduced multiprocessor servers based on the Pentium and other companies will introduce single processor based servers.

No Pentium Till 1994

Although PC systems have been sold as "Pentium ready" since the second half of 1992, Intel Corp. isn't expected to ship the Overdrive Pentium processor, code named the P24T, until 1994. Instead, Intel plans to introduce a 486DX3/99 later this year to help fill the gap.

"If I was Intel and I looked at how many 486 processors I was able to sell and the limited market for the Pentium initially, I would probably focus on the 486 this year as well," said Dean McCarron, a senior analyst for the market research firm InStat in Tempe, Ariz. "The situation would have been different if Advanced Micro Devices, Inc. had been able to ship its 486 clone early this year."

IBM and Microsoft have also announced a number of tools designed to help develop 32-bit applications and a new generation of compilers that will let software developers take advantage of the Pentium's superscalar capabilities.

SGI Upgrades Maintain Prices

Silicon Graphics Inc. has expanded its entry level three dimensional color Indigo graphics workstation offerings with the Indigo XZ. Aimed at the entry level 3D solids modeling market, such as mechanical CAD/CAM and molecular modeling, the XZ is based on the MIPS R4000 RISC processor and two SGI Geometry Engine processors. It will cost around \$23,000 and probably replace the \$22,000 Indigo XS24Z, which offered equivalent features but slower performance, company officials said.

Patent Issues Muddy VESA Local Bus Waters

First, Dell Computer Corp. claimed they have a prior patent on local bus technology. Then, VESA member and systems developer Advanced Logic Research Inc. said it has a prior implementation of a local bus system that will render Dell's patent claim invalid. Dell's patent appears to cover local bus connectors that access memory and the I/O bus simultaneously. The VESA committee did not comment on the validity of the Dell patent.

COMPUTER TRIVIA:

History of the Dongle

The SIM or hardware key plugged into the COM port of your computer lets you run CADKEY and prevents unauthorized distribution of software. Ever wonder why it is sometimes called a dongle? Originally developed by a programmer to protect his software, this small but effective piece of hardware needed a name. The developer didn't know what to call it, and his peers encouraged him to name it after himself. So he did, and soon everyone was calling the key a dongle.

CADKEY in the News

Training Materials Available

Training manuals for CADKEY®6 have been developed and are available to dealers, end users, training centers and schools. The manuals come in two sets: the introductory set covers 2D and 3D design and drafting in the form of student workbooks; the advanced set reviews more sophisticated 3D modeling techniques. An on-line computer-based tutorial is included.

CADKEY 6 and FastSURF

Under an exclusive marketing agreement with FastSURF of Sonora, Ca., Cadkey is offering FastSURF's advanced surface-modeling capabilities with CADKEY 6. FastSURF is also available as an individual product. CADKEY with FastSURF is available now for sale worldwide to dealers, distributors, developers and end users. FastSURF sells to maintenance CADKEY users for \$795 and to non-maintenance CADKEY users for \$995. FastSURF's regular retail price is \$2,200.

Cadkey's 30-Day Money-Back Guarantee

Cadkey agrees to refund a customer's money if the customer is not satisfied with the product and returns it within 30 days of purchase. This guarantee is effective immediately, and it applies to ALL of Cadkey's products.

Record January Sales Earn Honors

Congratulations are due to the following dealers and distributor:

Allegheny Educational Systems of Pittsburgh, Pa., for earning the honor of Educational Dealer of the Month for their best month ever in sales.

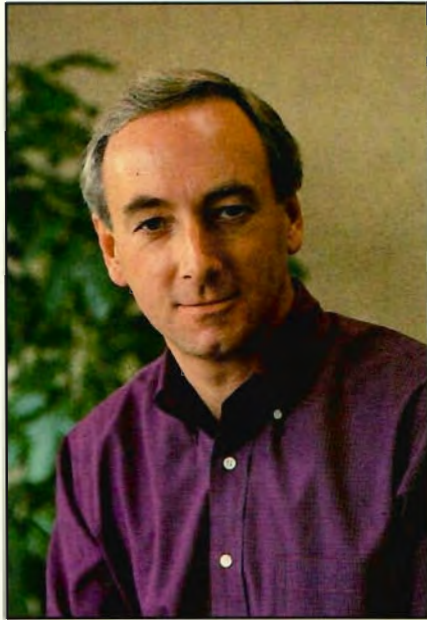
MLC CAD Systems of Austin, Tx., for achieving the distinction of Dealer of the Month for their record sales and for Michael Leesley's contributions in helping to formulate the proposal for the CADKEY Dealer's Council.

3E Praha Engineering of Prague, Czech Republic, for earning the honor of International Distributor of the Month for sales and for their help in making Cadkey's European Distributors' Conference such a great success.

Cadkey Forum

Thanks for the letters!

by Malcolm Davies, President-Cadkey, Inc.



A forum ideally involves two-way communications. I've had my say in the last two issues of **KEYSOLUTIONS**. Now I'm really glad to be getting letters from you. Thanks!

All of us at Cadkey are glad when we get "rave reviews." We are proud of our products and the things we do. However, we really appreciate constructive criticism as well. Software development is an ongoing process, perfection is elusive, and the product must reflect the needs of the users, so your comments, suggestions and ideas are a valuable resource for all of us at Cadkey. They help us develop products that meet real needs.

Several recent letters expressed reservations and concerns about the release of CADKEY®6. In summary, they criticised Cadkey's track record with new releases because they've been "buggy". One in fact said, "Where I work now, they never use a version with a zero (X.0) on it. They're just not reliable." Other letters have requested specific changes or additions to the soft-

ware. Topics have ranged from memory issues like "changing Cadkey so it doesn't hog the CPU" to printing and plotting issues.

I agree with these quality concerns - from the largest to the smallest. I especially understand the position of waiting for several versions past an X.0 release to upgrade. I would do the same. In the past, new releases of CADKEY have had problems. Be assured, I **do** take this issue very seriously and we are committed to do better. We are working extremely hard to make CADKEY 6 and all our products the best that they can be.

Our goal has not changed. Cadkey wants to become the number one provider of concurrent engineering and AEC software worldwide. Obviously, we want to achieve high profitability and increased market share, but none of this is possible without satisfied users. So, the measurement of our success will be customer satisfaction. We intend to create this by providing the highest quality products, service and support, and by aggressively addressing issues like the one above.

A special thanks to Jeff Davis of Beaverton, Oregon whose "truck packs a license plate that says CADKEY." I have offered to trade a Cadkey T-shirt for a photo showing his license plate.

So keep those letters coming. I will answer each one and also pass questions, suggestions, etc. on to the appropriate department for action.

Send your comments and questions to:

Malcolm Davies, President
Cadkey, Inc.
c/o **KEYSOLUTIONS**
P.O. Box 11978
Spokane, WA 99211-1978

A Memorial to Jay Hirth

Jay Hirth, with Cadkey, Inc. for seven years in a variety of positions, the most recent being CADKEY®NC Sales Manager, died on February 27th. He was well known and respected by all who knew him. He will be missed at Cadkey.

Gary Magoon of Cadkey knew Jay for 10 years and has some reflections regarding his untimely death.

"Jay was the first serious Applications Engineer that I ever met. I have met few, if any, who could compare to his intensity and perseverance. He led by example. He worked hard. He was constantly striving to become better at what he did. He impressed upon me important characteristics of professional behavior. He applied these simple "truths" in each job he did. Inside each lesson on work ethics there was a glimpse of "life ethics" from a hard working man, a sensitive husband, a dedicated father, a generous teacher and a caring friend. I am grateful to have known him and to have learned these precious morals from someone as committed and compassionate as he."

Cadkey has received many requests from co-workers, customers, dealers and international distributors for an opportunity to express their appreciation for Jay's contributions to Cadkey as a company and their regard for him as a remarkable human being, colleague and friend. The Hirth Memorial Fund has been established in answer to these requests and will be used to help his wife and two young daughters. If you would like to contribute to this fund, send your check to:

Hirth Memorial Fund
c/o Carol L. Bryant or
Ted Heywood
4 Griffin Road North
Windsor, CT 06095-1511

Cadkey Management to Visit User Groups

Cadkey, Inc. will host evening meetings with users in centrally located areas around the country between May 10 and May 22, 1993.

Users will be introduced to Cadkey, Inc.'s new management staff, and they will hear firsthand about Cadkey's future. The program will feature new product demonstrations and a special presentation of Cadkey's newest product line: Varimetrix. Cadkey technical representatives will be on hand to answer your toughest questions.

"We invite all CAD users to attend the CADKEY user meetings, regardless of the CAD system that you currently use," said Malcolm Davies, President and CEO of Cadkey. "Special, competitive upgrade offers will be available to those who attend."

People interested in attending a CADKEY user meeting must pre-register so that they can be notified in case any changes occur. To register and for further details, contact Danielle Cote at Cadkey, 203/298-6424.

May 10 - Marriot Hotel at Research Triangle, Raleigh-Durham, North Carolina.

May 12 - Ryerson Polytechnical Institute / C.A.T.E., Toronto, Ontario, Canada.

May 14 - Holiday Inn / Irvine, Irvine, California.

May 17 - Radisson-on-the-Lake Resort, Ypsilanti, Michigan.

May 19 - Seattle Airport Hilton, Seattle, Washington.

May 21 - Sheraton Suites Market Center, Dallas, Texas.

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 - △ Advanced Geometric Modeling
 - △ Introduction to CADKEY® NC
 - △ Introduction to FastSURF™
 - △ Introduction to DataCAD®
- Training with your local dealer/value-added reseller
- On-site training at your facility. Call for details.
- Training at Cadkey Training Centers
- CADKEY includes CADKEY® TUTOR, a self-running computer-based tutorial.
- Training materials are available for CADKEY and DataCAD.



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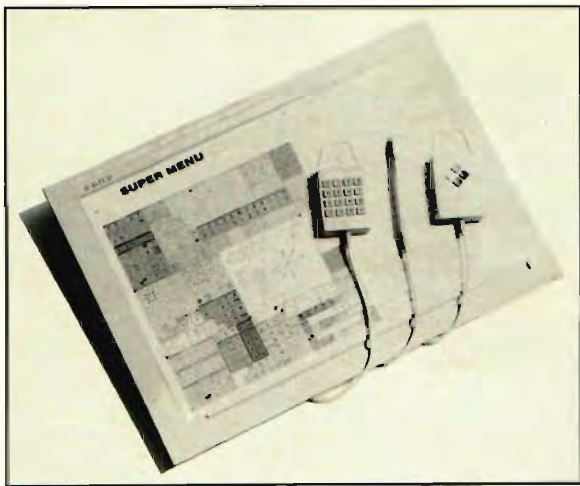
CADKEY and DataCAD are registered trademarks of Cadkey, Inc. CADL, CDE, CADKEY INC, FastSURF and CADKEY TUTOR are trademarks of Cadkey, Inc.

NEW PRODUCTS

INPUT

E-Size Scanner

Vemco Corp. introduces Model FSS 10000, a multi-scan, large format scanner. The multi-platform model features 25-1000 DPI, 300 DPI in 169 secs., four CCDs, and 20,000 pixel elements and is priced at \$24,900. All Vemco scanners have a SCSI interface for PC, PS2, MAC, SUN, HP, and 256 graytone levels. Its AUTOSCAN function automatically analyzes the drawing prior to scanning and during scanning varies the threshold to compensate for changes in background, faded areas and stains. AUTOSCAN is selectable in Tiled, Strip and Global modes. All MULTI-SCANS scan to more than 35 file formats including vector formats .DXF & .DXB, and CCITT Group 4 for CALS capability. Contact Vemco Corp. at 800/556-3344, 909/599-6745 or Fax 909/599-8199.



GTCO's Ultima™ digitizer

Voice Command

Command Corp., Inc. announced the IN³™ Voice Command Developer's Kit for SPARCstation which shows developers how to embed voice input and audio messaging into their applications. Priced at \$595, the kit

is compatible with SunOS™ β 4.1.x and Solaris® 2.1. The kit includes IN³ Voice Command, IN³ Application Program Interface (API), documentation, microphone (a choice of two: the ATM71 noise-cancelling headset or the AT859a unidirectional desktop model) and custom cables for microphone connection. IN³ provides voice control of Sun's OpenWindows user interface as well as voice command input to applications running on SPARCstations.

Contact Command Corp. at 404/925-7950 or Fax 404/925-7924.

Ultima™ Digitizer

GTCO Corp. introduces a 12" x 12" Ultima™ digitizer with unique standard features such as a 16 button cursor and technology that allows the unit to operate without an external power supply or batteries. The Ultima plugs into a serial port and draws the power it needs directly from the computer like a mouse, providing immediate compatibility with power requirements worldwide. The 12" x 12" model lists at \$399; a 12" x 18" model, at \$599. The Ultima ships with Summagraphics® MM1201 compatibility, Microsoft® Windows and Mouse drivers. The unit is backed with a lifetime warranty (USA) and free factory direct technical support.

Contact GTCO Corp. at 410/381-6688 or Fax 410/290-9065.

Small Format Digitizer

Numonics Corp. announces the GraphicMaster II, a small format (12" x 12") digitizer, which incorporates Six One Touch Softkeys (a quick means of changing emulations), ADI Driver, audible feedback

for easier operation, installation utility, lifetime warranty and up to 5000 lpi resolution. The GM II contains multiple emulations to ensure compatibility with all major CAD/CAM/CAE and graphics software packages. Listed price, \$595. Contact Numonics Corp. at 215/362-2766 or Fax 215/361-0167.

Voice-Recognition System

Voice Dynamics Corp. announces the MicroDyn II, a voice-recognition system that enables the operator to talk to any device which utilizes a standard RS-232 serial interface. The compact system recognizes up to 1000 verbal commands, with each command sending up to 255 ASCII keystrokes to the equipment being controlled. The system also provides text-to-speech voice output to verify commands and make verbal prompts from the computer through the supplied headset or by a small speaker. MicroDyn II works with most DOS-based software applications including Microsoft Windows. Prices range from \$1995 to \$2495 depending on MicroDyn configuration.

Contact Voice Dynamics Corp. at 714/252-1211 or Fax 714/261-8563.

OUTPUT

HP Pen Plotter

Hewlett-Packard Co. announces the HP DraftPro Plus pen plotter which offers a richer feature set than its predecessors. HP DraftPro Plus is available in two models--E-size (36" wide) for \$4995 and D-size (24" wide) for \$3695. The plotters have simpler menus and a vacuum fluorescent display panel that outlines operational steps. Other features include increased standard memory of 1MB, improved speed and acceleration, both RS-232-C serial interface and Centronics parallel interface, and HP-GL/2 compatibility. Both plotters use commonly available media,

either from A- to D-size or from A- to E-size. The plotters come with a three year limited on-site warranty. Contact Hewlett-Packard at 800/752-0900.

Flatbed Plotter

Euro-Tech Corp. announces two high-precision flatbed plotters: the 50" x 48" Kuhlman Plot MVP 1400 and the 50" x 96" Kuhlman Plot MVP 3000. Both can plot and cut with an accuracy of 0.0002". Features include a servo-motor-driven rack-and-pinion-drive system, an adjustable acrylic vacuum top, tangentially controlled high-speed tools, and an automatic roll-feed system. Routing/engraving, oscillating knife tools and high-performance cutting can be added.

Contact Euro-Tech Corp. at 303/690-9000 or Fax 303/690-9010.

Plotter/Printer Connectivity Solutions

CalComp announces three connectivity solutions for its line of plotters and printers: Model 981, an Ethernet network interface; Model 914, a VPI (Versatec Greensheet) conversion unit; and a Microsoft Windows device driver. The interfaces allow users to alternate between different software applications, connect plotter or printer to a network for more efficient resource sharing, or realize better output performance in speed and image clarity. Model 981 interface (\$995) includes a serial port and a parallel port and automatically discovers servers and queues at boot time. Model 914 (\$2450) is a protocol converter housed in a compact external unit.

Contact CalComp at 800/932-1212.

Color Electrostatic Plotters

Ocê Graphics announces G3244 (D-size) and G3245 (E-size) color electrostatic plotters, offering full-color plots and images with state-of-the-art RISC processing, operating at up to 66MIPS. This speeds the rasterization of data and boosts throughput. Features include the Silicon Imaging Bar™ writing head, a vacuum-lock paper transport system, dynamic emulation recognition and switching, and faster writing speed and cut-sheet delivery. With the G3245 full-color, typical E-size drawings are plotted in less than three minutes at 200 dpi and 400 dpi



CalComp's Model 981 Interface

designs in four minutes. The G3244 costs \$36,990 and the G3245 costs \$48,990.

Contact Ocê Graphics at 800/545-5445 or Fax 415/961-6152.

Large-Format Laser Printer

GENICOM Corp. announces Model 7150, a large-format laser printer, retailing for \$4395 for the 2-bin model and \$4645 for the 3-bin model. Features include 300 or 400dpi and 15ppm performance. Resident emulations include PCL 5 with built-in HPGL/2 LaserJet III-Si emulation;

HP7475A for direct access to HPGL and CAD/CAM applications without a PCL 5 driver; and GeniScript for fast output of PostScript files.

Contact GENICOM at 800/443-6426 or Fax 703/802-9039.

Presentation Grade Paper

ENCAD announces a new presentation grade bond paper that produces plots with more brilliant, saturated colors, and more contrast and sharpness than those on normal plotter bond. It allows dense, solid area fill while minimizing bleeding and rippling, and increases edge definition and line resolution. ENCAD's Presentation Bond is available in 36" by 150' rolls only and costs \$120 per roll.

Contact ENCAD at 800/453-6223 or Fax 619/578-4613.

SOFTWARE

Flow Analysis Package

Moldflow Pty. Ltd. announces MF/Quickcheck, a flow analysis package that gives instantaneous results on a PC. MF/Quickcheck solves three common design and production problems: it determines the optimum processing conditions, provides the user with the information to determine the number of gates, and automatically sizes the runner dimensions for either natural or artificially balanced runner systems and family molds. MF/Quickcheck is Windows driven, all options are menu selected and on-line help and tutorials are available. The price, \$2500, includes the software and a generic database.

Contact Moldflow at 203/925-0552 or Fax 203/925-1175.

ViewPort+ Supports Raster Formats

CADMAN Corp. announces ViewPort+ Release 4.0 which adds viewing and red-lining support for raster file formats. ViewPort+ now

supports PCX, Tiff v5.0, CCITT Group 3 & 4, GTX Group 3 & 4, and CALS Type 1 raster formats. ViewPort+ compresses industry standard plot files like HPGL, CALCOMP 906/907 and Houston Instruments DMPL into compressed vector files. Now, with Release 4.0, users can input files for viewing and retrieval regardless of the source of the file, including scanned images. ViewPort+ comes in both stand-alone and networked versions and supports linkages to all major databases. Free demo disk available.

Contact CADMAN Corp. at 805/371-0424 or Fax 805/496-2866.

CCDK Now Supports Borland C++ 3.1

Building Block Software announces that its CAD/CAM Developer's Kits™ (CCDK), C function libraries used by CAD/CAM, GIS and A/E/C developers, now support Borland C++ 3.1. CCDKs support a wide range of CAD/CAM operations such as constructing, editing, and displaying 2D and 3D CAD geometry, and reading and writing DXF files. By supporting the Borland C++ environment, programmers can take advantage of features like full support of Windows 3.1, increased program speed and Borland's debugger and profiler utilities. Each CCDK is available in either a Personal or Professional Edition. Prices range from \$499 to \$1799.

Contact Building Block Software at 617/899-4350 or Fax 617/899-4399.

CADKEY Drawing File Support

Cimmetry Systems, Inc. announces full support for CADKEY drawing files with AutoVue version 12.1 featuring fast viewing, printing, plotting, file conversion, overlaying and redlining of many CAD, vector, raster, bitmap and text file formats. Redlining and a Document Database

Management System (DDBMS), two optional modules, are available. Redline provides mark-up and annotation capabilities, and DDBMS includes search functions and report creation capabilities. AutoVue is available for DOS, MS-Windows, 5 Unix workstations, including SUN Sparc, IBM Risc, HP Unix, DEC, and SGI, and is fully network compatible.

Contact Cimmetry Systems at 514/735-3219 or Fax 514/735-6440.

Raster to Vector Conversion

Arbor Image Corp. announces Draftsman 7.02, a raster to vector conversion program with a new interface that permits Draftsman to be called by CAD Overlay 4.0 (from

man PF converts images up to 8.5" wide (\$795). Draftsman HS converts images up to 5" wide (\$199).

Contact Arbor Image at 313/741-8700 or Fax 313/741-8806.

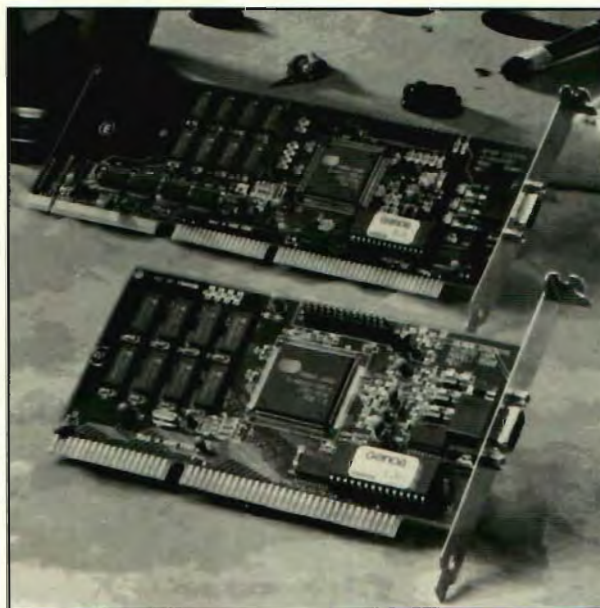
GRAPHICS

16.8 Million Color Accelerator Card

Genoa Systems Corp. announces WindowsVGA 24, offered with a 16-bit ISA bus or a 32-bit VESA local bus VGA card. With its 24-bit accelerator, the True-Color cards support up to 16.8 million colors.

Using 1MB of standard DRAM, the 8500/8500VL models provide full graphics functions with VGA capabilities. They offer resolution of up to 1280 x 1024, and support a 72Hz refresh rate at 800 x 600, and 70Hz at 1024 x 768 non-interlaced. Both WindowsVGA 24 models conform to all current video standards, including VESA, 8514/A, VGA, EGA, CGA and Hercules monochrome and are compatible with all analog and analog multisynchronous monitors. Price lists at \$179 (8500) and \$199 (8500VL), with a two-year limited warranty on parts and labor.

Contact Genoa Systems at 408/432-9090 or Fax 408/434-0997, 800/934-3662.




Genoa Systems' WindowsVGA 24

Image Systems Technology, Inc.). CAD Overlay 4.0 permits raster images to be viewed and manually traced. Now a section of the entire raster image can be selected by CAD Overlay for automatic vectorization by Draftsman. Draftsman converts the selected raster image to a drawing made of lines, arcs, circles and polylines. The vectors are automatically pasted over the raster image for editing, viewing and plotting the drawing. Draftsman LF converts images up to E-size (\$1695). Drafts-

Upgradable Motherboard

AMAX Engineering Corp. announces the Impression 786 ACIO motherboard which incorporates ISA and VESA local bus technology on one motherboard. Sockets for the 80486, 80387, and 80386 make the board compatible with Intel, Cyrix, and AMD CPUs. The board incorporates two VESA local bus slots and eight ISA card slots.

Contact AMAX Engineering at 800/800-6328 or Fax 510/651-3720.



LATE ADDITIONS / MISC.

386/DOS-Extender Version 5.0

Phar Lap® Software, Inc. announces Version 5.0 of its 386/DOS-Extender™, which allows developers to use the Microsoft® Windows NT™ 32-bit C/C++ compiler for 32-bit Extended-DOS development. 386/DOS-Extender provides support for the 32-bit Microsoft compiler under DOS, offering developers full functionality of the 16-bit Microsoft C/C++ DOS run-time libraries, including graphics. All standard 16-bit calls now work under 32-bit Extended-DOS. The 386/DOS-Extender Version 5.0 Software Development Kit (SDK) also includes Phar Lap's new 386/SRCBug™, a 32-bit source code debugger for protected mode 386/DOS-Extender programs. SDK documentation has been revised and updated. Price lists at \$495.

Contact Phar Lap Software at 617/661-1510 or Fax 617/876-2972.

Large Format Hybrid Plotter

Vemco Corp. announces the FSP 4200 Hybrid Plotter priced at \$10,900. FSP 4200 is a large format, E-size, direct imaging thermal plotter with a 36" plotting width, 400 x 200 dpi, and an integrated automatic cutter. The FSP 4200 can transmit and plot E-size drawings in 98 seconds. It is equipped with a high speed SCSI interface with a transfer rate of up to 1MB/sec. FSP 4200 Plotter uses CADImage/Plot Interface Kit for PC, PS2 or Sun. CADImage/Plot supports 28 raster file formats and facilities for conversion.

Contact Vemco Corp. at 909/599-6745 or Fax 909/599-8199, 800/556-3344.

CADKEY TRAINING SALES & SUPPORT ▼ SEMINARS

Half day hands on seminars on the new features of Cadkey Version 6 will be scheduled throughout April & May. These seminars provide a fast start for current Cadkey users to get up to speed on Version 6.

One day hands on seminar on Cadkey Version 6. Includes a free copy of Cadkey Light and a comprehensive overview of Cadkey's Cad, Cam, Surfaces, Reverse Engineering and Analysis.

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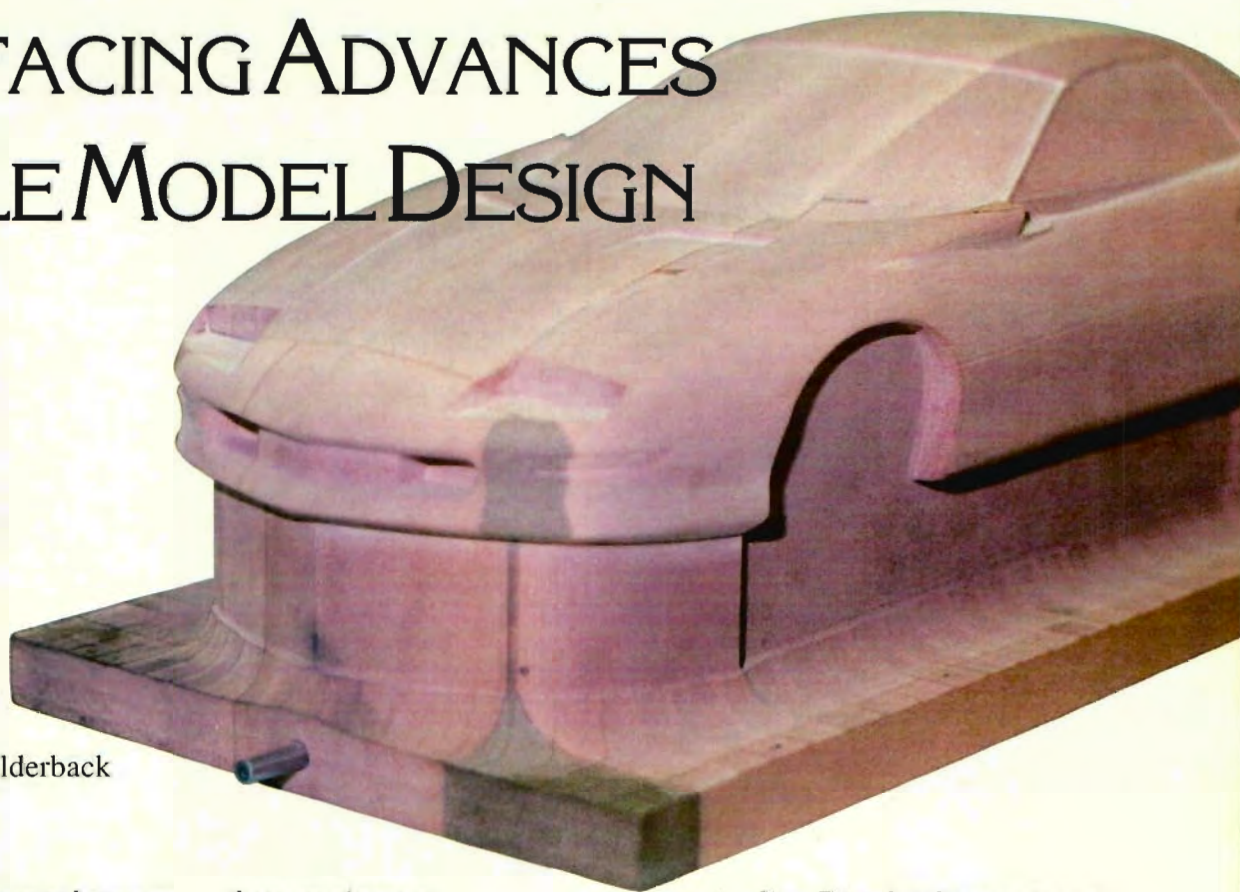
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SURFACING ADVANCES SCALE MODEL DESIGN



by Jack Bilderback

Some say the difference between men and boys is the size of their toys. Maybe so, but Ed Dietz and Bud Alford of Inscale Design Engineering spend the better part of each day creating 3D designs for plastic scale models, and they are definitely doing “man-size” work. Although in some ways there is very little difference between designing “toy” and full-size car parts, what is different about Inscale Design Engineering is that

they are pioneers.

By taking a very different approach to the methods in which miniature vehicles are designed and produced, they were the first in the industry to develop scale model hobby kits which are cut entirely from computer data.

Inscale is located 250 miles northwest of Detroit in Traverse City which is home to many companies supplying the large automakers with component parts.

Ed Dietz and Bud Alford started Inscale in 1992 to contract part design, rapid prototyping, and overall project supervision for both miniature autos, trucks, and airplanes in hobby kits, and components for full-scale vehicles.

Bud and Ed’s partnership is involved and long-

standing. Dietz has been active as an independent designer for 40 years in the hobby kit industry. Alford, an aspiring artist when they first met in 1979, was dating Ed’s daughter. (They’re now married). The two discovered their mutual interest in hobby kits and began to discuss the possibilities in their contrasting design methods. Now they incorporate both an engineering and artistic perspective.

Reviving a Dinosaur

Scale models almost went the way of the dinosaur. Adversely impacted by the popularity of video games in the 1970’s and 1980’s, they had been relegated to the backburner by many of the large toy companies. This despite the fact that the market is comprised of more than 50% adults. Craft House, a major model producer, had acquired Lindberg, a struggling model maker, and was trying to rejuvenate the industry with new products.

In the fall of 1989 Dietz was approached by Craft House about rejoining the organization as chief





engineer. He had worked for them for a number of years, and subsequently enjoyed an ongoing consultant relationship. He saw this as an opportunity to take advantage of new technology in CAD and surface design software from "inside" the company. These improved methods of design and production can produce models with a variety and level of detail previously unknown in scale model building. Ed believes the revitalization of the industry is already underway due to quicker development

cycles and reduced costs.

Not too long after, Bud joined Ed at Craft House and they subsequently set out on their own.

A Unique Approach

Inscale's approach focuses more on an artistic representation of a vehicle rather than a strictly engineering, design-by-the-numbers methodology. Primary concentration is on the shape and form (facilitated by CAD and surfacing software) rather than coordinates or dimensions. The trick is to remain true to the original design. Dietz observes, "The typical approach has been to take CAD designers and try to turn them into toy makers. The important elements to us are solid CAD experience as well as experience in kit design from an artistic perspective."

The first step in transforming a life-sized vehicle into a model from somewhere between 1/20th to 1/72nd scale is to photograph the subject from all angles and measure all critical dimensions by hand. The entire subject is then reproduced in

CADKEY. The exploded view begins the design process for the individual parts (which can range from 90 to 130 pieces per model) necessary to create the kit.

These details are then saved in .PRT files which are used to create the surface configuration for each individual part. The CAD and surface data is then sent to a pattern maker, where the first representation is produced using either wood or renwood, a polyester/plastic material. CADKEY data, along with FastSURF, produces the 3-D model. Basically, the time-consuming and costly process of manually reproducing three dimensional models for mold creation is eliminated.

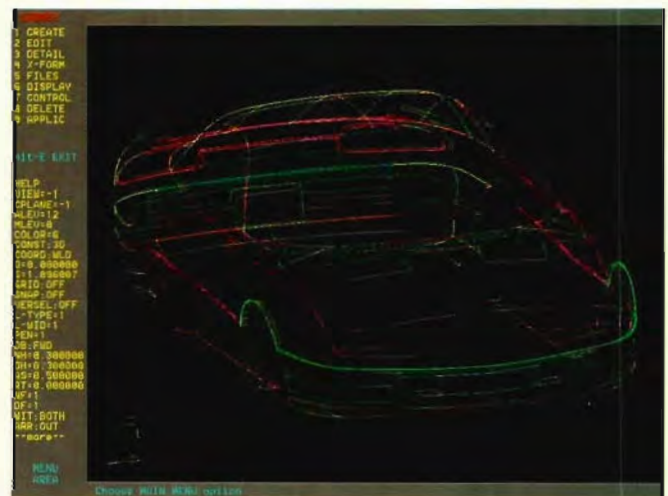
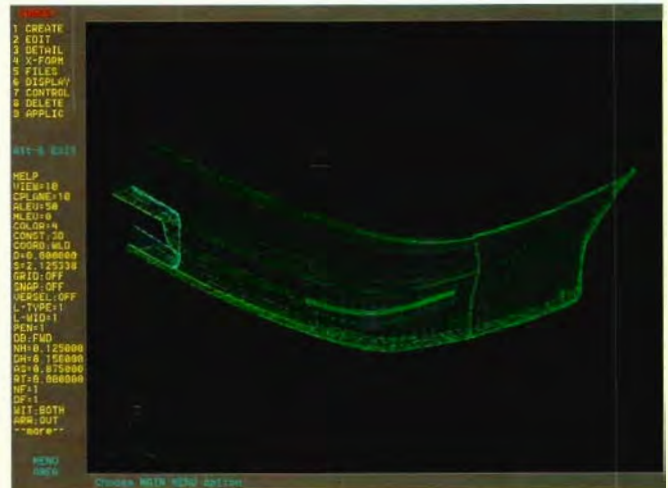
Ed and Bud originally chose CADKEY because of its 3D and CAM capabilities. At the time it was the only PC CAD program that met their needs, but with the addition of FastSURF they now are doing things they never thought possible. It's best told in Bud's own words. "FastSURF has been of immeasurable help to us. Without surfacing capability, using CAD to produce 3D models for the industry would not be economically viable, if not outright impossible. I have worked closely with our Cadkey VAR, Meeter and Associates, and Bob White, FastSURF founder, for two years now. We're doing things with CADKEY and FastSURF that were never planned for or thought about."

"The biggest obstacle to 3D CAD in the scale model industry is that

CAD designs have a tendency to look a bit too mechanical. With FastSURF we can define a surface and then, with the surface editing functions, essentially sculpt the

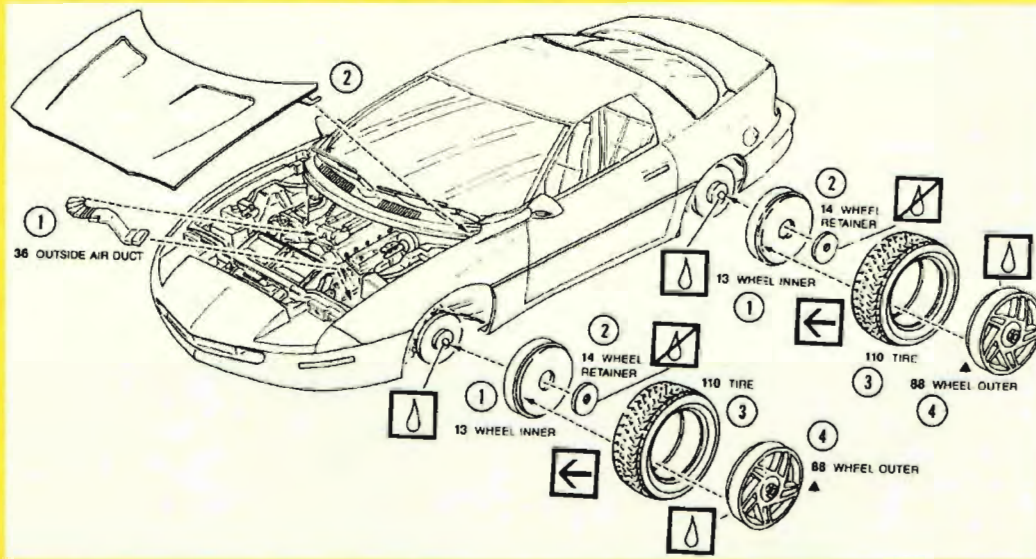
surface into the shape we need, so that the entire form 'flows' without looking mechanical."

There is a risk creating tools directly from CAD data. Total cost can run as much as 150 to 250 thousand dollars, should there be a problem somewhere in the process. However, eliminating the need to manually reproduce the model body saves much time and investment, and is destined to follow as the next elevation of standard practice in the



hobby kit industry.

Inscale has designed several scale models that are already in the stores. The Toyota 4x4 Pickup



marketed by Lindberg was the first kit in the industry to have the body successfully cut from computer data. In addition, they used CAD tools for portions of the GMC Syclone pickup and the Mitsubishi 3000GT. The 1993 Camaro Z-28 and 1993 Formula Firebird replications are also CAD designs which will ultimately be mass produced for the Ertl Co. A model of the Boeing B-52 aircraft will be available at press time.

Inscale's Future

Although 80% of Inscale's business currently is model/hobby kit design, service to companies

that supply parts to large automakers is growing. Inscale clients include manufacturers who supply auto components, such as instrument panels. Their services speed the process which provides the data necessary to physically fabricate the parts. In the industry, a number of companies are unable to translate data from CAD files directly into CAM due to a lack of resources in the form of either manpower, time, or expertise. Inscale fills the gap. Inscale's work for companies such as Ertl, Monogram, Revell, and Testors Corporation has yielded impressive results.

Dietz and Alford see their business expanding. Demand for their services has increased to the extent that new resources are being added, both human and hardware/software. Global involvement with toolmakers and customers continues to grow. Bud feels that with the facility and sophistication available today in CAD/CAM software the possibilities are endless. This will continue to provide solutions to creative barriers which exist today.

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SURFCAM's menu structure and view numbers are similar to CADKEY's for a clean and consistent interface.

SURFCAM includes bi-directional CADL support for seamless data translation between CADKEY and SURFCAM, including 2D & 3D geometry and NC toolpaths.

SURFCAM translates CADKEY's Bezier Surfaces from the Super Patch format into SURFCAM Bezier surfaces. (SURFCAM supports highest degree Bezier surfaces.)

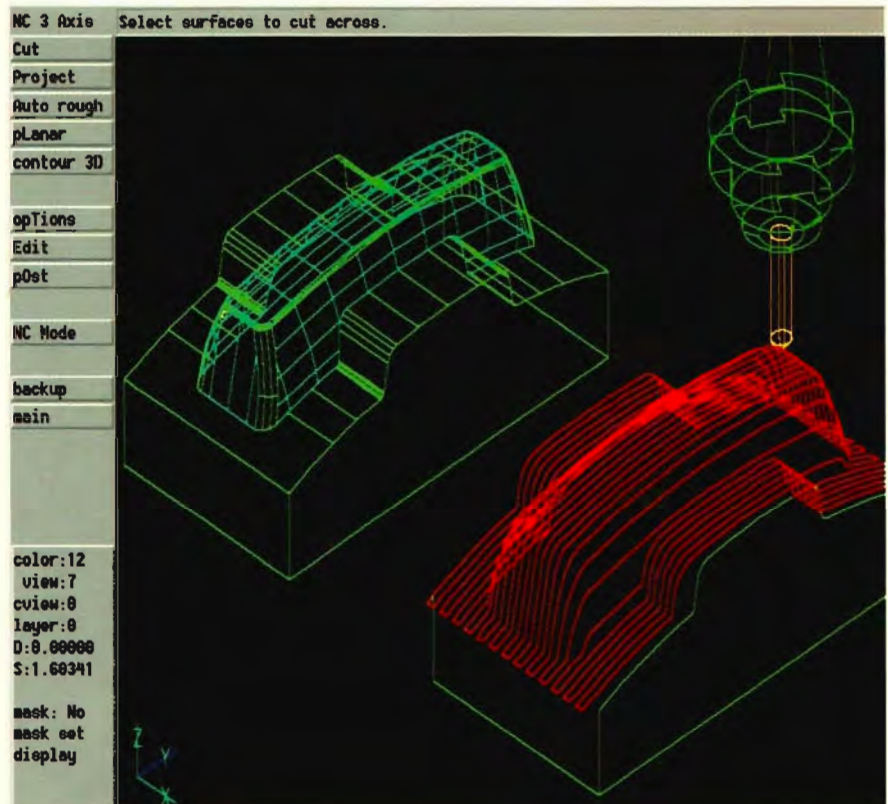
SURFCAM out-performs most high-end workstation systems in speed and features, yet has been judged the easiest-to-learn all-around CNC machining system.

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SURFCAM creates true surface models and optimized toolpaths with gouge avoidance for 2 axis through 5 axis CNC mills, lasers, waterjets, routers, digitizers, CMMs. Includes support for simultaneous 4 and 5 axis machining.

SURFCAM 32-bit DOS and 32-bit Windows versions require a 386/486 PC computer with 4 MB memory.



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REVIEWING THE REVIEWERS

PC Magazine recently published an eight page review of several CAD programs entitled "2-D Drafting: Why Pay More?" The February 23, 1993 article included AutoCAD and AutoCAD extension for Windows; CADKEY 5 and DataCAD; Cadvance and Cadvance for Windows; DesignCAD 2D; DrafixCAD Ultra and Drafix Windows CAD; Drawbase 2000; EasyCAD 2 and FastCAD; Generic CADD; IBM CAD/Plus, MicroCadam Plus; Microstation Nexus and Microstation PC; Point Line Professional; Silver Screen Professional Edition; TurboCAD, VersaCAD/386 and VersaCAD Design. The criteria given for software selection were 2D drafting programs that supported extended or expanded memory, text annotation, e-size drawings, symbol libraries, dimensioning, hatching, command scripts/links, DXF support and priced under \$4,000.

The CADKEY section contained several glaring inaccuracies. For instance, the reviewer stated plainly that CADKEY does not have a "stretch" command. Oops! CADKEY's EDIT: BOX MOVE command stretches geometry, but the words for the commands are different. The reviewer also did not address or mention several of CADKEY's strongest features such as drawing layout, history line and immediate mode commands, and had difficulty with a hatch routine which should be easy. The reviewer was obviously unfamiliar with CADKEY and the material was not submitted to Cadkey or an expert CADKEY user for a technical read before publication. Is this fair to readers who are looking for accurate information?

Many CADKEY users have contacted PC Magazine regarding the errors, but Dana Seero, CADKEY VAR and president of Computer-Aided Products of Marblehead, Mass., was also very concerned about the underlying design and execution of the review in addition to the accuracy. His comprehensive letter to Mike Miller, PC Magazine Editor, addresses these issues in depth and is printed here in its entirety.

Editor's Note

KEYSOLUTIONS talked with PC Magazine's editorial staff and the author of the letter about the problems described here. PC Magazine will be printing a correction in an upcoming issue.

February 26, 1993

Dear Mr. Miller:

As a long time subscriber to PC Magazine, and a system provider for mechanical CAD/CAM software and systems, I'm deeply troubled by your February 23 review of 2-D drafting systems. I'd like to detail my concerns, and request a reply. In some instances, I believe you owe your readers an apology, and an explanation.

I. General Considerations **Why 2D Drafting?**

In the two years since you tested 3-D mechanical CAD packages, we've seen the drafting market consolidate, while demand for 3-D and solids-based tools is increasing. According to Daratech, while 48% of CAD data is currently represented as 2-D, 84% of users would prefer to represent their data as 3-D solids. Almost every 2-D-only PC CAD package has added 3-D, solids, and rendering tools to be competitive.

Yet in 1993, you review 2-D programs, while giving credit for 3-D (in your Editor's Choice conclusions). The explanation is that, "...most users are still only doing two-dimensional drafting." By this rationale, you shouldn't review color printers, CD-ROM's, object-oriented programming tools, graphics accelerators, or any multi-media tools.

We expect leadership from PC Magazine in evaluating new, important trends in technology. 2-D drafting tools are not an area of active development by CAD vendors, who are working on "automatic" dimensioning of 3-D solid models that can be varied in many ways. Why did you decide to select 2-D tools now, when the future in 1991 was 3-D?

Qualifications of Reviewers

We are dealers of CADKEY, and in the past of Ashlar-Vellum (we also sell high-end UNIX solid modeling systems and PC CAM software). I state this up front. But one of your reviewers is not just a consultant - he is an AutoCAD dealer. Another is not just a consultant - he is an AutoDesk Fellow. That said, I believe that, within their frame of experience, your reviewers tried very hard to be fair.

What qualifications do you require of reviewers? What special or unique expertise and experience do your reviewers provide that justifies any faith in their conclusions by your readers? In this review, it seems that primary familiarity with one product by several reviewers may have unintentionally biased the way the evaluation was organized and conducted.

Choice of Packages

ANVIL 1000 is a long-popular professional drafting program, brought to the PC environment years ago by one of the leaders in the development of 3-D CAD. It comes with an extensive library of mechanical components that are expensive add-ons to other packages. The developers of this product, who understand and flourish in the 2-D drafting market, do not feel the need for "command scripts." How does PC Magazine justify this as a critical function, when support of drafting standards or associative dimensions are not?

This same scripting requirement knocked out another program of substantial merit to your readers, Ashlar-Vellum. Vellum uses a "sketcher" to create geometry, which can be constrained. You can dimension the drawing, then drive changes by editing the dimension value. Formula relationships can be established between dimensions, and parametrically driven to create linked changes or families of parts. Don't you think this is important?

CADKEY Light, currently selling for \$99, would have scored just as high on your benchmark as CADKEY, if it had not been excluded by your command script requirement.

Your Criteria - Omissions

One thing is really important to a draftsman - an engineering calculator! Some of the reviewed programs will accept formulas as

command input (i.e., $2.312 \times \tan(2)$). Others have an on-line calculator that supports important functions (ie, Sine, Cosine) and can access the results without retyping. Others require you to input a command script for the result, and others require you to type in output from a calculator on your desk. Which would you prefer to use? This is a critical productivity tool for draftsmen.

You require command scripts or links to outside databases. You specify "command scripts," instead of macros, although most of your other software reviews score macros (especially keystroke recorders) as beneficial for users. Ask your readers - the "most" users that are currently doing 2-D drafting. Draftsmen aren't programmers. If lack of macros or a programming language is a "showstopper," than why didn't you evaluate them in your benchmarks?

Your benchmark was trivial and does little to differentiate the products. Do you believe that drafters who purchase anything but \$500 packages are foolish and don't understand the technology and their needs? If a \$99 package does just as well in your tests as a \$3,495 package, maybe you aren't testing anything of meaning.

You require DXF support, but not IGES, STEP, VDA, or one of several other industry standard (and non-proprietary) translators. DXF is an AutoDesk-proprietary format that sometimes imposes grave restrictions on data interchange (for example, 3-D splines are output as polylines, which makes it difficult to use CAM software without special techniques). True, it is a de facto standard - but is **not** the primary means of data exchange in the CAD world. We think PC Magazine should support and promote open and industry standards, not proprietary ones - that's what made PC's popular to begin with!

You state a price less than \$4,000. This is entirely arbitrary - customers looking for drafting productivity typically look at PC-based packages in their entirety. And it seems to have eliminated from consideration two other powerful drafting-only packages - Hewlett Packard's ME10, and ADRA Systems CADRA-III. ComputerVision's Personal Designer includes advanced 3-D surfacing capabilities for a list price of \$3,995 - but does not include the programming language at that price, apparently another victim of your command script requirement that nevertheless fulfills the needs of many designers.

According to Daratech, there are two life-forms in the PC CAD market. Personal CAD systems cost less than \$1,000; dealer-supported professional packages cost \$2,000 or more. Prices change constantly, discounts are often available, and prices are trending downward. Do you think your readers find this restriction appropriate? The higher the price, the more flexibility in that price.

II. Suitability to Task

As my area of expertise is mechanical CAD, I'll limit specific comments to that area, but there are general areas of concern as well. **Special or All Purpose?**

You evaluate packages for architectural, mechanical, and facilities management use. For home or part-time use, I suppose someone might use the same package, on a limited basis, for all three purposes, and I think that's good. But professional products in these general areas have specialized, as the many 3rd party offerings attest. Access to external databases is an absolute "must" for facilities management, yet is much less important for architectural or mechanical use. Ability to use 3-D data from other packages is critical in mechanical CAD, but less

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important in AEC.

What was the rationale for evaluating these tools in all three areas, when many of the tools are specialized for a specific functional area?

Standards, Dimensions, Associativity

You give no examination or credit to drafting standards compliance. There are ISO standards, JIS standards, ANSI geometric dimensioning and tolerancing standards, and several more specific standards (i.e., guidelines used on some federal contracts). No one buys a professional CAD package that doesn't meet their particular standards needs - you don't mention or measure this.

You give no examination or credit to other critical dimensioning needs. Tolerance dimensioning is a critical function in many drafting environments. Most of the low-end packages you review **do not** support tolerance dimensioning, and users should know this! Datum and ordinate dimensioning are required in most mechanical drafting environments.

You mention associativity but do not define or measure this or other types of dimension change. Significant changes in geometry often result in other types of editing, such as moving the location of the dimension, changing the number of decimal places, changing the text height, or changing the cross-hatching. Some systems preserve their associativity throughout these changes - others don't. IGES output should reflect the same dimension types with the same level of associativity as the native binary format. If you are going to test associativity (and you should!) then test it in a meaningful way.

You mention being able to cross-hatch in complex boundaries, but leave out other important measures of functionality. Cross-hatching around islands, including text and dimensions, is a common problem for all types of drafting. Some programs

do this automatically - others require editing of individual cross-hatch patterns, a laborious process. Some programs have associative cross-hatching - others don't.

In your Editor's Choice conclusions, you state, "...the price of your package may bear little relation to its quality; we've seen inexpensive packages that can take on jobs that can't be done by packages that cost ten times as much."

This is not a reflection on the value or quality of the software products you reviewed. It is a reflection on the lack of familiarity of your reviewers with drafting tools users find important, as detailed above. You have done a grave disservice to your readers, who may have been led to a package that will significantly hinder, rather than enhance, their drafting productivity.

III. Editor's Choice

This was supposed to be a 2-D drafting review, yet you state, "AutoCAD Release 12....it's ability to take you all the way from design to execution of both 2-D and 3-D projects more than makes up for its drawbacks." If 3-D tools were part of your evaluation criteria, how? With all the shortcomings noted above in evaluating 2-D drafting tools, do you think your reviewers have the knowledge and expertise to compare 3-D functionality of all these packages as well? This is sheer opinion on the part of the reviewers, and I would like you to offer their qualifications for making this statement, or retract it.

IV. Concluding Statements

I've been a subscriber to PC Magazine for a long time, and I expect leadership. I do not believe that this review will help readers select the package that best fits their specific requirements. The organization of the review and criteria used do not reflect the

patterns of use of CAD drafting products, personal or professional, and excluded programs that are in many instances better for their intended use than the ones evaluated. As mentioned above, if not for the requirement to run "command scripts," CADKEY Light would have fulfilled all your benchmarks the same as CADKEY 5. Do you think you've done the right thing for your readers here?

The exclusion of ANVIL 1000, Ashlar-Vellum, CADRA, ME10, and Personal Designer is not in the best interest of your readers. Ashlar Vellum has a sketcher, an intelligent cursor, and parametrics. ComputerVison's DesignView has similar functions, plus solver capability, for \$1,000. ANVIL, ME10 and CADRA are professional drafting packages just about as good as any workstation drafting package at any price. CADKEY and Personal Designer were among the first to include 3-D and advanced surface modeling tools on a PC. If your readers are going to buy a professional product, do you think they consider a list price of \$3,995 acceptable, but not \$4,195 or \$4,495, a 5-10% difference?

I have every confidence that PC Magazine wants to be the best - and this means service to your readers. Reading your review, it is difficult to believe that this was your primary objective. The selection and evaluation criteria seem to have been chosen, out of ignorance or commercial interest, for reasons other than to fairly evaluate 2-D drafting tools the way your readers use them.

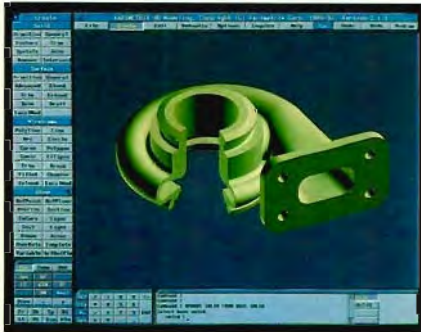
Please have someone get back to me with your plans for a response to this letter. I consider the implications of this article very serious and hope you will address them squarely.

Sincerely,

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DMS Dossier

by Martin van der Roest

Drawing management has taken on a high level of importance over the past decade. It is critical to fulfilling the promises of concurrent engineering and computer integrated manufacturing (CIM). It is the mechanism which can maintain the order and value of an organization's "currency." Unfortunately, in spite of its importance, drawing management is still not fully understood, much less implemented.

The subject of drawing management reminds me of an annual event that took place at the end of spring football practice during my high school years. The event, a liberal interpretation of rugby, was actually played in the school pool with a heavily greased watermelon! I remember the players (who were feared and respected on the field) were reduced to a pair of ineffective flailing arms in the pool. What a glorious equalizer! Trying to get a hold of the "watermelon" was next to impossible. If it popped in a direction you wanted it to go, it was purely coincidental. The watermelon feed afterwards was pursued with equal vigor, but with much more control and success.

Defining and understanding the issues of an automated drawing/document management system (DMS) is like that "greased watermelon." Companies struggle to get their hands around the issues, but if they do get a hold and make a push towards a solution, the results do not necessarily reflect the goals. Drawing management systems are not like other applications software. CAD and other well known and understood applications have been

distilled into features wars - like, "my red wagon is shinier than yours."

DMS, on the other hand, parallels accounting systems. You don't run down to the local software stand and pick up an accounting system expecting 'plug and play' operations. Of course not. Extensive planning must go into defining such things as chart of accounts, vendor/customer setups, invoicing policies and procedures, forms, multiple department interactions, etc. In other words, the software facilitates and provides the mechanisms necessary to support the administrative needs of the organization. A well planned effort permits the enterprise to focus on the business at hand. Likewise with an automated DMS solution. A successful system is the result of a well planned effort which considers both software and administrative practices, policies and procedures.

With that, let me welcome you to the DMS Dossier which will address the "greased watermelon" known as drawing/document management. On an ongoing basis I plan to focus on what DMS is, its common components, how it can benefit your business, how it works, and how to implement and support it. Clearly, every business is different in its needs and goals. However, just like CAD systems have basic and expected operations, DMS will also have basic and expected operations.

The organization I belong to has done extensive work in this area for the past five years. Continuous feedback regarding the evolving challenges of DMS is essential, so I am requesting your input. The

feedback mechanism is a FAX poll (see following page). Future columns will address subjects gathered from the FAX poll(s). Your participation is looked forward to, and will be valued.

Let me begin with a broad perspective of what DMS is and its most obvious benefits. To me, document management refers to the practices, policies and procedures an organization uses, (manual or automated), to support the introduction (creation or capture), management, and control of documents used to deliver product and/or services. This definition suggests that nearly everyone has developed, consciously or unconsciously, a DMS solution for their business. If we narrow this discussion to CAD and related applications such as engineering/manufacturing, we find a class of DMS typically referred to as engineering document management.

EDMS environments have three basic components. These include the drawing creation and/or prerelease stage, the release stage, and the document distribution stage. So, comprehensive EDMS solutions are not isolated to the drawing creation stage using CADKEY. They go beyond and encompass the release processes, the controls imposed, engineering change controls procedures/processes, relationships to MRP environments, and then of course, the challenges of document distribution. An organization can benefit from such a broad implementation by being able to quickly and easily find a drawing/document and having the confidence that it's the right document! As intuitively obvious as this sounds, this is a huge barrier to productivity in most

organizations. Nearly 60-70% of the time spent retrieving documents is consumed in searching, verifying, and understanding inter-relationships. This may be acceptable for smaller operations. But for larger operations,

this becomes a significant resource drain that will have a noticeable impact on the bottom line. This is clearly unacceptable, regardless of the state of the economy.

I look forward to digging into this

subject with you. Making it relevant and applicable is a given. Your feedback will be a plus. So let's get started. ☐

KEYSOLUTIONS *DMS Dossier* FAX POLL

We want to hear from you. Tell us what's going on with your CAD related drawing management activities. The results and input provided will be published in the next issue of **KEYSOLUTIONS**.

Send this FAX form to 714/543-4931.

1. What is your primary business?

- | | |
|-------------|-------------|
| A/E/C | Instruments |
| Automotive | Machinery |
| Aerospace | Metals |
| Electronics | Other |
| Government | |

2. What is your primary area of responsibility?

- Executive
- Management
- Technical

3. What is your CAD system used for?

- | | |
|--------------|---------------|
| Architecture | Manufacturing |
| Construction | Mechanical |
| Civil | Rendering |
| Electrical | Other |
| Facilities | |

4. What network is currently being used, or is planned for use with your CAD system(s)?

- | | |
|--------|---------|
| None | IBM |
| Novell | StarLAN |
| Banyan | PC NFS |
| 3COM | Other |

5. The time it takes to find or locate commonly used drawings is (on average):

- | | |
|----------|--------------------|
| Quick | If not Quick, why? |
| Moderate | |
| Too long | |
| Unknown | |

6. Once a drawing is found, your confidence that it is the correct drawing is:

- High
- Moderate
- Low
- Unknown

7. Please profile the state of a DMS solution for your organization.

- Exists
- Planned
- No Plans
- Unknown

8. What specific questions or topics are of interest to you?

Optional Information: Respondent's identities will be kept confidential:

Name _____

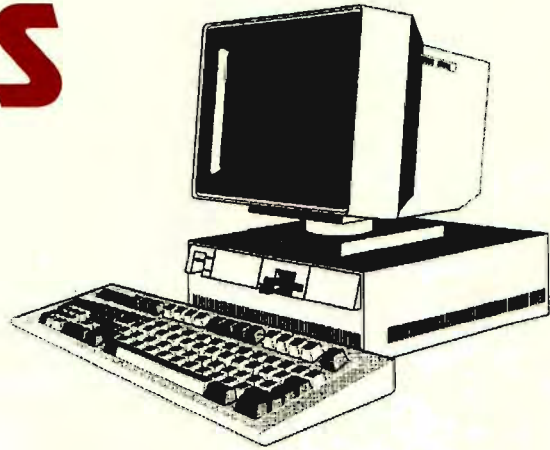
Company _____

Phone Number _____

FAX Number _____

MONITORS FOR CAD

High Performance - More Than High Resolution



If you spend long eye-burning hours at a computer working on CAD, you know you need all the help you can get. Large, high-resolution monitors can be very valuable. They not only make the work easier by reducing obvious things like eye strain, but let you work faster by lessening the need for pans and zooms. They're not cheap, but the benefits they provide for CAD make them worth the expense.

There are many complex features and terms to understand. The following explanations and definitions are very brief and intended only as an overview. For those who want to research the topic in more technical detail, "How to Select a CRT Monitor" is an excellent book available from Beta Review Inc., 703/837-1436, fax 703/837-3063. The cost may seem a little "pricey," but compared to the cost of a monitor (from \$1600 to \$3500) plus nearly as much for a graphics card to support it, this could be \$185 well spent.

High performance monitors can be understood on two levels: 1) what you see and use; and 2) what you can't see or the internal electronic technology.

What You See

Resolution/Dot Pitch

Many people believe high resolution is the main factor in selecting a high end monitor for CAD, the theory being, the higher the resolution the better the display image. This idea is not totally accurate. Display quality is actually

based on a complex set of interrelationships between monitor size, dot pitch and resolution. Images displayed on smaller monitors at a very high resolution but a large dot pitch can be unusable because text, for example, is often unreadable, etc. In general, the smaller the dot pitch the clearer, sharper the picture because the phosphor elements inside the CRT are closer together.

A few comparisons should make these relationships clear. A 20" monitor with .31 dot pitch produces good 1280 x 1024 resolution. On the other hand a 17" CRT requires a .28 dot pitch for top quality 1280 x 1024 display. Higher resolutions really should have a smaller dot pitch. At .31 dot pitch the best resolution on a 14" monitor will only be 800 x 600, but at .26 dot pitch the 14" will produce fine 1024 x 768 resolution.

We believe high-production CAD needs a monitor that is at least 17" with 1024 x 768 resolution or better. If you want a larger screen, be aware that 19" monitors and larger require an enormous amount of desk space.

Size/Display Area

Monitor sizes are normally described in inches (17", 20", etc.). Like a television, this number measures the diagonal of the CRT (Cathode Ray Tube), but the viewable area is usually about 1 inch smaller (20" = 19" viewable). However, (pardon the pun) this is only part of the picture. The active display area is measured horizontally and vertically in millimeters. On many monitors this area may be

less than the actual real estate of the screen and/or there may be distortions of the image along the edges and in the corners. Flat and flat-and-square screens and other technologies tend to alleviate these problems.

Display Features

Glare and reflection are enemies of productivity. Coated anti-glare glass, tints or other ways of decreasing this problem are essential. High performance monitors also generate large amounts of static electricity. An anti-static coating stops this and lowers the amount of dust that collects on the CRT and stops the dust from being thrown on your face.

Flicker (even below the eye's perception level) can be fatiguing. That's why high performance monitors are predominantly set up for non-interlaced operation. In non-interlaced mode each line of the screen image is drawn consecutively in one pass. Interlaced mode draws the screen image in two passes: first drawing every other line and then filling in the missing lines on the second pass. Flicker is also reduced as the vertical refresh rate increases. This is discussed below.

User Controls

High performance monitors are big. A simple thing like on/off switches and other controls located at the back of the unit can be a major inconvenience on a regular basis. Make sure your monitor's controls are forward not aft. Many have front drop-down panels which provide excellent access.

Minimum controls on a high performance monitor allow you to adjust horizontal display position (phase) and size and vertical display position and size which can vary for different video modes. Some have degaussing switches for discharging the magnetic field that can build up on the CRT. This build up can throw all the colors off. Some monitors have additional sophisticated external controls for color and correction of geometric image distortion.

Flip Screen

An important factor for CAD or Windows users is "flip screen time." This is the black out interval when switching the PC from high resolution graphics mode to text command mode (VGA) in either sequence. A good design takes approximately 0.5 seconds to switch; others may take 2 to 3 seconds.

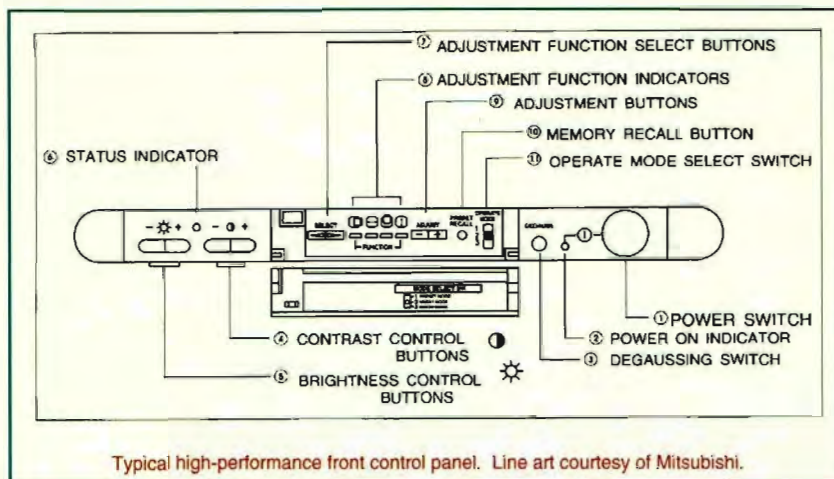
Cables/Connections

Two types of connections are common: 15-pin D sub and BNC. The BNC type has three to five separate color-coded connections on the monitor end. A new version of the D SUB type, 13w3, has coaxial embedded instead of regular pins. Developed for the B2 bomber, they are not common yet for monitors, but offer some excellent technological advantages. Make sure the vendor includes the proper cable with the unit.

What You Don't See

Refresh Rate

A CRT monitor generates an image by passing an electron beam (in the case of a color CRT, a set of three beams) across a glass area that is covered with phosphor. The electron beam excites the phosphor causing it to glow momentarily. The phosphor must be continually re-excited in order for the glow to create a visible image. For the image to appear stable, the phos-



Typical high-performance front control panel. Line art courtesy of Mitsubishi.

phor must be excited, or updated, with sufficient frequency. This update frequency is called the refresh rate. In general, 70Hz or higher is considered a high refresh rate, and the higher the rate the more stable the image will appear. Higher refresh rates also produce more vivid images. Since the phosphor begins to fade immediately after it is excited by the electron beam, increasing the refresh rate will raise the average brightness of the glowing phosphor.

A 60Hz refresh rate (the display image updated 60 times each second) has been a de facto standard for computer monitors. In

Europe, and more recently in the United States, standards have evolved so that refresh rates of at least 70Hz are required. Users become more productive with higher refresh rates because they can work longer without fatigue or discomfort.

Scan Rate

The scan rate is the frequency at which the monitor's electron beam must sweep horizontally across the face of the CRT in order to make its way from top to bottom of the screen at the required refresh rate. Monitors can be grouped into distinct performance classes on the basis of their minimum to maximum scan rates. Given a desired refresh rate, for example 72Hz, and a desired resolution, for example 1280 x 1024, you can roughly calculate the type of monitor that will be required: [refresh rate] x [vertical resolution] = scan rate. In our example, 72 x 1024 = 73,728 or approximately a 74Hz scan rate.

EMISSION STANDARDS

The concern over possible effects from electromagnetic emissions is controversial and unlikely to be resolved in the near future. To be on the safe side some people are purchasing low emission monitors. Currently the U.S. does not have any ELF/VLF emission standards. In Sweden, three standards have emerged.

The first standard MPR-I came in 1987. It is very limited and only addresses VLF magnetic fields. It does not address ELF or electrical fields. Some companies say their monitors meet Swedish standards, but don't say which standard they meet. When this is the case, they usually just meet MPR-I, which isn't very much.

MPR-II covers the areas MPR-I missed. The selection of the parameters for this standard wasn't based on any research, but on what was possible at a reasonable price.

At the same time MPR-II was created (Dec. 1990), the Unions in Sweden demanded a tighter standard. This became known as the TCO option. Meeting TCO requirements is possible, but does add considerably to the final price of the monitor.

Some monitor manufacturers "Pass" the test by measuring their monitors at VGA resolution. The electrical emissions from a monitor increase at the higher resolutions.

A Simplified Comparison of Standards

	MAGNETIC FIELD		ELECTRICAL FIELD	
	ELF	VLF	ELF	VLF
MPR-I*	n/a	0.50mG	n/a	n/a
MPR-II*	2.5mG	0.25mG	25 V/m	2.5 V/m
TCO**	2.0mG	0.25mG	10 V/m	1.0 V/m

* Measured at 50cm (19.6 inches) around.

** Measured at 30cm (11.8 inches) from front and 50cm all other sides.

by B. Diaz - Nanao U.S.A. Corp.

This is only an approximation. In practice, the calculation must include another factor called the retrace period.

Retrace Period

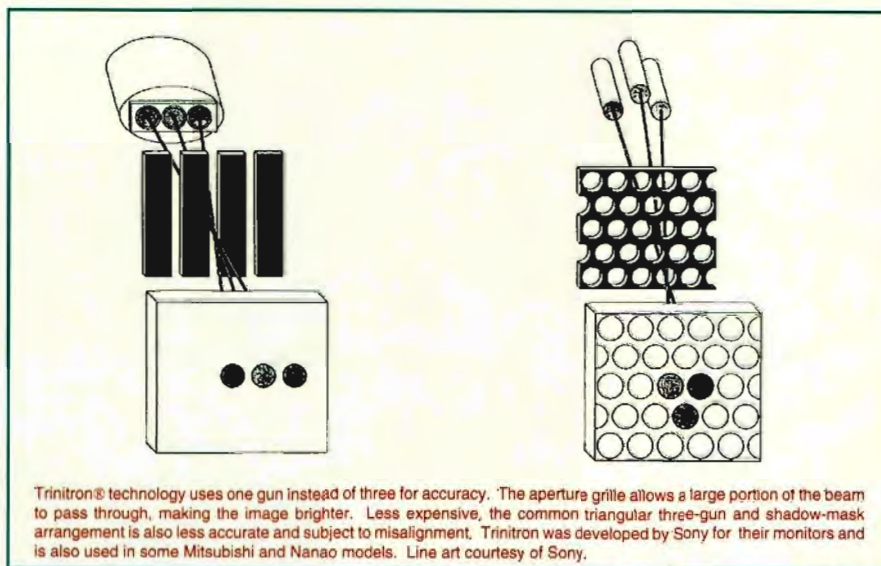
The amount of time that it takes for the beam to retrace to the top of the screen to start scanning again in the horizontal direction is called the "vertical retrace period." The scan rate as calculated above must be adjusted upwards to include the retrace period. In our example, we can safely assume that a multiple frequency monitor capable of 78KHz will be able to achieve 1280 x 1024 resolution at 72Hz refresh rate.

Video Bandwidth

The video bandwidth is mostly associated with horizontal component. The 1 volt signal from the CPU must be amplified by 40 by the video amplifier without distortion. Basically, the higher the bandwidth, the higher the resolution and clarity of each pixel.

Tube Types

There are two basic types of shadow masks. The most common



looks like a mesh or household window screen. Sony's and Mitsubishi's new aperture grill looks like the wires inside a piano. All variations are attempts to increase brightness and color purity.

Graphic Card Support

You must have a graphics accelerator card that supports all the features of your monitor, otherwise it's a waste. It's that

simple. Do your homework.

Microprocessor Based

High performance monitors are autoscanning and provide versatility with a wide range of applications from VGA to 1280. Among other things, a microprocessor based monitor can store video settings for different resolutions in memory so you don't have to adjust settings for different video modes.

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MONITORS FOR CAD

Special Features Go Beyond High Resolution

The monitors KEYSOLUTIONS reviewed for this article are quite similar in some ways. All are capable of 1280 x 1024 resolution or higher; they have very high scanning frequencies and refresh rates; they are about the same size; and all meet high standards for electromagnetic and radiation levels and have some type of non-glare displays. Their differences lie in the technologies the manufacturers have developed or adopted for such things as type of shadow mask, electron focusing guns and adaptability with color and memory settings. The following descriptions assume the features shown in the chart and focus on a few of their special technologies and capabilities.



Mitsubishi - Diamond Pro 20

- Premium, bonded anti-reflective CRT panel.
- Dynamic Beam Forming (DBF) automatically corrects pixel shape over the entire CRT reducing image distortion in the corners.
- Built-in digital scan mode memory stores custom and preset settings for up to 20 different operating frequencies.
- High speed switching for VGA-pass-through graphics cards (approximately 0.5 seconds flipscreen).
- Ultra high 1280 x 1024 maximum resolution including all new high vertical refresh standards (up to 76 Hz at 78 KHz) and VGA pass-through capabilities.
- Easy to use, icon-based front panel display set-up controls.



Nanao - Flexscan 750i

- Anti-glare coating eliminates glare and static electricity.
- Dynamic Beam Spot Control and Dynamic Focus systems provide edge-to-edge sharp focus.
- Stores and automatically recalls horizontal/vertical picture adjustments and modifications such as Side Pincushioning and Trapezoidal Distortion for up to 30 signal sources.
- Color Control to adjust red, green and blue color intensities separately.
- Reduced picture interference with a special S/S (Saddle/Saddle) Deflection Yoke reduces previously required 24-inch distance to 6 inches.



Sampo - AlphaScan LE

- Microprocessor Controls: 20 memory settings, including 12 user adjustable controls.
- ColorKey System lets user calibrate color to match Pantone colors for true WYSIWIG output and optimum user control of color.
- Special Invar Shadow Mask to increase brightness and contrast.
- Lowest price for monitors in this size range with similar features. Price equivalent to competing 17" monitors.



Sony GDM-2036S



ViewSonic 17"

- Incorporates Trinitron® technology (25 years old this year), a one-gun, three beam system that provides brighter, sharper images with truer colors than conventional systems. Trinitron tubes feature the Super Fine Pitch™ Aperture Grille with thin unbroken vertical openings and a vertically flat, black screen.
- Complies with MPRII emissions standards.
- Features microprocessor-based Sony Display Memory System, providing 9 preset display modes and 15 user-definable modes. All controls located on front panel.
- Announced at press time: New Sony 20" GDM-2038 monitor provides highest refresh rate (80Hz) at 1280 x 1024 resolution and advanced digital control of video modes and image parameters, including color temperature. Provides full, edge-to-edge display in all video modes.
- DQ-DAF gun (double quadropole dynamic astigmatism focus) uses two lenses rather than the normal single lens. The double lens system increases the screen image focus at least 20% over conventional dynamic focus guns with reduced moire at all resolutions.
- AIM (Advanced Invar ShadowMask) for brighter images.
- ViewMatch™ color control system adjusts color to match printed output and selects either temperatures of 9300K or 6500K.
- 21 programmable modes.
- Flat square screen.

High Resolution Monitors

	Mitsubishi Diamond Pro 20	Nanao Flexscan 750i	Sampo AlphaScan LE	Sony GDM-2036S	ViewSonic® ViewSonic 17
CRT					
Dot Pitch	0.31mm	0.31mm	0.31mm	0.30mm(AG pitch)	0.28mm
Glass Surface	Non-glare, high contrast, optically coated, bonded	Dark face, non-glare, anti-static	Non-glare, silica coating anti-static coating	A/R coating	Tint (TM=52%), anti-static, anti-glare, anti-reflection
Maximum Resolution	1280 x 1024	1280 x 1024 1600 x 1280	1280 x 1024 non-interlaced	1600 x 1280	non-interlaced
Tube Size	20" flat	21" 90° deflection	20"	20"	17"
Display Area(HxV)	345 x 275mm(1280x1024)	380x285mm	360x270mm	360x274mm	300x 225mm
User Controls	Front Access	Front Access	Front Access Static Conversion	Front Access	Front Access
MicroProcessor Based	Yes	Yes	Yes	Yes	Yes
Scanning Frequency					
Horizontal Scan	30-78KHz	30-78KHz	30-82KHz	30-71KHz	30-82KHz
Vertical Refresh	50-130Hz	55-90Hz	45-90Hz	50-120Hz	50-90Hz
Video Bandwidth	130MHz	120MHz	110MHz	60-100MHz	135MHz
Connections	5-BNC with termination switches for loop through	5-BNC & 15 pin D-sub	15-pin D-sub	5-BNC & High density 15-pin	5-BNC & 15-pin mini D-sub
Power Supply (Max. Consumption)	155 watts	160 watts	150 watts	180 watts	140 watts
Radiation Standard	No rating	MPR-II	MPR-II	MPR-II (full)	MPR-II
Dimensions (wxhxd)	495x493x543mm	496x567x471mm	480x450x480mm	480x481x500mm	414x412x448mm
Weight	33Kgs	36.5Kgs	26.5Kgs	33Kgs	19.4Kgs
Price	\$2,999	\$3,299	\$2,395	\$3,399	\$1,599
For More Information	Mitsubishi Electronics 800/843-2515 714/236-6352	Nanao 310/325-5202 Fax 310/530-1679	Sampo Corp. 404/449-6220 Fax 404/447-1109	Sony Corp. 800/352-7669 408/435-7990	ViewSonic 800/888-8583 909/869-7318

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CADKEY AND AUTOCAD IN MIXED CAD ENVIRONMENTS

by Frank Simpson

In today's engineering, manufacturing, and industrial environments, the active use of more than one CAD system has frequently become the rule rather than the exception. This has heightened the need for bidirectional data-translation software. Foremost among these translators are the Initial Graphics Exchange Standard (IGES), the Product Data Exchange Specification / Standard for the Exchange of Product Model Data (PDES/STEP) and other specifications supported by the International Standards Organization, and by the American National Standards Institute. However, interest in data translation also includes software based on proprietary specifications, such as the DWG format and DXF® format of Autodesk, Inc., Sausalito, California.

Autodesk's DWG format is the unpublished binary format used in AutoCAD® data files. DXF is the acronym for Autodesk's Drawing Exchange Format. Although these Autodesk data formats are proprietary, they have become a quasi-standard due to the number of AutoCAD users around the world. Therefore, CAD software developers, including Cadkey, whose end users frequently work in mixed-CAD environments must take Autodesk's DWG and DXF formats into account.

The DWG and DXF translators in CADKEY®6 incorporate the

Sirlin CAD+ + Engine®, produced by Sirlin Computer Corporation, Londonderry, New Hampshire. CADKEY 6 can directly read and write data files in Autodesk's DWG and DXF formats in a manner that is transparent to the user. (Tables 1 and 2 describe in outline form how CADKEY entities translate into AutoCAD, and how AutoCAD entities translate into CADKEY).

In CADKEY 6, a user who wants to translate data from DWG or DXF format merely makes selections, starting from the main menu, with a mouse or function keys: FILES (F1); TRANSLAT (F8); DWG (F1) or DXF (F2), IMPORT (F1) or EXPORT (F2) and OPTIONS (F3).

From now on Windows-like dialog boxes prompt the user through the steps to translate the geometric data from AutoCAD into CADKEY or

vice versa. In fact, the user can even specify that the data being imported into CADKEY remain in AutoCAD-entity format so that after work in the file in CADKEY has been finished, the data can be exported more easily back to AutoCAD as a DWG or DXF file.

This article describes the file translation capabilities of CADKEY 6 including:

- System Interpretations to Expect
- Entity Type Distinctions
- Entities and Display Attributes

That Require Approximation

- Attributes to Entities
- Entities that Don't Fit into Any Category
- Entities/Attributes that Cannot Currently be Translated

System Interpretations to Expect

Even the best bidirectional translator cannot directly translate geometric entities that are not supported in both the source and target systems. End users need to understand exactly what type of translation to expect when translating data between two very different CAD systems. A significant technical difference separates CADKEY and AutoCAD. This difference essentially comes down to the type of mathematical entity representation that each system supports.

At the risk of oversimplifying matters, the situation can be summarized in this general way: CADKEY supports higher-order (more complicated) mathematical entities, and AutoCAD supports lower-order (less complicated) mathematical entities. A typical example is the spline. A spline is an irregular curve mathematically defined by node points, each individual point of which is mathematically verifiable. A more comprehensive definition of a spline follows. A spline is a sequence of parametric polynomial curves (typically quadratic or cubic polynomials) forming a smooth fit between a sequence of points in three-dimensional space. A spline is a

CADKEY 6 can directly read and write data files in Autodesk's DWG and DXF formats

Table 1: CADKEY to AutoCAD Translation

CADKEY Entity	Translated into AutoCAD as
Arc	Arc
Arrow	Solid (filled or outline), line or circle
Circle	Circle
Collective	Block and Insert with a special name. Note: If you export a CADKEY part file into AutoCAD, and then you import the same file into CADKEY, you may experience some data loss.
Conic	Curve-fit polyline, that is, a polyline with a curve between two vertices
Copious Data	Cannot translate
Cross-Hatch	Block and Instance
Dimension	Dimension
Drawing Layout	Not translated
Drawing Instance	Not translated
File Note	Text
Font	User-defined in the DWG or DXF translator's OPTION dialog box
Group	Not translated
Label	Block and Instance
Leader	Block and Instance
Level	Layer. The layer name can be up to 30 characters long.
Line	Line
Note	Text
Point	Point
Polygon	3D Face (if not filled) or solid (if filled).
Polyline	Polyline
Subgroup	Not translated
Spline	Polyline with user-defined tolerance
View	Entity Coordinate System vector
Viewport	Not translated
Witness	Block and Instance
CADKEY Entity Attribute	
Color number	Color. Mapped to the approximate AutoCAD color match.
Fill color	If applicable, mapped to the approximate AutoCAD fill color match.
Group number	Not translated
Level number	Mapped to the AutoCAD layer
Line type	Line type. Mapped to the approximate AutoCAD line type.
Line width	Not translated
Pen number	Not translated
Subgroup number	Not translated
View number	Mapped to AutoCAD's Entity Coordinate System vector.
CADKEY Text Attribute	
Angle	Rotation
Aspect	Xscale
Filled flag	Not translated
Font number	User-defined in the DWG or DXF translator's OPTION dialog box
Height	Height
Line space	Not translated
Mirror	Mirrored text
Slant	Oblique
Underline text	Not translated

Table 2: AutoCAD to CADKEY Translation

AutoCAD Entity	Translated into CADKEY as
3D Face	Polygon (unfilled)
Arc	Arc
Attdef (attribute definition)	Not translated
Attrib (attribute)	Not translated
Block	Collective (collection of entities)
Circle	Circle
Color	Mapped to CADKEY's RGB color palette
Dimension	Dimension. Linear, circular, radial, diametric, angular and ordinate dimensions are translated. Some special characters in the text, such as +/- (plus or minus), the degree symbol, the radius symbol and the diameter symbol are translated. Associated blocks are not translated.
Elevation/Thickness	Collective. All entities with thickness are translated as collectives
EED (external entity data)	Not translated
Handle (entity identification)	Not translated
Insert	Collective (collection of entities)
Layer	Level. Note: The translator maps the AutoCAD layers 0 to 254 to levels 1 to 255 in CADKEY. The translator keeps all layer names. The user defines in the DWG or DXF translator's OPTIONS dialog box whether to put data from AutoCAD layers above 254 all onto level 255 in CADKEY or to add the data to individual levels, starting again at level 1 in CADKEY.
Line	Line
Line Type	Translated as one of four CADKEY line types: solid, dashed, center or phantom line. The user defines which line type the translator will use in the DWG or DXF translator's OPTIONS dialog box.
Paper Space	Not translated
Point	Point
Polyline	Polyline
2D Polyline	Polyline
3D Polyline	3-D polyline
Polyline + Vertex	Polyline. Note: As an entity with multiple vertices, the translator connects each vertex to its adjacent vertex by a linear, quadratic or cubic curve.
3D Mesh	Several 3-D polylines
Polyface Mesh	Collective (Polygon Mesh)
Bulge	Arcs and polylines
B-Spline	Polyline
Shape	Not translated
Solid	Filled polygon. Fill color is mapped to its approximate match in CADKEY. The translator does not import the AutoCAD solid's invisible edge. Note: If you import a solid from AutoCAD into CADKEY, then export it from CADKEY into AutoCAD, you may experience some data loss.
Text	Note: The user defines the note's font.
Trace	Polygon. If the trace has color fill, the translator maps the fill colors to their approximate match colors in CADKEY.
View-3D	Orthogonal view
Viewport	Not translated
XRef	Collective and reference. XRef will only be imported when the user defines in the DWG or DXF translator's OPTIONS dialog box that the Entity Format is to be AutoCAD format.

Not included in this table are 26 additional text-information elements related to none in CADKEY that the DWG or DXF translator can translate into AutoCAD. For information about these elements, consult the documentation for the DWG and DXF translators.

high-order mathematical entity that has great significance not only in three-dimensional computer-aided design, but also in computer-aided manufacturing. CADKEY users can create geometric figures that are true cubic parametric splines. AutoCAD uses its polyline entity to represent a B-spline. However, AutoCAD's B-spline is not mathematically verifiable at every point.

Both CADKEY and AutoCAD support these geometric entities: arc, circle, line, point, polyline and dimension

In translating from AutoCAD into CADKEY, if the DWG or DXF translator encounters a geometric entity defined in AutoCAD as a B-spline, it will translate it into CADKEY as a polyline. AutoCAD defines its B-spline entity as a variation of polyline. However, in translating from CADKEY into AutoCAD, if the DWG or DXF translator encounters a geometric entity defined in CADKEY as a spline, it cannot directly translate it into AutoCAD because AutoCAD does not support mathematically true splines. The translator exports a CADKEY spline into AutoCAD as an approximation of a spline, that is, as a polyline with a user-defined tolerance. The translator does not export a CADKEY spline into AutoCAD as an AutoCAD B-spline.

A similar contrast between CADKEY and AutoCAD relates to another high-order mathematical entity, the conic. CADKEY users can create true, mathematically verifiable conics. AutoCAD users can approximate a conic as a curve-fit polyline, that is a polyline with the best curved-line fit between two vertices.

Entity Type Distinctions

CADKEY and AutoCAD systems contain geometric entities that are common to both systems. They also contain entities that are specific to each system, but which the DWG or DXF translator can translate into other related entities that exist in the target system. Then, there are entities specific to each system

which the DWG or DXF translator cannot translate because there is no other entity in the target system that can even approximate these entities.

Both CADKEY and AutoCAD support these geometric entities: arc, circle, line, point, polyline and dimension. The note entity in CADKEY and the text entity in AutoCAD have different names, but their definitions are essentially the same. CADKEY's note translates into AutoCAD as text, and vice versa.

Although both CADKEY and AutoCAD have an entity called dimension, each system defines the entity slightly differently. CADKEY defines six types of dimensions: linear, circular, radial, diametric, angular and ordinate dimensions. The translator exports CADKEY's dimensions into AutoCAD, but the detail entities, such as generic dimension, label, leaders, etc. do not have a direct equivalent in AutoCAD. The translator exports these as blocks and instances, but it does not export some dimension attributes (whether a dimension is a linear, circular, radial, diametric, angular or ordinate dimension) for each dimension entity. Dimensions in AutoCAD are translated into CADKEY as linear, circular, radial, diametric, angular or ordinate dimensions. In translating from AutoCAD into CADKEY, the DWG or DXF translator skips associated blocks in AutoCAD, but does translate some special characters in the text, such as + / -, the degree symbol, the radius symbol and the diameter symbol.

CADKEY has four line types: solid, dashed, center and phantom. AutoCAD has many line types

because users can define their own individual line types. AutoCAD line types get translated into one of the four CADKEY line types. The user defines which line type to use in translating AutoCAD line types into CADKEY in the OPTIONS dialog box of the DWG or DXF translator. The default line type for the DWG and DXF translators is solid line. A line type in CADKEY gets translated into its approximate match as a line type in AutoCAD.

Entities / Display Attributes Requiring Approximation

A CADKEY spline translates into AutoCAD as an approximation of a spline, that is, as a polyline with a user-defined tolerance. The translator does not export a CADKEY spline into AutoCAD as an AutoCAD B-spline. Similarly, a CADKEY conic translates into AutoCAD as an approximation of a conic, a curve-fit polyline, that is, as a polyline with the best curved-line fit between two vertices.

The polyline in AutoCAD is a very generic entity. CADKEY accepts each type of AutoCAD polyline in somewhat different ways:

- (1) What AutoCAD designates as a 2D polyline, CADKEY imports as a polyline, but CADKEY does not support the variable widths that

A CADKEY conic translates into AutoCAD as an approximation of a conic, a curve-fit polyline . . . a polyline with the best curved-line fit between two vertices

- AutoCAD's polyline can have.
- (2) CADKEY accepts AutoCAD's 3D polyline as a three-dimensional polyline.
- (3) What AutoCAD designates as a bulge, CADKEY imports as a collection of arcs and polylines.
- (4) AutoCAD's 3D mesh gets translated into CADKEY as several three-dimensional polylines. The translator brings these polylines into CADKEY as individual polylines, not as a mesh.
- (5) Among its many polylines, AutoCAD defines one that it calls a B-spline. CADKEY imports AutoCAD's B-spline entity as a

polyline. A CADKEY spline gets translated into AutoCAD as an approximation of a spline, that is, as a polyline with a user-defined tolerance.

The AutoCAD entity called trace gets translated into CADKEY as a filled polygon. The translator maps the trace's fill color to the approximate color match in CADKEY.

The AutoCAD entity called vertex is translated into CADKEY as part of a polyline. Because a vertex in AutoCAD follows a polyline, the DWG and DXF translators embed the vertex inside the polyline.

CADKEY has an entity called polygon. A polygon in CADKEY can be filled or unfilled. What CADKEY designates as an unfilled polygon, AutoCAD calls a 3D face. What CADKEY identifies as a filled polygon, AutoCAD calls a solid. The color of the solid in AutoCAD gets translated into its approximate match in CADKEY. The translator does not import the AutoCAD solid's invisible edge into CADKEY. It is important to note that if a user imports a solid from AutoCAD into CADKEY, and then exports that solid from CADKEY back into AutoCAD, some loss of data may take place.

What AutoCAD identifies as a block, that is, a named collection of entities, CADKEY imports as a collection of entities called a collective. The same is true of the entities that AutoCAD defines as insert, elevation/thickness and polygon mesh. CADKEY accepts these AutoCAD entities as collectives.

AutoCAD files have layers, while CADKEY files have levels. AutoCAD files can contain an unlimited number of layers which are identified by layer names of up to 30 characters. AutoCAD's default layer name is "0." CADKEY files can contain up to 255 levels, numbered from 1 through 255. If the AutoCAD file being translated

has 255 layers or fewer, the translation of AutoCAD layers to CADKEY levels is straightforward.

AutoCAD's first layer goes to CADKEY's level 1, etc. However, if the AutoCAD file contains more than 255 layers, the user must decide whether to put all of the data from all of the additional AutoCAD layers onto level 255 in CADKEY, or to put the additional data, layer by layer, onto CADKEY levels, beginning once again at level 1. Putting additional AutoCAD data onto CADKEY's level 1, for example, does not mean that the

AutoCAD data originally translated and put onto level 1 gets destroyed.

The data

from AutoCAD layers 0 and 255 will be stored together on CADKEY's level 1, and so on. The user must distinguish among the data elements which ones originally came from AutoCAD's layer 0, and which ones came from layer 255. When CADKEY data is translated into AutoCAD, if the user chooses to name a particular layer on which the data is located, the layer name can include up to 30 characters.

The entities identified in CADKEY as cross hatch, file note, label, leader and witness, all get translated into the AutoCAD entities called block and instance.

Attributes to Entities

Entities in CADKEY and AutoCAD data files can have attributes, and users can define these attributes. Here, too, CADKEY and AutoCAD differ in the term "attribute." CADKEY defines an attribute as a data element which is related to the graphical display of data in the file. Data elements, such as color number, fill color, level number, line type, line width, group number, subgroup number, pen number and view number are entity attributes in CADKEY. CADKEY has additional text attributes for notes. These attributes to notes are angle, aspect, filled flag, font number,

height, line space, mirror, slant and underline text. This is the meaning of the function ATTRIB that appears in the CONTROL menu in CADKEY.

AutoCAD has two types of attributes: display attributes and non-display attributes. AutoCAD defines display attributes essentially as CADKEY does. A display attribute is a data element related to the graphical display of data in the file. Among AutoCAD's display attributes are color, layer, line type, line width, etc. AutoCAD defines non-display attributes as non-graphical data attached to a block. The cost of material or the name of a manufacturer are examples of such non-graphical data. It is this non-graphical data attached to a block that defines the function ATTRIB that appears in the AutoCAD menu. The DWG or DXF translator does not translate these non-graphical attributes into CADKEY; so it disregards them.

Among text attributes to the note entity in CADKEY, angle, aspect, height, mirror and slant translate respectively into the rotation, Xscale, height, text mirror and oblique attributes in AutoCAD. CADKEY's font number depends upon the font that the user defined in the OPTIONS dialog box of the DWG or DXF translator. The default font number is 1, which represents CADKEY's standard font.

An Entity That Does Not Fit Into Any Category

One entity in AutoCAD, XRef, appears not to fit into any category. XRef is an externally referenced, complete drawing that appears as a block in another AutoCAD drawing file. CADKEY can import AutoCAD's XRef entity into a CADKEY file, but only under the condition that the user has defined the target file in CADKEY as remaining in AutoCAD format. AutoCAD's XRef becomes a CADKEY collective and reference.

Entities/Attributes That Can-not Currently Be Translated

This version of the bidirectional

The DWG and DXF bidirectional translators in CADKEY 6 interface directly with AutoCAD Releases 10, 11 and 12

DWG and DXF translators cannot translate these CADKEY entities into AutoCAD: copious data, drawing layout, drawing instance, group and subgroup.

These attributes to CADKEY entities currently cannot be translated into AutoCAD: filled flag, group number, line space, line width, pen number, subgroup number and underline text.

The bidirectional DWG and DXF translators cannot presently translate these AutoCAD entities into CADKEY: attdef (attribute definition), attrib (attribute), EED (external entity data), paper space, shape and viewport.

Range and Flexibility

The DWG and DXF bidirectional translators in CADKEY 6 interface directly with AutoCAD Releases 10, 11 and 12. CADKEY users are not necessarily the only ones who will find this additional capability for working in mixed CAD environments valuable. Even AutoCAD users may need to take advantage of CADKEY 6's DWG read-write capability because the file format used in AutoCAD 11 and 12 is not compatible with the file format in AutoCAD 10. Therefore, AutoCAD users working in mixed-CAD environments, or even in mixed AutoCAD-release environments, can use CADKEY to exchange geometric data files among different versions of AutoCAD. So, CADKEY users can import an AutoCAD file into CADKEY and work with it either as a CADKEY part file or as an AutoCAD drawing file. And, CADKEY or AutoCAD users can export a CADKEY part file or an imported AutoCAD drawing file in DWG or DXF format from CADKEY to AutoCAD and work with that file in AutoCAD. □

Editor's Note: Reference for the definition of a spline and of a B-spline: see CAD/CAM Dictionary; Edward J. Preston, George W. Crawford, Mark E. Coticchia; Marcel Dekker, Inc., New York, 1985, pp. 12 and 174.

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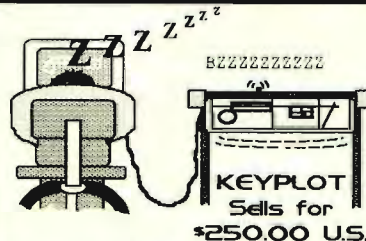
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PRODUCTIVITY TOOLS

for Drafting and Modeling

by Robert Martin

DRAFT-PAK™

DRAFT-PAK's features for 2D drafting and 3D modeling include *Features*, *Fasteners* and *Mechelem* (mechanical elements), and comprehensive parametric libraries of everything from nuts and bolts to sprockets and roller chains. The modeling function that most impressed me was *Mechelem*. This function's options include Gear, Rack, Spring, Sprocket, Chain, Bearing, Bushing, Shaft, Strucshp (structural steel shapes), all in 3D.

After holes, fasteners and/or other features are created, you can use

dimensioning accuracy.

A user-programmable icon pattern loader provides several pre-configured libraries containing hundreds of symbols for electrical, fluid power and logic symbols. A key feature of the library allows users to visually see their patterns on disk as icons and to incorporate their own symbols of 3D patterns into the library.

Database utilities allow you to "tag" geometry with data such as "Flow Control Valve, 80PSI" and then extract the information for analysis. Pattern files can also be "referenced" using DRAFT-PAK's PTNREF function. This capability allows you to draw one pattern and use the pattern in hundreds of pad files. Change the pattern file and it will automatically change in every part file that uses it. For example, you can search for all occurrences of a pattern reference (say a 4" x 6" bracket) and replace them with an alternate pattern (6" x 10").

One of DRAFT-PAK's most popular features is its Automatic Drawing Creation and Compress utility. This allows you to easily create a multi-view drawing from a 3D wire frame, add horizon (tangency) lines and then compress it into a 2D file. Additional utilities include a file browser/manager, pop-up calculator, entity offset or "DRAFT" function, level and picture management, and more. All



Modeled in 3D with DRAFT-PAK's Mechelem

AUTOLABEL to construct manufacturing notes. Since the program automatically constructs and formats the note, accuracy and consistency is maintained. Additional detailing capabilities include geometric dimensioning and tolerancing, weld symbols, dual dimensions, balloon notes and a function that verifies

CADKEY all by itself is extremely strong, but the addition, application-specific software packages offered by third-party developers are well worth the investment. All have been designed to improve efficiency and productivity with CADKEY. I call these packages Productivity Tools because that's exactly what they are. Most are loaded as CADL files or CDEs and work right inside CADKEY.

This article describes several drafting and modeling tools that assist in the production of 2D detail shop drawings and the development of 3D models. Each package has many more features than I had space to describe here, so I selected representative features from each that I personally found helpful.

Some productivity packages are very similar, but no two have completely identical features. You might find it advantageous or necessary to have more than one and so have trouble deciding which one is best for you. If the non-duplicated features of such packages are what you're after then by all means purchase both. In general, the more features a package has, the more it will cost, but all are modestly priced compared to your investment in CADKEY. They can pay for themselves quickly in time gained through increased efficiency.

DRAFT-PAK geometry supports the CADKEY 6 "Picture-It" utility for rendering and shading.

One of DRAFT-PAK's finest features is the optional Bill of Materials (BOM) Database Generator. I believe the BOM belongs on the face of every assembly drawing. However, in a true concurrent engineering environment, BOM data generated in engineering needs to be available in electronic format - not just as a paper drawing. DRAFT-PAK/BOM can do it and export data to many common spreadsheet and database file formats. This feature turns CADKEY into a strong non-graphic database generator.

Other DRAFT-PAK features that impressed me included Automatic Balloon placement, manual arrow termination editing, user constructed data templates, and extensive dialog boxes including a bill tree.

DRAFT-PAK is accompanied by a tutorial and complete documentation. It is the most comprehensive CADKEY drafting tool around. Most CADKEY dealers will furnish a free limited-use evaluation copy of DRAFT-PAK with a tutorial booklet.

CADJET Drafting

CADJET Drafting has standard features, fasteners and utilities for 2D and 3D drafting, including symbols for ANSI Geometric tolerancing, welding and text. But CADJET Drafting is not a "me-too" in how it handles these elements. It has a unique and user-friendly interface that makes selecting CADJET functions and accessing symbols extremely fast and easy. The CADJET on-screen Tool Bar utilizes the latest in CADKEY CDE technology, but is only available for CADKEY 6.

CADJET Drafting loads automatically into the CADKEY menus and can be accessed with the mouse, keyboard or the optional digitizer template.

With symbols that have to be built up, such as ANSI welding symbols, CADJET adds another feature that works quite well. A dialog box prompts you for the proper attachment to be added to the welding symbol. All

built-up symbols can be reviewed before placement on the screen.

A unique feature I found extremely useful is the QUIKVIEW function which allows you to quickly access any of the eight predefined views and create up to 15 other views. The views are graphically displayed in a dialog box as icons. Switching views is as simple as clicking on the icon. Selecting



CADJET's Tool Bar with Weld Symbol dialog box

an icon immediately changes the view and CADKEY refreshes the screen with the new view.

CADJET Drafting also has a series of convenient utilities such as arc/circular text, search & replace for text, Dynamic text that adds text to the screen as it is being typed, a font manager, and an autoloader that lets

you quickly and easily load CADL (*.CDL or *.CDX) directly into the CADKEY application menu.

CADJET Drafting comes with one additional CADKEY font, Helvette. EZ Fonts is an add-on which includes 17 additional fonts, a font manager and drafting symbols (like depth, diameter, degree, +/- which are called as ASCII codes).

A useful feature in CADJET Drafting is SET/CHANGE ATTRIBUTES. This function lets you select any entity in CADKEY and set or change the LEVEL, COLOR, LINE TYPE, PEN NUMBER, TEXT ATTRIBUTES in one simple step.

LIBRARIAN is another unique and incredibly useful tool that can be incorporated into CADJET Drafting or operate as a stand-alone unit. It allows you to organize any pattern files and retrieve them quickly and easily. Currently, with CADKEY pattern file names, you are limited to DOS's standard maximum 8 letters. The file names can get pretty cryptic. LIBRARIAN lets you name pattern files with a special code that converts it to a string of words that you define.

Then you build libraries of commonly used pattern files and access them from a "Rolodex-like" popup dialog box. This looks like a file drawer

PRODUCTIVITY FEATURES OVERVIEW

CADJET Drafting

General Purpose Drafting Productivity

- 15 Styles 2D/3D Fasteners including screws, nuts & washers
- 4 Styles Holes
- Geometric Tolerancing
- ANSI Y 14.5 M (1982)
- Weld Symbols
- Drafting Symbols
- Set/Change Attributes Function
- One Font - Helvette
- Digitizer Template (optional)
- Symbols
- Beams, Channels, Ducts

Unique Features

- Librarian/Organizes pattern files
- 17 Font styles (optional)
- QuikView - Select views graphically
- Font Manager
- Circular Text
- Search & Replace
- Keyboard Template (optional)
- Text Handling
- Dynamic Text
- Tool Bar User Interface

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DRAFT-PAK Release 5

General Purpose Drafting Productivity

- 60 Styles 2D/3D Fasteners, including screws, nuts & washers
- 7 Styles Holes, Slots, Pockets
- Geometric Tolerancing
- ANSI Y 14.5M (1982), ISO 1101 & 3040
- Weld Symbols
- Drafting Symbols
- Set Attributes Function
- One Font - Proportional Helvetica - Type
- Digitizer Template (optional)
- Symbols

Unique Features

- 3D to 2D Compression
- Parametric Mechanical Elements - gears, racks, springs, sprockets, chains, bushings
- bearings, structural beams, shafts
- User programmable Icon Loader
- Dynamic External File Referencing
- Attribute Tagging
- Transform Offset Function
- Hole Table/Text Table Generator
- Feature Labeling
- Pop-up Calculator
- Full compatibility w/CADKEY SOLIDS/SURFACES
- BOM Database Generator (optional)

BAYSTATE 508/755-1172

CK-SYNERGY

Basic Drafting Productivity

- Symbols
- Weld Symbols
- ANSI
- MILSPEC notes
- Fonts
- Spell Checker
- Special Drafting Features
- Enlarged View
- Zoomed View

HANSEN DESIGN 206/643-8528

PARADESIGN

Modeling Productivity
Paradesign 619/484-8386

ABC - PM

Part and Level Manager
Alton Boring 313/522-9595



CK-SYNERGY

with file folders tabbed "A-Z" and "1-9." Each file folder can hold an unlimited number of pattern files. You can store custom pattern files in the LIBRARIAN, and organize them, as you like. Scaling and rotation can be set as you retrieve the patterns.

CADJET Drafting is a good tool with worthwhile drafting utilities, and several truly innovative and useful features.

CK-Synergy.....

CK-Synergy was originally created by Scott Hansen (a designer in the

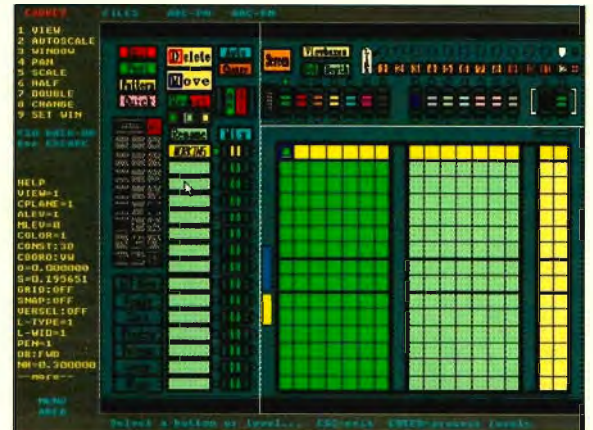
aerospace industry) for his own use, so you get some real-life solutions with this product. CK-Synergy is a simple but basic draftsman's utility kit. Its tools include the standard ANSI Y14.5M Geometric tolerance symbols, 2D and 3D fasteners, weld symbols, standard note and detail balloons, surface texture symbols, tablet overlay, fonts and more.

What sets CK-Synergy apart is the

attention paid to detailing in the 2D or layout mode. For example, using the ZOOM VIEW Circle function, you just window select the area to zoom, type a name for the view and place the enlarged view with the line width set and the arrowheads added properly. Another example is how CK-Synergy handles shafts. Usually, a long shaft has detail on either end and the middle is merely an extension and is

a constant. While it's necessary to show shafts at full length in a model, it's not always practical to create a detail drawing six feet long just to dimension the shaft. To make this type of shaft fit on a standard sheet, shaft breaks must be used. CK-Synergy easily and neatly creates shaft breaks in either of two of the traditional display methods.

Balloons are one of my pet peeves. Many productivity tools that use balloons to identify a specific item will not allow you to identify a series of items with multiple balloons. CK-



ABC-PM(Parts Manager)Dialog Box

Synergy not only allows multiple balloons, but also creates alignment lines so assembly drawings look much cleaner.

One of the most important features of CK-Synergy is its MIL-spec capabilities. When you grab the HDNotes command, there are MILSTD notes for sheet metal, castings, plating, etc. The program displays the notes by category, the user selects any of the notes in the order desired, and then places the automatically numbered notes into the drawing. Notes and note categories are fully customizable.

Although it's hard to choose, for me, CK-Synergy's *piece de resistance* is the spell checker. (I can't spell worth a darn.) This feature lets you take selected text into any DOS word processor, spell check it and return to the drawing - all on-the-fly using the CADKEY DOS shell.

ABC-PM (Parts Manager)...

Although we get used to working with levels in CADKEY, the truth is, the process could stand some simplification. Although ABC-PM does not have drafting or design tools per se, it does a super job of managing levels and entities, and could be useful for

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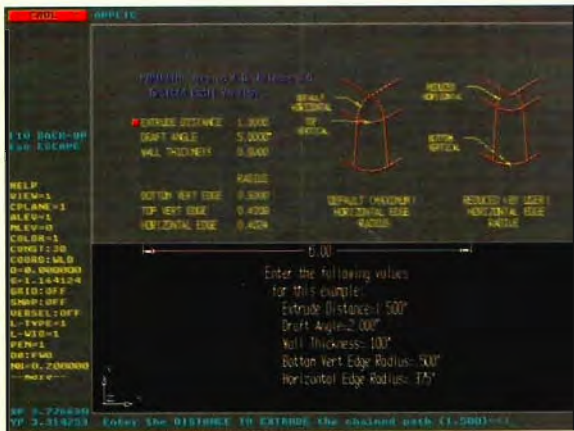
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The PARADESIGN Path 2 screen

any CADKEY user.

ABC-PM simplifies moving entities from level to level, changing colors, line types, etc., turning levels off/on, and masking levels. These operations are accomplished via on-screen control panel. No longer do you have to navigate several layers of menus, but simply pick options from the panel. You can select entities and the level to which you want to move them, and use [OFF]/[ON] buttons to turn layers off/on. Entity icons (line arc, circle, etc.) let you select specific entities on a given level and perform any number of level operations on them.

Since the ABC-PM panel covers most of the drawing area, a [SCREEN] button lets you see the entities picked for level editing. This feature makes level masking much easier in complex drawings. In addition, feed-back indicators tell you what colors are on which levels and which levels are on or off.

With the ABC system, levels are organized into three groups: Primary, Secondary, and Notes and Dimensions. This is an organization I endorse because I do it that way.

VIEWs and CPLANEs are dealt with in an unusual way. Two rows of buttons at the top of the ABC-PM screen contain the VIEW and CPLANE commands. The lower row has numbered boxes that represent twelve plus views. The top row is a series of Arrow indicators that represent the CPLANE. When a VIEW has been selected, the number box for that view changes color to indicate the selected view for user feed-back. Likewise, when a specific CPLANE has been selected, the same color change takes place serving the same purpose. Another useful feature is the ability to contain two separate magnifications of a view with that view. Both pattern and part files can

be manipulated inside ABC-PM making this software tool multi-functional. ABC-PM is very useful for working with multi-level drawings, especially assembly models.

PARADESIGN

Not all productivity requires symbols and/or drafting tools. Productivity can be gained in the modeling mode as well. An excellent example (actually the only one I'm aware of) is PARADESIGN, a software utility that automatically creates models in CADKEY. This is very powerful software, but does it's thing so automatically and well, that it speaks for itself.

You simply layout a flat plane that describes the general shape of the part to be generated. Then you invoke PARADESIGN from the APPLIC menu. PARADESIGN prompts you for the draft angle, edge radius, top radius, depth of part, etc. From this point, PARADESIGN takes over and

creates the entire model.

PARADESIGN supports islands and pockets and also accepts a non-tangent radius as a top radius. PARADESIGN has some restrictions, but nothing insurmountable. For instance, the path must be flat on the current construction plane.

PARADESIGN includes PARABLOCK, which creates a simple building block that can be used in your designs, and PARAPATH that helps you create complex molded or cast models with relative ease. The OFFSET function allows you to offset any entity that is parallel to the construction in which you are working. You can specify the offset directly, or indirectly by defining the draft angle and depth of the offset.

In CADKEY 6.0, PARADESIGN is fully supported by dialog boxes and other windows-like features. I see this program as a "must" for developing castings, moldings, and/or semi-complex surface machined parts where pocketing, islands or any combination thereof are used. □

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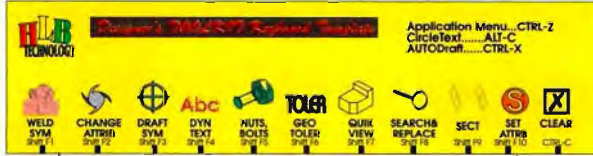
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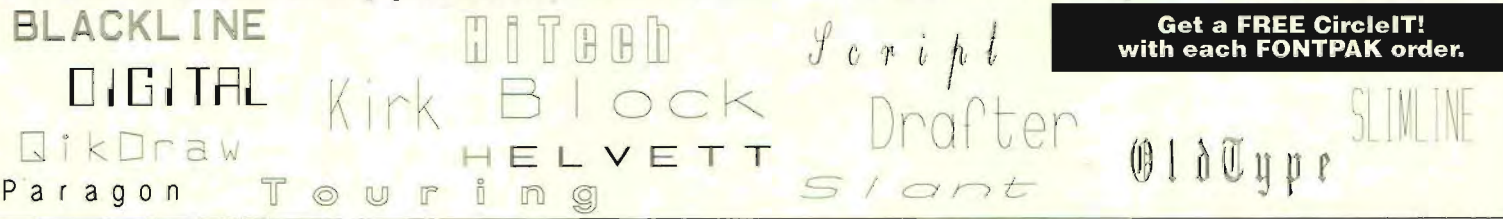
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MACROS CADL CDEs

This column will be an ongoing programmer's guide to customizing CADKEY and will appear regularly in KEYSOLUTIONS. This installment offers an overview of CADKEY'S customization tools. Starting with the next column, we will show you how to write your own utilities with the tools described below. When appropriate, we will provide the entire code for these utilities here, and also place it on Cadkey's Bulletin Board.

An Introduction to CADKEY'S Customization Tools

by Craig Storms and Usman Rashid

OPEN ARCHITECTURE

At Cadkey, Inc., we believe in open architecture. This provides flexibility in how you use our products and gives you the ability to customize them to meet your needs. We pride ourselves in offering one of the most powerful, flexible, and easy-to-use CAD/CAM solutions available today. Right out of the box, CADKEY® and CADKEY®NC (Cutting Edge) are excellent tools for productivity, yet improvements are always possible.

Both CADKEY® and CADKEY®NC include three primary customization tools to help you shape the products into your ideal productivity system. They are macros, CADL, and CDEs. First, some brief definitions and then a more detailed description of how to use them and potential applications.

MACROS

Macros are recorded keystrokes, menu selections, and cursor positions. They are often used to repeat commonly performed tasks such as locating a frequently used menu selection, loading a standard part or pattern file, or configuring a preferred viewport arrangement. A macro "remembers" cursor selections in the drawing area. Also, you can use macros to reconstruct geometry, place notes and dimen-

sions, and perform other tasks involving work in the drawing viewport(s). Nearly any program task you consider repetitious can be converted into a macro.

You can construct complex macros to create parametric designs. For example, you use repetitive steps to create a series of bolts. The values you use to construct a bolt may vary, but the steps (and construction functions) remain the same.

Macro creation includes optional PAUSE statements which you can use to allow flexible input for length, width, pitch, etc. For a truly custom parametric macro, you can define unique prompts to appear in place of the CADKEY prompts. For example, you can substitute the prompt "Enter bolt width:" for the standard CADKEY prompt for the CREATE, CIRCLE, CTR+DIA function.

CADL

CADL is an acronym for the CADKEY Advanced Design Language. It is an interpretive programming language that you use to customize CADKEY applications. CADL is an excellent language for new and experienced programmers alike.

CADL has many commands that resemble their CADKEY counterparts. POINT, LINE, WINDOW,

REDRAW, and SET VIEW are all command keywords that CADL uses. Other programming commands typical of many languages include IF, ELSE, GOTO, and =, etc. CADL also performs logical and mathematical operations with a sophistication that rivals many advanced programming languages.

Possible CADL applications include level management, file management, adding, removing, and modifying geometry in the data base, inputting data from a file, writing data to a file, setting status options, parametric design, and customized construction and dimensioning routines. The possibilities are endless. CADL is a powerful tool that can:

1. Create, modify, and delete CADKEY entities.
2. Read and modify system settings.
3. Add new menu options.
4. Create custom dialog boxes.
5. Access position and selection options.
6. Use file and device input/output.
7. Use subroutines and sophisticated program control.

You can use CADL to automate repetitive routines that are common. Advanced applications such as FastSURF™ and DRAFTPAK™

DRAFTPAK™ have also been written using a combination of macros and CADL. The language packs plenty of power, and you decide exactly how you want to use it.

The following categories help group applications into a logical framework. Some common applications include:

Parametric Programs:

These are programs that draw an object (a bolt, for instance), by inputting parameters such as length, diameter, and thread size.

Data Management:

Levels and other entity attributes are often used according to standards set by a group of end users who work together. Automated routines can be set up to name levels, manipulate geometry based on color and line-type, pen number, etc.

Construction Utilities:

Unique tasks demand unique functions to complete them, and CADL can be used to create utilities such as OFFSET and DRAFT ANGLE functions, or to quickly

create custom dimensions.

Data Transfer:

Other programs often have a use for the data in a CADKEY part file, and vice-versa. CADL provides an easy way to exchange data in the correct format for each program. If a specific format is required, CADL allows for customized input and output.

CADKEY DYNAMIC EXTENSIONS (CDE)

CADKEY Dynamic Extensions allow the most powerful access to customization tools. All of the CADL functions described above are also available as CDE functions. To write CDEs you will need CADKEY's Software Development Kit (SDK) and a 32 bit C compiler (such as the Metaware High C compiler or the GNU C compiler). You also need a DOS-extender suitable for creating 386 extended memory access (such as the Phar Lap Extender).

A dynamic extension is

exactly what it sounds like: a means of extending CADKEY while CADKEY is running. You can load CDEs into memory at any time using the FILES, CDE, OPEN or LIST/OPN options. They dynami-

DEFINITIONS

MACRO - Recorded keystrokes that repeat common tasks. You can customize macros with user-defined prompts and bind them to a hot-key for immediate access from any place in the system.

CADL - The CADKEY Advanced Designed Language is a programming language built right into CADKEY. This interpretive language uses easy to read commands which are outlined in the CADL Reference Guide.

CDE - CADKEY Dynamic Extensions are sophisticated mechanisms that allow programs (written in C programming language) to dynamically link to CADKEY and literally extend the CADKEY program.

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CIRCLE CARD 266

cally link to CADKEY at this time and add new functions. You can access these functions through custom menu selections like the FILES, CDE, EXECUTE or LIST/EXE options, or from the APPLIC list. If you want to remove them from memory, use the FILES, CDE, CLOSE, or LIST/CLS options.

Once you load a CDE into memory, it executes with the same speed as a CADKEY function. This is one of the prime advantages of CDEs over CADL. CADL is an interpretive language. That is, it requires commands be interpreted one line at a time. This slows down program execution considerably. This is a minor issue for simple programs, but a very important issue for complex programs such as surface creation or boundary element analysis.

You can install and set up a CDE so that it appears transparent to a CADKEY user. That is, when you load the CDE and set it up as a modified menu option, the new function(s) will for all practical purposes be CADKEY. An end user

can select the menu option without any indication that a special add-on program is running. The user assumes the new function is a part of CADKEY. This is not the case for MACROS and CADL, which clearly display the PLAY or CADL system indicator at the upper left corner of the CADKEY screen.

THE CDE ADVANTAGE

CDE technology provides a means of customizing the CADKEY database in a way that CADL cannot. Although both CDEs and CADL store copious data (non-CADKEY data), CDEs provide a superior solution to custom entities. For example, if a program was written to handle assembly design using predefined sets of geometry to represent bolts, fixtures, etc., CDEs could attach a reference entity and create collectives which represent the shape of the parts and additional information stored in the reference entity. If you copy a collective using XFORM, DELTA, CDEs call for an overlay function to handle exactly how CADKEY

makes the copy. Overlay functions allow customized applications to handle functions such as XFORM, DELTA and EDIT, BX MOVE so that the underlying data stored in the reference entity (and copious data) can be modified as needed to retain the integrity of the application.

CDE technology offers the following advantages over CADL:

1. Execution speed.
2. C language programming.
3. Dynamic linking to extend CADKEY functions.
4. Access to all of CADKEY's leaf functions.
5. The ability to execute a compiled CADL program.
6. Reference entity Creation and Manipulation.
7. Overlay functions for XFORM, BX MOVE, etc.

These functions can replace normal CADKEY functions when a user calls XFORM, BX MOVE etc. to change a reference entity.

Happy programming!

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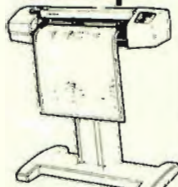
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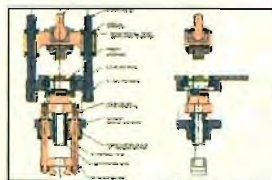
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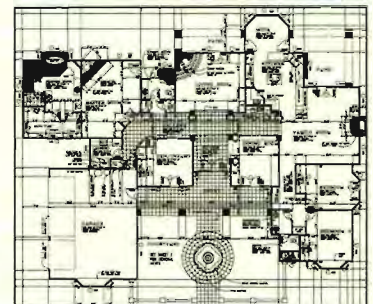
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CADKEY CORNER



CADKEY® Light

Recently, a CADKEY® Light software package for Version 5 arrived on my desk. It seemed like quite a lot of software and is being offered at a very reasonable price. How would it compare with Version 5? Loading and configuring was easy thanks to a simplified pamphlet. The system requirements do indicate a need for 10 megabytes of disk space and 4 megabytes of RAM. Like Version 5, a math coprocessor is required. Installation showed over 6.6 megs taken for the total package. The help files do take up room and should not be loaded if they are unnecessary. New users should load them, please. The help program will be quite beneficial to you. The included sample drawings take nearly one meg of disk space.

Similar to other Light packages, certain functions were removed and others carefully retained. I found both positive and negatives here. For instance, on line documentation and FOLIO are included. The ALCADMY utility is retained. Viewport options are two choices, single or 4 view. Mesh, construction planes (views), delete by polygon, and selection by window or polygon via all out, part out or part in are not available.

The LAYOUT feature is available in CADKEY Light. However, it only works on models created in the version 5 software. Models made in the Light package cannot be used for this function. I believe this is a plus for operators who primarily work with the

final drawing product and would not need the full design capabilities of version 5. And, Light will print and plot. Light can perform as an inexpensive remote station.

The manual which accompanies CADKEY Light is impressive, quite detailed and written in plain English.

It has a very detailed setup section and a worthy index. The TUTOR provides a worthwhile learning experience. Another plus is the inclusion of DXF abilities. There is no required simm key or other software protection.

I happen to know that Cadkey will be promoting more of its products. There will be special offerings for those that have smaller operations, or just want something so that some work can be done at home. There have been special promotions made to students and schools for some time. Watch for these new offerings.

NOTE: CADKEY Light is retailing for \$99 and will be mass marketed through Ingram-Micro. See KEYNOTES in this issue.

Translating Error Messages

Here's a word about Phar Lap error messages. Upon "nearly-but not quite successful installation of CADKEY" this message may appear. If it does, feel directed to increase the number of register variables found in the CADKEY main config program under the Program Options Menu. Increase it by increments of 50 and retry loading CADKEY. This has solved the problem for many users.

My Favorite Soap Box

One thing that has always been important to me is the future of our kids. Being involved in both education and technology has made me want more to be available to them. I believe that the educational system needs to address those kids that have a knack for the technical; those that do not go on to college. They have interest, creativity, incentive and true potential.

I'm talking about those kids who do not have technical schools available after eighth grade; those who do not have a career path laid out for them during their high school years. Although a few good technical studies programs exist, these are not reaching the majority.

Finally, a program called Tech Prep is emerging across the country. I lend much energy and support to the program in my own state, Florida. Similar to College Prep, this Tech Prep program is a direct career path. The U. S. Department of Education is promoting its direction and resources to address the needs of these kids. Several successful applications are in place in South Carolina, Oregon, Rhode Island, Kentucky and Texas. Course tracking includes Engineering Technology, Applied Science, Mechanical, Industrial, Practical Arts and Trades, Agriculture, Health, and Business.

In a Tech Prep program, first, students are tracked according to interests and abilities from the middle grades through, and beyond, high school. In most instances, courses are aligned with the community colleges so that these students can continue right on with their

studies toward a certificate or degree and full readiness to enter the work force. Paths toward four year degrees are available. Certain high school technical courses can even replace community college courses so that students can expedite their studies as they move toward viable careers.

Second, educators of vocational and academic disciplines work hand in hand. In the specific school program I have become involved with, math teachers work with drafting and design teachers. They share the same planning time and the same students; they team teach and blend their curriculums. For example, imagine a student learning geometry in 3D on a CADKEY system, or trigonometry? The science teachers at this school will be joining the Materials Processing instructor in a woods, plastics, and metals laboratory.

Done properly, such programs can easily promote interest and learning.

Tech Prep will align and update what we already do. And, consider what a positive effect this will have on the self-worth and self-image of our kids.

If you have the time and the abilities, get involved in your own way with your local schools. For more information about the Tech Prep program, call or write to:

Office of Vocational-Adult
Education
U.S. Department of Education
Washington, D.C.
202/205-5440

National Center for Research in Vocational Education
University of California at Berkeley
Berkeley, CA
800/762-4093

National Tech Prep Network
Center for Occupational Research and Development
Waco, TX
800/972-2766

National Network for Curriculum Coordination
Sangamon State University
Springfield, IL
217/768-6375

In closing, Version 6 is here. Be sure to upgrade. You're going to welcome the new features, ease of use and added abilities.

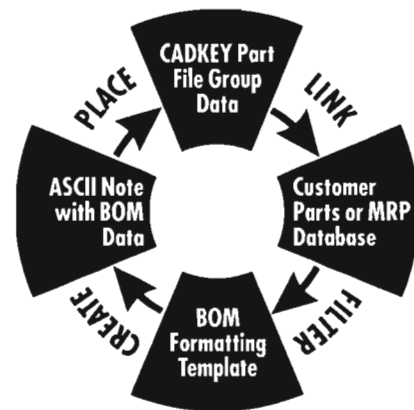
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- Defines and automatically updates dBASE or Paradox database files
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The Bill of Materials Database Generator extracts data from CADKEY part files and compares them to your external database. The result is then formatted by a user-defined template into a Bill of Material, which can be placed anywhere on the CADKEY part file as an ASCII note.

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CONCURRENT ENGINEERING WORKSHOP

Part 2

Stress Analysis with CADKEY ANALYSIS

by Craig Storms and Ken Fortier

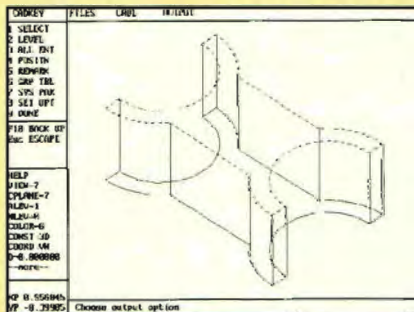
This is the second in a multi-part series designed to familiarize you with several Cadkey concurrent engineering tools. The first session showed you how to create a conceptual design of a storage bracket for compressed gas cylinders. In this session you will use CADKEY ANALYSIS to evaluate the structural integrity of the bracket. The bracket design allows for many cylinders to be stacked on top of one another, and the key issue for analysis is to evaluate the internal stress on the bracket under load. By approximating the weight expected under maximum load conditions, the analysis will reveal whether the current design is strong enough to withstand the load. Also by inspecting the stress results throughout the bracket, it is possible to identify strong and weak spots, providing a guide to assist in optimizing the overall design.

ANALYZING THE STRUCTURAL INTEGRITY OF A BRACKET

1. Load the part file.

- Change to view 7 (ALT-V) and autoscale (ALT-A).
- Choose FILES, CADL, OUTPUT and enter a file name.

The new file contains instructions for reconstructing the top plane geometry. In this case the CADL file passes data to ANALYSIS. CADL is the CADKEY ADVANCED DESIGN LANGUAGE.



STEPS 1 & 2

2. Select the top view of the 3D model.

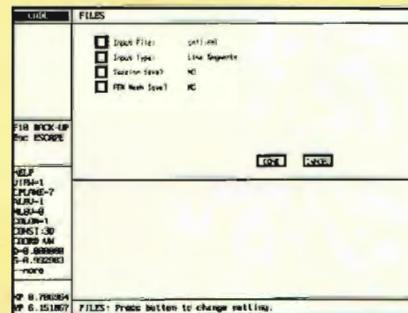
- Choose SELECT, PLANE, ENTITY.
- Select any of the arcs on the top plane.
- Click on DONE to end the CADL output.

3. Run ANALYSIS from inside CADKEY.

- Press ESCAPE to return to the main menu.
- Choose APPLIC.
- Click on ANALYSIS.
- Press <Enter> twice to start ANALYSIS.

4. Fill out the Files information.

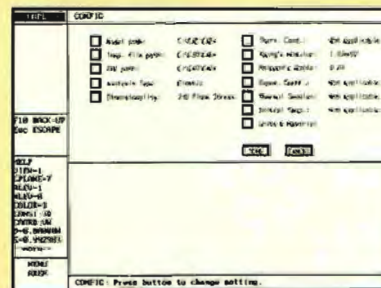
- Choose FILES from the Analysis main menu.
- Choose Input File and enter the file name.
- Verify that Input Type is Line Segments.
- Verify that both Session Save and Fem Mesh Save read NO.
- Click DONE.



STEP 4

5. Fill out the Configuration information.

- Choose CONFIG from the Analysis main menu.
- Click on Analysis Type until Elastic appears. (Thermal, Elastic, and Thermoelastic are the analysis types.)
- Click on Dimensionality until 2-D Plane Stress appears.



STEP 5

6. Specify units and materials.

- Choose Units and Materials from the Analysis Config menu.
- Verify that ENGLISH_(in) is highlighted (screen not shown).
- Click DONE.
- Click on the down arrow located on the right side of the Material box.
- Select aluminum from the list.
- Click DONE.
- Click DONE to accept the remaining default values and return to the main menu.

7. Select the segmentation length.

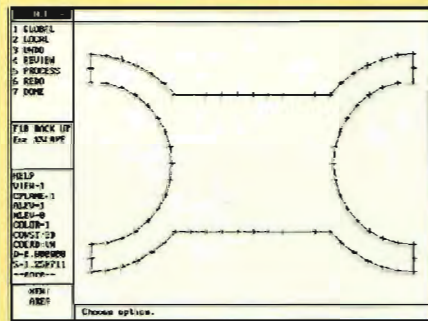
The SEGMENT menu determines the boundary element mesh. It is important to have the segmentation fine enough to highlight all the important features, but not so fine as to slow system performance.

STEP 6



- Choose SEGMENT from the Analysis main menu.
- Press <Enter> to load the file.
- Choose GLOBAL and enter "0.3" as the value for the segment length.
- Press <Enter>.
- Choose PROCESS, DONE, YES, and enter a new file name to save the segmented model to.

STEP 7

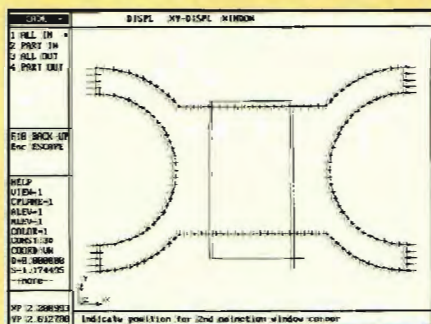


8. Apply load conditions to the model.

- Choose ASSIGN from the Analysis main menu.
- Choose LOAD, DIST-LOAD, X-DIREC, WINDOW, ALL-IN and enclose the left end of the part in a selection box.
- Enter a load in the x-direction of 150 pounds.
- Choose WINDOW, ALL IN and enclose the right end of the part in a selection box.
- Enter a value of -150 (negative) pounds
- Click on DONE three times.

The stress model must be fixed in space. If a point of zero displacement is not defined, errors may occur due to rounding off of values in the thousands of calculations being performed, creating a dynamic rotation (imbalance) in the part.

STEP 9



9. Restrain the model.

- Choose DISPLY, XY-DISPL, WINDOW, ALL IN and enclose the center of the part in a selection box.
- Enter a value of 0.
- Click on DONE three times and select YES.

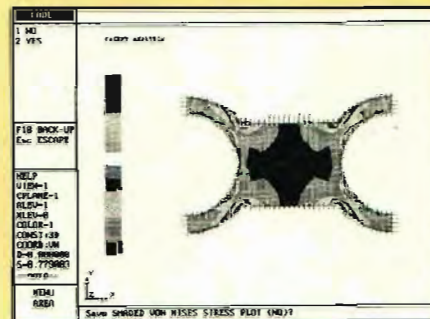
10. Begin the analysis process.

- Choose SOLVE, STATUS.
- When the analysis is complete press <Enter> to return to the CADKEY main menu.

11. Use a Von Mises stress plot to map the stress values in pounds per square inch (psi).

- Choose RESULTS, STRESS, VON MISES, SHADED.

STEP 11



In the color coded stress plot of the part, red areas show high stress concentrations and blue areas show low stress areas.

The value next to the red color code is the highest stress value. With a conservative safety factor of 3, the maximum stress is approximately 4000 psi. From the units and materials section the value of Yield strength of aluminum is 60,000 psi which indicates that the part will not yield.

12. Save the stress plot and exit ANALYSIS.

- Choose YES and enter a name for the stress plot.
- Choose YES to clear the display.
- Exit ANALYSIS by clicking on DONE twice, followed by EXIT, YES.

Next time Workshop features design revision and optimization using data from **CADKEY ANALYSIS**

The ROTX.cdp is a program to create views that display the part as rotating about a vertical Z axis and offers tools for view rotation that match a designer's intuition. The current view is rotated in a way that the part seems to rotate about a 3D axis passing through a point that belongs to the part itself. During the rotation, the axis preserves its orientation and relative position on the screen, creating the impression that the part is rotating about a fixed point. The standard Cadkey ROTATE RIGHT/LEFT IN/OUT functions always spoil the Z axis orientation, and trying to see the rear of the teapot would finally spill the contents.

The program could also be used for creating consecutive images of a part which is rotating as if on a turn table. It helps to select the correct view for design or rendering of parts while keeping their natural vertical orientation.

The program is based on the so called Euler angles that describe the relationship between the local and global coordinate systems. When the program is started, the current view matrix is examined and the Euler angles are calculated. In the main program loop, the Euler angles are incremented according to the selected direction of rotation. New views are then created using the new angle values.

The program menu offers several rotation directions.

- With the CW/CCW options, the part may be rotated as if on a turn table.
- The vertical position of the viewing point is controlled through the TOP IN/TOP OUT options.
- The angular step of every rotation may be entered by selecting the ANGLE options.

*This Toolbox is provided by
Chavdar Popov of Merit Computer
Solutions - London, England*

```

/* ROTX.cdp - VIEW ROTATION ABOUT THE Z WORLD AXIS Ch.Popov, 1990 */
/* This program creates CADKEY views that display the 3D part
/* as rotating about the Z world axis. */

local incr,t,f,curscale,vw,opt

/* Get the current view matrix and check if the Z axis is vertical */
getview @view

if (abs(@fltdat[6]) > 1e-3)
{
    set view, 7
    auto
    redraw
    getview @view
}

/* Define the current values of the Euler angles */
t = atan2(-@fltdat[7], @fltdat[8])

if ( sin(t) == 0 )
{
    f = atan2( @fltdat[1], @fltdat[4] )
}
else
{
    f = atan2( @fltdat[2]/sin(t) , @fltdat[5]/sin(t) )
}

incr = 15.0

do
{
    getmenu "ROT: Select rotation direction ", "TOP OUT", \
        "TOP IN", \
        "CW", \
        "CCW", \
        "ANGLE"

    opt = @key

    /* Increment the angles */
    switch ( opt )
    {
    case 1 /* Top in */
        t = t + incr
        break

    case 2 /* Top out */
        t = t - incr
        break

    case 3 /* Clockwise about Z */
        f = f - incr
        break

    case 4 /* Counter-clockwise about Z */
        f = f + incr
        break

    case 5 /* Enter the angle increment */
        getfit "ROT: Enter rotation angle (%f) =>", incr, incr
        incr = ( (incr > 0) && (incr <= 180) ) ? incr : 15.0
        break

    default /* Exit */
        exit
    }

    /* Create the new view using the incremented angles */
    curscale = @scale

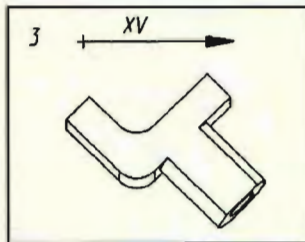
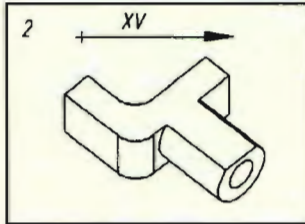
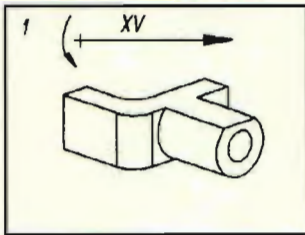
    VIEW 9, cos(f), cos(t)*sin(f), sin(t)*sin(f), -sin(f), \
        cos(t)*cos(f), sin(t)*cos(f), 0.0000, -sin(t), cos(t)
    call cdlv2sysv, 9, vw
    set view, vw
    scale curscale
    redraw

} while ( 1 )

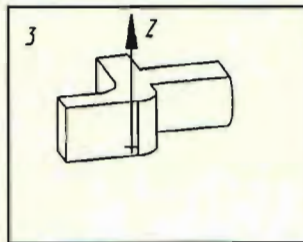
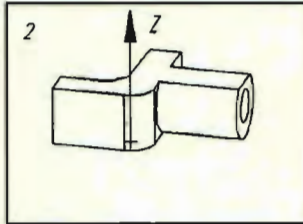
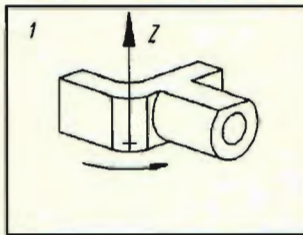
/* End of program */

```

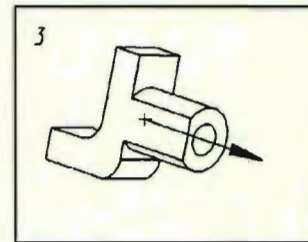
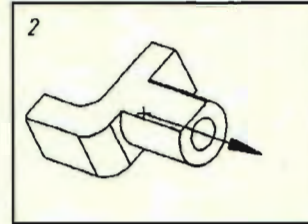
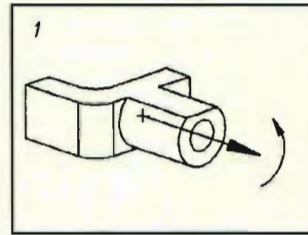

TOP IN/OUT



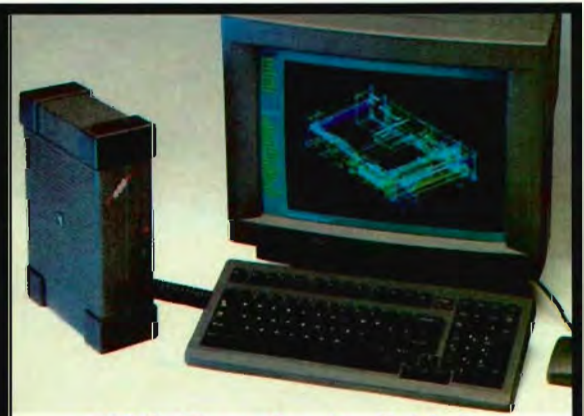
SPIN AROUND Z



3D AXIS



Rotating on a 3D axis with ROTX.cdp



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S.O.S.

Needs You!

by Bob Martin

For two issues I've been talking about the SAVE OUR SCHOOLS (S.O.S.) project being sponsored by KEY SOLUTIONS and Cadkey at Selkirk, a small rural school district in Metaline Falls, WA. This pilot project in technical vocational education is a "bootstraps" operation run and funded by the school and the private sector with no federal or state involvement.

The program has had super response from our advertisers and Cadkey, Inc. who are supplying products for the classrooms. This is a great start, but not enough. We need your help, too. Here's how and why.

The goal of S.O.S. is to change vocational education so high school students are employable in the technical fields right after graduation. To accomplish this we need to make manufacturing and engineering equipment (the best and latest we can afford) available to them. We also need to supply top-level instructors who can assist teachers in the classroom with special topics and/or train the teachers who are in this for the long haul.

Why S.O.S.?

The vast majority of our public school systems are failing to prepare children for the technical job market where they can make decent wages. Now the government proposes spending millions of tax dollars in the inner-city schools to solve the problems. Although this is good, it still leaves the crying needs of thousands of rural and suburban school districts untouched.

And what about the children in these districts? There are many non-achievers, but they're not stupid. They are just bored to death with a curriculum that is primarily aimed at the college bound. No wonder they drop out. Meanwhile, teachers and administrators struggle under an educational bureaucracy that is out of step with the times and with a lack of funds for relevant vocational programs.

Then the post-secondary (Junior Colleges and vocational) schools must deal with the results (or lack thereof) of the secondary educational institutions. In two years they not only must prepare students for a vocational field, but they also have to make up for what they did not learn in high school. This is a tall order. Sadly, after fourteen years of formal education our children can barely function in the technical field of their choice.

We want to forge a partnership between business and education whose

results will shake the very foundations of vocational education and reshape the economic future of our country. A note for those who take issue with my attitude about government's involvement in the public good. I'm in excellent company. Thomas Jefferson said, "If government were to control the sowing and reaping of wheat it would not be long before we would be in dire need of bread."

We are technologically behind almost every other industrial country in the world. We are rated fourth in industrial standing and quickly losing ground. It is estimated that by the turn of the century foreign governments will hold more U.S. patents than Americans. They'll own our technology. A major part of the solution is better education.

I'm asking you to help S.O.S. with whatever resources you can afford. Selkirk needs people who can share skills, knowledge, equipment, and/or money - specifically the following:

- Qualified CAD, CAM, CNC, and machine shop instructors to donate time to write curriculums and/or assist in the classroom

- Discarded equipment, tools, and raw materials such as sheet metal bar stock, and blocks of materials such as aluminum, steel, brass or bronze

- Even with donations of equipment and software, project schools have extremely limited budgets and need cash for supplies (such as technical textbooks and raw materials), teacher training, and equipment that isn't available through donations.

If each KEY SOLUTIONS reader were to send \$10, the resulting resource would let us support three or even four schools each year instead of one. We would like to add one new school each year.

All donations are tax deductible and semi-annual reports will be made to participants. A trust fund is being established. For more information on how to participate call Robert Martin at KEY SOLUTIONS.

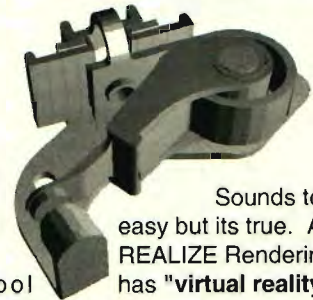
Many thanks from all involved: first and foremost from the Selkirk students themselves, and also from their teachers and parents, the community of Metaline Falls, myself and the KEY SOLUTIONS staff. ☐

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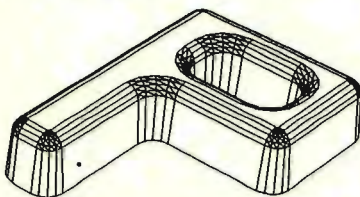
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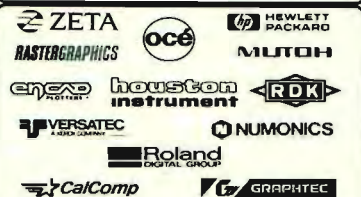
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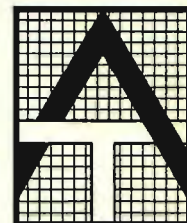
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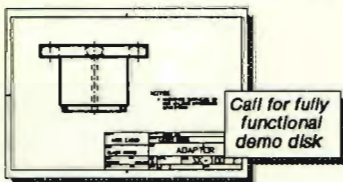
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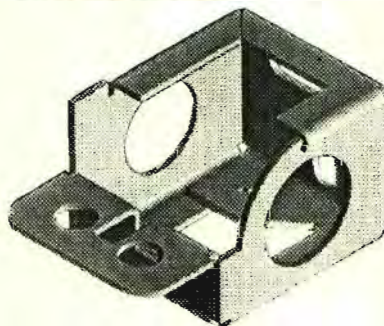
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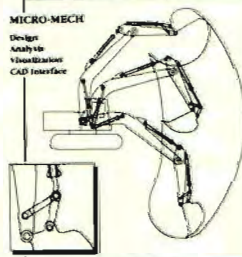
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KEY MAIL

An Engineer's View / CADKEY 6 and AutoCAD 12

Talk about a biased article! The part about how AutoCAD does a Window Zoom is absolutely not true. Window zooms can be done from within a function right off the tablet.

B. J. (An AutoCAD 11 User)
Belmont, California

Dear B. J.,
You're absolutely right about the bias! This article was written from my perspective as an ex-ACAD user, and expresses my personal opinions. I feel that CADKEY wins hands down on all counts. The Windows Zoom comparison was of CADKEY and AutoCAD as they come out of the box without modification. CADKEY does not

require the user to buy an expensive digitizer to perform this simple operation.

R. Martin, Technical Editor

Publication for DataCAD Users?

I'm just another DataCAD user who is now receiving **KEYSOLUTIONS** and doesn't know what to make of it. Is there a publication for us?

Baffled, Portland, Oregon

Dear Baffled,
For the time being DataCAD users continue to receive "Reference Point", a quarterly pub for DataCAD.
The Editor



Please note the following corrections and additions to the February/March issue of **KEYSOLUTIONS**:

On page 42, in the article about REPPS Plankton Sampler entitled "Students + CADKEY = Learning and Results," the article stated that software donated to educational institutions is always Version 1.4. Cadkey's Educational Programs Department always works with the latest production release of Cadkey's products for sale and grants to educational institutions. The Educational Programs Department also heavily discounts previous versions of Cadkey's products, for example, the student offer of CADKEY 5 for \$150 (available only in the U.S. and Canada), until June 30, 1993.

The students in the story were using a very old version of CADKEY; still, they were able to invent a brand new product for technical research in marine biology/zoology. Additional information about this project is available. **REPPS Fall 1990/1991**, the report written by the students for the University of New Hampshire documents their project in detail. **NOR'EASTER**, the Magazine of the Northeast Sea Grant Programs, Volume 4, Number 1, Spring 1992, page 27 also documents the REPPS project in the

article, "Ocean Projects Are Much More Than Academic Exercises."

NOR'EASTER is published by the University of Rhode Island, Rhode Island Sea Grant, Naragansett, Rhode Island 02882-1197.

Correction to the CADKEY®6 Article on page 13: In identifying the types of analysis performed by CADKEY®ANALYSIS, the article states: Thermal Elastic, Elastic and Thermoelastic. These should read: Thermal, Elastic and Thermoelastic. It is important to note that, although CADKEY ANALYSIS is integrated with CADKEY 6, the user must install the module separately. Once installed, CADKEY ANALYSIS operates as a CADKEY®Dynamic Extension™ inside CADKEY. You select it from the APPLIC (application) section of CADKEY's main menu.

The CADKEY IGES Translator is also now bundled with CADKEY 6 as part of a single product. However, the CADKEY IGES Translator still operates as an individual software module, external to CADKEY 6. The CADKEY Advanced IGES Translator, scheduled for release later this year, will operate as a CADKEY Dynamic Extension inside CADKEY.

Clarifications from Cadkey about Vibrant Drivers: The article on page 48, "CADKEY Gets 12x Performance Boost with Vibrant Graphic Device Drivers," indicated that DL-Xpress/CK, a product of Vibrant Graphics, Austin, TX, is included with CADKEY 6. However, although **KEYSOLUTIONS** published information that it had received from Cadkey, Inc., DL-Xpress is not yet available with CADKEY 6. When the software is ready, Cadkey will ship a CADKEY 6 update containing

DL-Xpress to all maintenance customers and to customers who have specifically purchased CADKEY 6.

The article also indicated that Vibrant Graphics' Soft Engine/CK will be shipped with CADKEY 6 beginning in May, 1993. Soft Engine/CK will be available later this year. Cadkey, Inc. apologizes to everyone who has experienced inconvenience because of this situation.

Cadkey User Group News

San Diego CADKEY User Group Sponsored by:

Engineering Technology and Systems International, Inc. (Entech International, Inc.), 9560 Black Mountain Rd., Ste. 124, San Diego, CA 92126-4586, Ph: 619/695-0102; Fx: 619/549-0875. Meetings held monthly at various locations. Currently they have 237 members. Serving: San Diego, Imperial and Orange Counties.

CALCAD

CALCAD User Group would like to invite more CADKEY users in Orange County, CA to join their group. Please contact CALCAD Editor Larry Maldarelli of Lawrence Engineering at 714/731-9277 for more information.

Please send all material to:
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