

A prototype under construction

## Apple Pattern Change to CAD pays off for moldmakers

By Belinda Jones

Neither moldmakers nor a design house, Apple Pattern Company of Sterling, Mass., has found a niche and is prospering. The company works with industrial designers and mechanical engineers to troubleshoot designs, discuss alternative prototyping methods, review tooling, and provide precision CAD data.

In 1990, Apple Pattern president Jack Haley made three key decisions which turned his model shop into a thriving business with a competitive edge. In fact, it grew

### CADKEY<sub>in</sub>WORK

from six to 22 employees and doubled revenues in two

years. First, Jack realized he had to implement CAD/CAM or get out of the business. He purchased four seats of CADKEY for all design work and SurfCAM for CNC and trained his entire staff in CAD. Second, he maximally utilized the combination of his staff's expertise and his purchased cutting-edge technology to provide superior services to clients. Third, Jack invested in CNC. Eight machines have been added since 1992; four are 2-axis Prototrak milling machines and four are 3-axis Mitronics milling machines. Companies which had not considered them in the past send them word today because of this addition alone. Jack notes, "Companies that did not get involved with CAD and CNC machining are no longer in

See MOLDBAKER, page 9

# KEY SOLUTIONS

THE PROFESSIONAL JOURNAL FOR CADKEY &amp; DATACAD USERS •

VOLUME 4 NUMBER 4 • JUNE 1995

## Old meets new in conservatory design

By Susan Caff

Imagine sitting in a comfy chair in a small room in your home. You're surrounded by daylight and sky views, and snowflakes are falling softly overhead. But, despite the nearness of the outdoors, you're staying warm and dry. This little bit of nature right in your home is the work of a Pennsylvania designer who is helping homeowners combine the best of British elegance with American technological ingenuity. For the past three years, Wayne Schultz has been designing conservatories, an old-fashioned concept updated with modern materials and techniques.

Homeowners began building conservatories onto their homes in the mid-19th century. The English called them orangeries and used them to grow orange trees so they could have fresh fruit during the winter and avoid scurvy, a disease caused by the lack of vitamin C. The conservatory became something of a nature room, where one could sit and watch the stars or the passing of the seasons. It soon grew into an all-purpose living area where the temperature stayed warm, but an outdoor feeling remained. The room also evolved into a romantic sort



### DATACAD<sub>in</sub>WORK

of place, where intimate conversations and dinners were held. However, by early in the 20th century, heating costs had grown so high that conservatories began to fall out of favor.

When the idea of adding conservatories to residences first crossed the Atlantic, it was a more primitive version than its British counterpart — an aluminum "hamburger-stand"

approach, according to Schultz, whose business is located in Collegeville, Pa. The concept of a well-made, high-quality addition to homes is fairly recent, gaining popularity in just the last 10 to 15 years.

Schultz became involved in designing conservatories three years ago, when he met a colleague who was incorporating English designs with products made in the United States. "We plagiarized the English approach and style and enhanced it with the use of American technology," Schultz says. More sophisticated products, such as high-quality glass and better-engineered wood products, combined with the English sense of refinement, resulted in a product growing tremendously in popularity — the best of the British style married to American technology.

Many factors go into the decision as to what kind of conservatory to build, including budget, location, function, and use. Prices range from about \$100 to \$300 per square foot for the basic design and outer construction. That doesn't include any of the mechanicals, such as foundation, heating, air conditioning and finished flooring.

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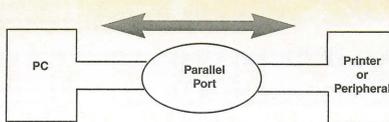
## New standards solve printing bottlenecks

By Larry Stein, President FairPoint Communications

CAD has always taxed the capabilities of personal computers.

From the beginning, the best way to improve an application's performance for computing or imaging and graphics was to improve the platform. In fact, the personal computer has evolved from the 12MHz 80286 platforms of eight years ago to today's 100MHz Pentium processors. The result is that CAD applications have become more responsive, quicker and better to use than ever before — in all areas except one: printing.

Printing capabilities have not evolved at all; in fact, they have barely improved over the entire history of the personal computer. That is until now. It took 12 years, but the PC's parallel port finally caught up with the rest of the system. The change was not evolutionary, but revolutionary. This new technology has two aspects: first, the ability to improve printing performance to all existing installed laser printers,



and second, the development of a new industry standard that will allow for high-performance printing and peripheral connectivity in future printers and peripherals.

According to the new technology, a brief history of the old parallel port is in order. When IBM introduced the PC in 1981, the parallel printer port was included as an alternative to the slower serial port as a way to accommodate the latest high-performance dot matrix printers. The parallel port could transfer eight bits of data at a time, whereas the serial port transmitted one bit at a time. In the PC's infancy, dot matrix printers were the main peripheral that used the parallel port. But as technology progressed and the need for greater external connectivity increased, the parallel port became the means by which many high performance peripherals could be connected. These peripherals now range from portable disk drives and

See STANDARDS, page 8

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# KEYSOLUTIONS

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## Creating Smart Macros: An Addendum

Keith Coleman of Aluminum Shapes called to tell us that "Creating Smart Macros."

A CADKEY Tech story in the April issue, left out a couple of important pieces of information. The routines described are from View 1 and World Coordinate dependent. They will not work properly otherwise. Many, many thanks to Keith for being on his toes and taking the time to help other readers who may experience difficulty as a result of this omission.

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Please take a moment to answer the following questions:

What is your company's primary activity?

How many people are employed by your company?

What platform do you use?  DOS  Windows

Software used  CADKEY  DATACAD

## CADKEY IN THE NEWS

### Hot Software In the Press

Cadkey Inc. was featured in the April issue of Engineering News in an article on the use of CADKEY, Draft-Pak and DMS-Pro by Diesel Technology for the design of fuel-injector systems.

Cadkey also was featured in the May issue of Popular Mechanics. The article titled "Super Models" described how in-scale design and testers use CADKEY to design products for the model industry. A related story will be the cover feature of an upcoming Computer Graphics World.

### Desperately Seeking Stories

Home Office Computing is interested in featuring CAD images and topics. Virtual Imaging, Cadkey's press agency, currently is looking for a story about an architect using DataCAD for office design. If you design offices and interiors, have nice images and want some free publicity, contact Becky at Virtual Marketing at e-mail 74561.3375@compuserve.com or phone 203/347-5042 or fax 800/395-3208. Virtual Marketing also would like to contact users who are successfully running CADKEY or DataCAD under OS/2 for possible publicity/profile in industry publications. Please respond ASAP.

### Vibrant-Cadkey Team for Windows Version 7

Vibrant Graphics Inc., the leader in CAD display technology, has extended a long-standing relationship with Cadkey Inc., delivering new display list technology for the recently released CADKEY for Windows version 7. Vibrant has provided the display list technology and graphics adapter support in the DOS versions of CADKEY since 1992.

"The Vibrant display list technology provides CADKEY for Windows with unprecedented graphics performance, which we are able to offer at a price point that is way ahead of everyone else in the industry," stated Gary Magoon, senior vice president of Cadkey Inc. "Vibrant has definitely given us an edge with their new display list technology."

### Cadkey on the Internet

Cadkey Inc. has launched a "home page" on the Internet World Wide Web. The new Web site offers the latest product, news, educational and technical support information for its DataCAD and CADKEY software. Cadkey's home page address (Universal Resource Locator) is <http://www.cadkey.com>.

Information on Cadkey's home page includes special product promotions, product reviews and user stories, trade show and user group meetings, pricing information, time-saving technical tips, educational news, list of tutorials and textbooks, and information on creating third-party Cadkey/DataCAD programs via CAD, CDE, DCAL and LISP programming. Downloadable software demonstrations will be added in the near future.

CADKEY and DataCAD information also can be found at the following Internet sites:

1. Automated News Network's IndustryNET (<http://www.industry.net>), choose Business Centers, then C for CADKEY.
2. WorldData (<http://www.worlddata.com>)
3. National Center for Manufacturing Studies
4. Internet NEWS group *ALT.CAD.CADKEY*

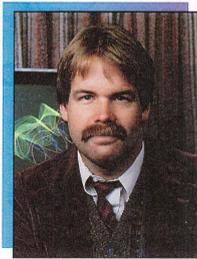
Compuserve:  
CADKEY and DataCAD technical support is handled electronically via the CADKEY subsection of the CAD/CAM/CAE vendors' forum on Compuserve (*GO CADKEY*).

### On the Cadkey BBS: CADKEY 7.0.5 Changes

Recent changes to CADKEY 7.0.5 include data speed enhancements which affect load and save time for parts that contain Advanced Modeler and/or FasSurf entities; polygon selection fix for lines, polylines, and polygons; update of arrows and witness lines for auto-centered dimensions; and a box move for out-of-plane entities (it now uses the construction plane matrix when one is specified). In addition, when all of the layout geometry for one layout is deleted, other layouts are not deleted, and only drawing instance entities are selected when you update a layout scale. A 7.0.5 patch with these features is available on the CADKEY BBS 203/298-6405.

### New DataCAD Drivers

The BBS also has several new drivers for DataCAD: a new VESA 16 color, VESA 256 color, and S3 video drivers, and a new Encapsulated PostScript print driver.



## PRESIDENT'S PERSPECTIVE

BY LIVINGSTON DAVIES • PRESIDENT, CADKEY

### Life in the Global Village

[welmaster@www.cadkey.com](mailto:welmaster@www.cadkey.com). There are also active DataCAD and CADKEY user group forums on Internet and on Compuserve. Internet forums are at [datcad-dbug@world.std.com](mailto:datcad-dbug@world.std.com) and at [news@cadkey.com](mailto:news@cadkey.com). You can participate in either of these groups by sending a message to either with the word "subscribe" in the body of the text. Comments, product suggestions, and technical advice from other user group participants around the world will be sent to you at your e-mail address. Your comments and questions are welcomed by other participants. This is truly an outstanding place to get technical help on Cadkey products. Cadkey technical staff members regularly participate. But some of the best advice comes from other product users who have had experiences or needs similar to yours.

One of the few things growing more rapidly than the Internet is the World Wide Web. The Web, as it is fondly called by its users, is a remarkable source of information on a surprisingly broad range of topics. To "surf the net," you need a piece of software called a "browser." In addition to having an Internet account, a browser provides a graphical user interface which allows you to easily go from one web site to another. I myself use a browser called Net Cruiser from Netcom Inc. and find it quite adequate. High-quality browsers also are provided by SPRC Inc. (Internet in a Box),

Compuserve and others. You can access Cadkey's Web site at [www.cadkey.com](http://www.cadkey.com) and the corresponding ftp site (used for downloading files) at [ftp.cadkey.com](http://ftp.cadkey.com). You will find up-to-date information on new products, graphic drivers, trade shows, press releases, tutorials and more. You can download sample parts, macros, CDEs, CADL examples and other files. You will find references and hypertext links to third-party developers and to other web sites of interest. There is a remarkable amount of Cadkey-relevant information available at the click of a mouse button. This is a work in progress, so you will want to visit it often to see what is new.

The Global Village has just become smaller. Your neighbors could be anywhere.

Reference addresses:  
*WWW.Cadkey.com* - World Wide Web site  
*ftp.cadkey.com* - FTP site for uploading and downloading files  
*welmaster@www.cadkey.com* - send general comments or request here  
*bets-ter@cadkey.com* - send beta test comments here  
*davies@cadkey.com* - typical e-mail address for staff member  
*datcad-dbug@world.std.com* - DataCAD user group forum  
*news@cadkey.com* - Cadkey user group forum  
*GO CADKEY* - Compuserve command to enter Cadkey forum

## KEYMAIL

### Dear KeySolutions:

Is there interest in trading work (drafting mostly) over the Internet? It seems feasible in these "hi-tech" times. I have sent dead dogs over the net using Eudora with no problem to places as far away as New Zealand and Italy. The architects on the bug mailing list already use DataCAD; it is the perfect place to start. (But there may be others interested.)

John Helm - e-mail [jhelm@pewgrad.electricti.com](mailto:jhelm@pewgrad.electricti.com)  
<http://www.electricti.com/~jhelm>

### Dear KeySolutions

I recently read a discussion on the Internet about "trading" work among members of our group, or through the

Internet community of architects. I believe that this sort of "virtual office" represents one very valid view of the future, with more widely distributed independent practitioners coming together specifically, mainly electronically, to form larger groups for special projects. In my own practice, I have already "farmed" portions of projects to others who use DataCAD; a simple modicum connection and an agreement for a fixed fee for the work make it both easy and economical, and if the other party wants to do it at home between midnight and 4 a.m., that's fine.

Has anyone else tried this, or contemplated it?  
Kent R. Abraham, architect  
The Catholic University of America, Takoma Park, Md  
[abraham@blaser.net](mailto:abraham@blaser.net), [abraham@ccua.edu](mailto:abraham@ccua.edu)

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To order, contact your local authorized CADKEY/DataCAD dealer or call the CADKEY Sales Dept at 203-298-8888.

Product Name	Suggested Retail Price	Product Name	Suggested Retail Price
<b>CADKEY 7 FOR WINDOWS</b>		<b>DataCAD &amp; DataCAD UPGRADES</b>	
CADKEY 7 Windows (3-1/2" OR CD ROM) -	\$ 495.00	DataCAD 6 Professional ( 3-1/2" OR CD ROM) -	\$ 149.95
Introductory price valid thru 6/30/95		Upgrades from DataCAD 5	\$ 69.95
CADKEY / Window (3-1/2" OR CD ROM) -	\$ 795.00	Estimator	\$ 99.00
SRP after 6/30/95		TOUCH-UP Macro	\$ 49.95
<b>CADKEY</b>		Command Performance Macro	\$ 49.95
CADKEY Professional 7 (3-1/2")	\$1995.00	BLOCKER Macro	\$ 49.95
CADKEY 7 DOS (3-1/2")	\$ 795.00	All Three Macros above	\$ 129.95
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CADKEY Professional (Upgrades for CADKEY and Analysis, Advanced Modeler)	\$ 350.00	EduCAD America Program - DataCAD & CADKEY	
CADKEY 7 DOS & WINDOWS	\$ 250.00	Call for Program Details/Costs	
		(Contact: Pete Mancini, Cadkey Education Dept., 203-298-6420 or FAX 203-298-6590)	Call for Quote

# KEYSOLUTIONS EDITOR'S AWARDS

A big part of working with CAD in architecture or engineering is a constant search for solutions. The right hardware and software tools can help. The following products have been awarded the KeySolutions semi-annual Editor's Award as a "key solution." They were selected on the basis of quality, uniqueness, price and performance.



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**XI Pentium Workstations** - High-quality Pentiums specifically configured for CAD.

XI Computers  
980 Calle Negocio  
San Clemente, CA 92672  
(800)432-0486

### INPUT DEVICES

**MicroScribe 3D Digitizer** - This affordable 3D digitizer provides an easy way to gather accurate 3D data from real-world objects. Useful for reverse engineering and measuring.

Immersion Corporation  
3350 Scott Blvd. #30  
Santa Clara, CA 95054  
(408)653-1160

**BAT Personal Keyboard** - This 7-key programmable keyboard enhances productivity by providing "heads-up" access to keyboard macros and data entry.

Infogrip  
1141 E. Main Street  
Ventura, CA 93001  
(800)397-0921

### LASER PRINTERS

**JRL - LP 180 Printer/Plotter** - This solid, compact, affordable laser printer emulates Postscript, has high resolution and produces up to 11x17 output.

JRL  
8305 Highway 71 West  
Austin, TX 78375  
(512)288-6750

### PLOTTERS

**Mutoh Pencil and InkJet Plotters** - Excellent large format plotters in a variety of technologies that have all the features of the "big guys" at a

competitive price.

Mutoh America  
3007 East Chambers  
Phoenix, AZ 85040  
(800)99MUTOH

### MODEMS AND COMMUNICATION SOFTWARE

**Boca Fax/Modem** - A complete line of quality communications products from a company with years in the industry.

Boca Research, Inc.  
1377 Clintmoore Road  
Boca Raton, FL 33487  
(407)997-6227

**Optima 288 v.4** - High-end modem for remote control, multi-media, remote LAN access, and transferring large data files and graphic images.

Hayes Micro  
PO Box 105203  
Atlanta, GA 30348  
(404)840-9200

**Chameleon** - Excellent integrated network manager combines terminal emulation, e-mail, file and printer sharing, Internet access and network utilities using only 6 MB.

NetManage  
10725 North DeAnza Blvd.  
Cupertino, CA 95014  
(408)973-7171

### MONITORS

**Diamond Pro Series** - Full-featured, large format monitors for CAD and graphics.

Mitsubishi, USA  
5665 Plaza Drive  
Cypress, CA 90630  
(800)828-6372

### STORAGE SOLUTIONS

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Reno, NV 89511  
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Rockville, MD 20852  
(301)762-9800

### ENGINEERING SOLUTIONS

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FastSURE  
6 South Washington #14  
Sonora, CA 95370  
(209)536-0591

**STARDYNE FEA Software** - Easy-to-install and use Windows-based finite element analysis software.

RSR Software  
3628 Madison Ave. Suite 1  
North Highlands, CA 95660  
(916)344-3900

**Analix** - Full-featured kinematic Windows-based software for mechanical design and simulation

Saltire Software  
9725 SW Gemini Drive  
Beaverton, OR 97005  
(503)520-7800

**Mathematica** - Advanced mathematics in Windows

Wolfram Research  
100 Trade Center Drive  
Champaign, IL 61820  
(217)398-0700

### MANUFACTURING SOLUTIONS

**Mini-Mill/2** - This full-featured 3-axis

desktop CNC mill provides an affordable way to produce prototype parts.  
Mintech Machinery Corp.  
737 Lambert Drive  
Atlanta, GA 30324  
(800)662-1760

### SOFTWARE SOLUTIONS

#### DOCUMENT/PROJECT MANAGEMENT

**AM-Workflow** - Document management software specific to CADKEY.  
Cyclo International  
1908 Cliff Valley Way  
Atlanta, GA 30329  
(404)634-3302

**Kruise Control** - Search, print, view and share CADKEY documents on a network without CADKEY license.

Kruise Control  
104 Gallagherville Road  
Downington, PA 19335  
(800)272-5659

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## SOFTWARE

### Power Tools Bundle<sup>™</sup> release 3.0

ParadeSign recently announced version 3.0 of Power Tools Bundle for CADKEY, a software enhancement geared to assist designers in creating parts with draft, fillets, rounds, and wall thickness. Features are parameter-driven, and all fully parametric features can be edited with the feature editor. The Power Tools Bundle retails for \$325, with yearly support contracts available. Free demo disks also are available.

Contact ParadeSign at (619) 484-8386.



RT Texture for Windows

### RT Texture for Windows™

RT Texture for Windows allows users to import a DXF or 3DS file and navigate throughout in wireframe, shaded, or textured modes. Walk-throughs can be recorded for instant animation. Features include multiple animations, surface and background editing, dynamic links between models, and texture editing. VideoScout NTSC video capture solutions also are available, including live motion video backgrounds. No special graphics accelerator is required. RT Texture for Windows works with IBM-compatible 386/486 and Pentium™ computers with at least 2MB RAM. List price is \$495.

Contact StereoCAD Inc. at (408) 245-5201 or FAX (408) 245-5202.

### Rio-Myrriad<sup>™</sup> From Informative Graphics

A new version of Myriad<sup>™</sup> drawing management software is available. Rio-Myrriad (Raster Image Only) is a single-station software viewer for monochrome raster images sizes A through J that redlines and prints TIFF bitmaps, packets, G3, G4, and CALS type 1 and 2 raster images. Features include zoom, pan, bird's eye, and eyelash viewing; sketch, crossout, insert, arrow, and text note for redlining. Rio-Myrriad can print any image, including annotations, at any zoom level using standard Windows drivers. It integrates with IGC's Softbooks DLL/DDE for interface with any document database application or mail system. The introductory price is \$295.

Contact Informative Graphics at (602) 971-6061 or FAX (602) 971-1714.

### 3DR Graphics Interface

Intel announces the 3DR interface, a graphics systems programming interface designed to boost the performance of 3D graphics, real-time animations, and display of photo-realistic images on Intel486™ and Pentium™ Pcs running Windows. 3DR technology provides a Windows-compatible method for accelerating the rendering and texture mapping of 3D objects. 3DR also offers developers a systems software block for developing 3D graphics application program interfaces (APIs). Artist Graphics Inc., ATI Technologies Inc., Western Digital Corporation, and 3D Labs Inc. (among others) plan

to deliver graphics drivers that comply with the 3DR interface and support Microsoft's DDI extensions.

Contact Intel e-mail via Internet at 3DGraphics@intel.com.

### AutoVue Professional

AutoVue Professional now includes the functionality of the basic AutoVue plus markup, measurement and hyperlinking capabilities. Markups on drawings can be on selected layers or saved with different file extensions, so the original file is not changed. Files associated with a drawing arc indicated when the original is opened. Measurements can be taken between two points, even if the user doesn't have access to the application that created the file. Hyperlinking allows the user to attach relevant information in "hot spots" by creating a "folder" of links to other files or applications.

Contact Cimmetry Systems Inc. at (800) 361-1904 or FAX (514) 735-6440.

### Broadcast Faxing

E-fax Communications Inc. and Supra Corporation have announced an automated dial link-up between E-fax's Fax Broadcast service and Supra's fax software, FAXclite. E-fax's broadcast service allows users to send faxes simultaneously, worldwide, with a single transmission from FAXclite. This dial-up link allows Macintosh users to off-load hours of computing time to E-fax. Access to E-fax is available once Supra's FAXclite is installed.

Contact E-fax Communications Inc. at (510) 836-6000 or FAX (510) 836-8935.

## HARDWARE

### Tri-CAD OGL 3D Personal Workstation

Tri-Cad Computer Corporation's Tri-CAD OGL 3D Personal Workstation is specifically optimized to deliver workstation-class 3D graphics. Tri-CAD OGL 3D models deliver all high-level graphics features at full-screen resolution (1280x1024), and hardware double-buffering and Z-buffer at high resolution. Components include an AccelGraphics™ AG300, 3D graphics accelerator with 7.5MB of video RAM, Intel®, Pentium™ chip, 1GB or 2GB 9ms SCSI hard drive, 17" Idek monitor or 21" ViewSonic monitor, 32 or 64MB RAM, SCSI 32-bit controller, Keytronic keyboard, and Logitech mouse. The OGL 3D 17 model is \$7,695, and the OGL 3D 21 model is \$8,795.

Contact Tri-Star Computer Corporation at (602) 751-4926 or FAX (602) 751-4979.



Deltis CD Recordable subsystem

### Deltis<sup>™</sup> Recordable CD

Olympus Image System's double speed Deltis<sup>™</sup> CD Recordable (CD-R) subsystems are designed as ready-to-use solutions for application areas including audio recording and pre-mastering. The CD-R subsystems, designed to create CDs for content archival and distribution, feature multi-session recording capabilities and incorporate a

1MB data cache memory. The Deltis CD-R subsystems support most existing multimedia and interactive CD data formats, including CD-DA, CD-ROM, CD-ROM-XA, CD-I and Photo CD. Complete with a SCSI-2 interface, SCSI interface cards, SCSI cables, media, audio jacks, power cord, caddy and software, the CD-R connects to both Macintosh and Windows platforms. Other product features include double-speed CD recorder/player, audio and photo CD play capability, and multi-session recording formats. Prices range from \$1,795 to \$2,095. Contact Olympus Image Systems Inc. at (516) 364-3000 or FAX (516) 677-1699.



MAG InnoVision's Elite series

### InnoVision's Color Monitors

MAG InnoVision introduced its high-end Elite series of 15" and 17" ergonomically designed color monitors. Features include EPA Energy Star compliance, Invar shadow mask, high resolution (1600x1280 to 1280x1024) with refresh rates up to 120Hz, and Zero Border Overscan. Also available are digital or LCD controls including sizing, horizontal phase, vertical position, color control, rotation control, and pinposition control, and optional Advanced Display Calibration software, which allows the user to adjust the monitor controls using a mouse. All models of the Elite series come with a three-year limited warranty. Prices range from \$699 to \$1,299.

Contact MAG InnoVision at (800) 827-3998 or (714) 751-2008.

### Recordable CD System

Pinnacle Micro is offering a new recordable CD backup system for large storage needs. The RCD-1000 combines three products (a CD recorder, a CD-ROM player and a backup system), eliminating the need for separate devices. It features a 1MB cache buffer and double-speed writing. Discs can be used as a master for data duplication, and the RCD-1000 can create ISO 9660, HFS, CD-Image, or audio format discs that can be played on most CD-ROM players. Price is \$1,995.

Contact Pinnacle Micro at (800) 553-7070 or FAX (714) 789-3150.

### DFI Diamond P120

DFI plans to ship the new Diamond P120 tower system in June. The Diamond P120 tower configuration includes standard high-end features, such as 16MB RAM, a quad-speed CD-ROM, 1GB hard drive, fax modem, and 16-bit sound card. The video lineup features a 64-bit PCI graphics accelerator and low-radiation color monitor. Prices range from \$1,889 to \$3,999. All DFI systems come with lifetime technical support and lifetime labor depot warranty.

Contact Diamond Flower Electric Instrument Company at (916) 568-1234 or FAX (916) 568-1233.

### Deltis PagePlex 18 Plus

Olympus Image Systems Inc.'s PagePlexTM 18 Plus high-volume printer offers 600 x 600 dpi resolution and 18 ppm. The

PagePlex 18 Plus supports PCL, PostScript, line printer emulations, and 42 barcodes including POSTNET. It has 2MB of RAM (expandable to 66), standard multi-purpose cassettes, and a small 13.6x13.8x7.7-inch footprint with a weight of 23 pounds. Various printing/feeder options are available. The list price of \$3,495 includes a one-year, on-site service warranty for parts and labor. Contact Olympus Image Systems Inc. at (516) 364-3000 or FAX (516) 677-1699.

### Tri-CAD DESIGNBOOK

Tri-Star Computer Corporation announces a new series of notebook computers. The 486/33SX Monochrome Designbook with 4MB of RAM, 3.5" floppy drive, and a 200MB hard drive retails for \$1,695 and includes DOS 6.2, Windows for Workgroups 3.11, Polaris Packet Software, carrying case, charger and battery. A 486/66 DX2 CAD/Graphics system with 10" TFT Active Matrix VGA color monitor, 12MB RAM, and a 340MB hard drive, and software, case, and battery sells for \$4,595. The DESIGNBOOK series features a 512K Cirrus Logic VESA Local Bus Video, PCMCIA Type III slot, Power Management unit, and AWARD Flash BIOS. A microfilm-compatible trackball is included, and a 200-pin docking station is offered as an option at \$475.

Contact Tri-Star Computer Corporation at (602) 961-3401 or FAX (602) 961-4010.



CSS Laboratories' "green" PC

### Green PCs

CSS Laboratories introduces two Energy Star-compliant PCs based on Intel's 100 MHz Pentium™ P54C processor. These "green" PCs are "network transparent," meaning their energy-efficient functionality remains intact when attached to a network. The Preferred 5100E and 5100 PCI ESP systems operate at 140 watts at full power, and go into low-power consumption modes below 30 watts. The PCs feature a network activity detection algorithm that allows the systems to "sleep" and "wake up" while maintaining constant connection to the host network.

Contact CSS Laboratories at (714) 852-8161.

### AccuJet Plotter Series

Mutoh America's new inkjet plotters, the AccuJet Series, feature monochrome or color output with a monochrome-to-color upgrade option, 300 dpi resolution, cut-sheet or roll-feed capabilities, support for HP-GL, HP-GL/2, and DMPL/ vector formats and support for HP RTL and CALS Group 4 raster formats. The 2MB to 4MB buffer is expandable to 32MB. It also has ADI and Windows™ drivers, LCD operation panel, and automatic port switching. Prices range from \$2,995 to \$4,495.

Contact Mutoh America Inc. at (602) 276-5533.

The mid-range cost for construction of a conservatory on the owner's foundation is \$30,000. Schultz, who designs primarily residential conservatories in New Jersey and eastern Pennsylvania, says there is a growing demand for conservatories at the lower end of the price range.

Homeowners now use conservatories in a variety of ways. The glass-enclosed walls serve to expand the living area in a home. Kitchens can be extended by adding a breakfast nook conservatory onto the room.

Some people simply want to open up their home and spread sunlight in previously dark areas. Houseplants have found new homes in conservatories and often the cozy glass rooms are used for dining or entertaining. The conservatory can be connected to a home either by an opening in a wall or sometimes by a tunnel or hallway. Stand-alone conservatories often are used to house swimming pools or spas. Primarily, Schultz says, conservatories serve to refresh the soul.



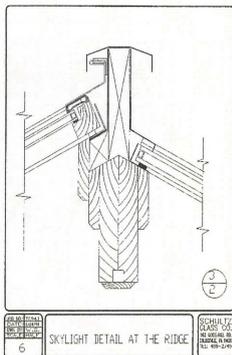
Conservatories are designed to match the existing structure.

Sitting in an open space, with nature in view all around, "releases a lot of the tension and the stress inside of you," he says. "You use it to relax after a hard day at work. It's an inner sanctum kind of thing."

Wayne Schultz has 40 years in architectural design and now fills a variety of roles — from salesman to janitor to secretary — in his one-person shop. At age 66, he says he still has lots of room to grow in the computer-aided design

field — and with DataCAD in particular. He had been a CAD software user for some time before he picked up DataCAD and he enjoys the versatility of the program. He particularly welcomes the functionality potential, such as 3D and rendering, without having to pay for extra add-ons. He has created a number of elements as symbols, such as corner, wall and construction details, which he is able to insert quickly and easily into a design.

In addition to the ease and versatility of using DataCAD to design conservatories, Schultz has discovered a unique benefit of using CAD software for his work. As he has gotten older, Schultz has found it increasingly difficult to focus on a drawing table, with the numerous parts of a drawing laid out at varying distances from his eyes. Using CAD software on his computer, he can see each part of the drawing from the same distance and blow up smaller details to a viewable size. "CAD is a tremendous lifestyle enhancer for your eyes," he says.



The figure above shows conservatory skylight detail created with DataCAD.

**STANDARDS** from Page 1

tape backups to local area network adapters and CD ROM players. The printing technology also has increased. Today's high-speed laser printers are capable of printing schematics and drawings at eight to 16 pages per minute, but they are being limited to one to two minutes per page by the parallel port. Although the performance of the PC has increased dramatically, there has been virtually no change in the parallel port performance or architecture. The maximum data transfer rate achievable with this old architecture is about 150K per second and is extremely software-intensive. The average print driver delivers data at only 12K to 20K bytes per second.

In 1991, a group of printer manufacturers began discussing the development of a new standard for the intelligent control of printers over a network. These manufacturers (Lexmark, IBM, QMS, Texas Instruments, and others) formed the Network Printing Alliance. The NPA defined a set of parameters that, when implemented in the printer and host, allowed for complete control of printer applications and jobs.

While this work was in progress, it became apparent that full implementation of this standard would require a high-performance bi-directional connection to the PC. The usual connection, the ordinary PC parallel port, did not have the capabilities to meet the full requirements and abilities of this standard or to meet the capabilities of the newer printers and peripherals.

The NPA submitted a proposal to the International Electrical and Electronic Engineers (IEEE) for creation of a committee to develop a new standard for a high-speed bi-directional parallel port for the PC. This committee became the IEEE 1284 committee. Part of the committee's guidelines were that the new standard remain fully compatible with the original parallel port software and peripherals, but that it increase the data rate capability to greater than 1MB per second, both into and out of the computer.

The IEEE 1284 standard, "Standard Signaling Method for a Bi-directional Parallel Peripheral Interface for Personal Computers," was approved for final release in March 1994. The 1284 standard defines five modes of data transfer. Each mode provides a method of transfer-

ring data in either a forward direction (PC to peripheral), reverse direction (peripheral to PC) or bi-directional data transfer (half duplex). The defined modes are:

- Forward Compatibility "Centronics" or standard IBM PC mode
- Reverse Nibble 4 bits at a time using status lines for data Hewlett Packard Bi-ronics\*
- Byte 8 bits at a time using data lines, sometimes referred to as a "bi-directional" port
- Bi-directional EPP Enhanced Parallel Port, used primarily by non-printer peripherals, CD ROM, tape, hard drive, network adapters, etc.
- ECP Extended Capability Port, used primarily by the new generation of printers and scanners

All parallel ports can implement a bi-directional link by using the Compatible and Nibble modes for data transfer. Byte mode can be utilized by about 10 percent of the installed base of parallel ports. All three modes utilize software only to transfer the data. The driver must write the data, check the handshake lines (i.e., BUSY), assert the appropriate control signals (i.e., STROBE) and then go on to the next byte. This is very software-intensive and limits the effective data transfer rate to 50 to 100K per second. See Figure 1.

Figure 1 — Compatibility Mode Data Transfer Cycle

- 1 - Write the data to the data register
- 2 - Program reads the status register to check that the printer is not BUSY
- 3 - If not BUSY, then Write to the Control Register to assert the STROBE line
- 4 - Write to the Control register to de-assert the STROBE line

See STANDARDS, page 19 ◀

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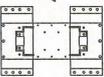
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business."

Apple's services go far beyond merely producing models. By proving out CAD databases, helping customers get past limitations, critiquing problems and reviewing tooling, they are facilitators between design and manufacturing. Jack states, "This is absolutely a service business. It's not just 'here's your model' and on to the next project." Ric Perry, senior sales engineer, adds, "We try to find out what the customer's trying to accomplish and use the best method. If a project has 10 parts, some may need to be CNC machined. Others must be fabricated and CNC machined or made with laminated clear and cast manufacturing technology. Each project depends on part complexity, the geometry and the engineer's goals. It becomes more of a team effort than a mere sales quote."

Apple builds a wide variety of prototypes using many processes and assets in simulating very realistic representations of the end product. Clear and clear-tinted polyurethane-molded prototypes are one of their specialties and are especially impressive.

CADKEY is a vital tool because Apple receives data from a wide range of customers and CAD systems. CADKEY's powerful data translators allow them to easily read the CAD files and transfer data into CAM (Computer Aided Manufacturing) solutions. In CADKEY, they verify CAD databases, correct geometry that does not properly connect, rebuild wireframe models for surface generation, and modify conditions that could cause problems downstream in machining.

When Apple made the transition into computerization, every employee attended CADKEY training courses at night. Today, virtually every modelmaker can, at the minimum, pull up a CAD database and generate a 2D toolpath. Over half of the modelmakers can produce a 3D surface machine toolpath. Ric Perry says, "A few years ago, modelmaker meant a person who created aesthetic models. Now our modelmakers are proving CAD databases and substantiating designs for manufacturability."

The company's 12 PCs are fully networked in a client/server environment. Apple Pattern communicates with customers and transfers CAD part files through a high-speed modem. For key accounts, direct lines provide even greater response time. They proudly boast "no prints required." They also have witnessed an interesting trend. Two years ago, 100 percent of their work came from blueprints. One year ago, half of their jobs came from prints, and half from computer diskettes. Today, 80-85 percent of their work comes in a CAD data format, and 50 percent of that is transferred to them via modem. In the past, Apple's customer base was geographically sensitive. Today, engineering data changes hands quickly and opportunities come from all over the globe.

**A Typical Project**

One recent Apple project involved a full-service part (a modern casing prototype) for Microcom Inc., which develops and markets high-speed modems and PC remote solutions. Wayne Norwood, Microcom's manager of mechanical design, was charged with conceptualizing a new design for a modem with a sleek, contemporary look, but with a new lower price.

Wayne contacted Concurrent Design Incorporated, an industrial design consulting firm in York, Maine. David Masury, president (also a CADKEY user), started the modern case design before the internal design was finalized. CADKEY's ordinate system functionality allowed him to size and design in 3D from the inside out and could properly place LEDs and hard switches. Concurrently, David constructed visual concepts at the PC board design level. In CADKEY, he constructed 3D models of the modem housing and included the circuit board so clearances could be checked. As the PC board design was finalized, David could make changes easily. For visualization, he rendered a digital prototype from the 3D wireframe.

Early on, Wayne, David and the Apple team met to discuss the producibility of the



These silicone rubber molds were produced from CNC-machined master patterns. The polyurethane parts produced were used to test and analyze the housing components.

wireframe design, the mold design and possible changes in this prototype. David's CADKEY part file was read into SurfCAM via IGES. The prototype was ready within two weeks. Then, snap features were tested and modified; a thin metal condition was detected and corrected; and a tooling dis-

cussion led to further design improvements. Finally, the master was modified and went directly into RTV mold. Wayne shipped the polyurethane parts offshore for the final production run.

Prototyping helped shorten the product development cycle in other ways. Regulatory testing for UL and EMC shielding was initiated much earlier than normal. Work on the tooling cycle could proceed while the PC board was modified to meet federal standards. The ISO 9000 documentation also was produced as the project progressed to the final stages.

Once the parts were out of the mold, the modern prototype was photographed. The images were used in data sheets, documentation and marketing literature. Normally, this step must wait until the part is completely manufactured. The prototype also was used for package design. Wayne maintains Microcom had a lead into the marketplace of 12 to 20 weeks.

Wayne realizes that the prototype is a good investment. He says, "You will invest several thousand dollars to develop a proto-

type. This is short money compared to the cost of developing a tool in 12 to 20 weeks, only to find there is a problem. Now you have a really expensive modification in the tool. If it's catastrophic, you may even have to start over. The big dollars are in the time you have lost in the market window."

Ric Perry says, "We are finding more and more injection molders are sending work our way. They are telling designers, mechanical and industrial design houses to prototype the designs first and prove the databases up front."

Apple Pattern Company is the epitome of how a company using cutting-edge technology has attracted many new customers and continues to be highly successful. But ultimately, it is Apple Pattern's customized services and their fierce attention to detail that keeps those customers coming back for more. They want their customers to achieve the best design, not just a design.

For more information, contact Apple Pattern Company Inc. at (508) 422-8223 FAX(508) 422-8293; or Concurrent Design Inc. at (207) 363-4406/FAX (207) 363-8902.

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# PRODUCT FOCUS > A Buyer's Guide

## Modems 101

### Practical tips on your link to the information superhighway

By Claudia Martin

A modem is your hardware link to the burgeoning information superhighway. Fortunately, today's modems and the communications software that utilizes them are light years ahead of those available a few years ago. The modems are relatively easy to use (close to plug-and-play) and even fast, fancy ones are modestly priced. The Windows-based software is actually pretty user friendly, and in some cases, real no-brainers. Setup is usually minimal. This is good. When you're "surfing the net" or send-ing Hayes modem



#### Porsche or Pinto?

Technically, faster is better because you save time watching data move and can save phone time, thus money. However, your transmission speeds will only be as fast as those supported by the receiver on the other end. None of the major on-line services and few bulletin boards support the higher data speeds, and most business fax machines still transmit and receive at 9600 kbps only. This means that 14.4 kbps devices should suffice in most situations. On the Internet or in distributed work groups with remote offices, faster modems may be advantageous. Faster also is more expensive, so assess your present and future needs.

#### Internal or External?

An internal modem slips into a slot in your computer and you just plug a phone line directly into the RJ11 outlet on the back of the computer. Internal modems also tend to be faster because the data doesn't have to navigate the bottleneck of the average COM port. However, internal modems can be difficult to setup for less experienced users because they depend on those dedicated COM and IRQ settings.

External modems can just be plugged into an available COM port (assuming you have one) which means you don't have to



U.S. Robotics internal modem

without being prepared. The cable requirements should be spelled out in the documentation. Only one modem we looked at for this article (Boca Research) shipped a cable with the external modem.

#### Standards

The safest bet is Hayes-compatible, most modems are compatible with this popular brand.

#### Software's the secret

Modems are the hardware tool that communications software uses to do its thing. You can use the fax/communications software you prefer, but most modems ship with basic software to get you started. This software is usually a stripped-down version of something better; for instance Windux Lite or QuickLinkII. These simple packages are definitely enough to get you started. Some, like Quick-LinkII, have enough features that you may not need anything else. If you need more advanced features, there is usually an inexpensive upgrade offer in the package.

#### Problems?

Cables for external modems can be a minor problem. First, if the cable is not right, you're out of luck. Further, you usually have to provide your own, so don't plan to set up at midnight or on a holiday

## MODEM GLOSSARY

**Baud** - Rate of data transmission. Baud rate includes data, parity bits, and stop bits. Baud rate is less than bps.

**bits** - French for more or encore. Means an extension of the standard. For example, V.32bis includes the V.32 standard plus additional refinements.

**bps (bits per second)** - A measure of speed in data transmission. The higher the bps number, the more information that can be sent or received in a given amount of time.

**ITU-TS (formerly called CCITT)** - An advisory committee established by the United Nations to recommend worldwide standards for data transmission. CCITT is now known as the ITU-TS, or International Standards Union-Telecommunications Standardization Sector.

**Modem** - A contraction of **M**odulation-**D**EModulation. A device that converts digital signals from computers into analog signals for transmission over telephone lines and, conversely, for reception by computers.

**Protocol** - Rules for specific data communications functions.

**V.32 bis** - Additional refinements to the V.32 standard. Adds 14,400 and 12,000 bps to V.32 9600, 7200, and 4800 bps standard. All V.32 modems fall back and forward as line quality deteriorates or improves.

**V.34** - International standard for communications are 28,800 bps. Will fall back or forward as line quality changes.

**V.42 bis** - An extension of V.42 that includes 4X data compression. Compatible with MNP error control.

**V.fast** - A proprietary 28,000 bps designation. V.fast modems use a Rockwell (brand) chip set and are not completely compatible with V.34 modems.

**PCMCIA** - Personal Computer Memory Card International Association. A PCMCIA slot is designed to accept peripherals conforming to the PCMCIA standards. PCMCIA cards come in three categories: Type I (3.33mm), Type II (5mm), and Type III (10.5mm). A slot that will accept Type III cards is compatible with Type I and Type II cards.

## MODEMS FOR ALL REASONS

We tried the simple modems profiled in the chart below. All were easy to set up, fast and trouble free. A few basic features are listed in the chart below, but some had really "hot" features like caller ID, programmable volume control, and the ability the share a line with a fax and answering machine. The price differences reflect the differences in features. These are quality modems produced by established companies that will be around tomorrow. All have a comprehensive selection of communications products and will be glad to send you information.

	ATI Vigor 14400	Boca Research Boca Modem	Computer Peripherals	GVC Inc. MaxTech	Motorola Lifestyle Series	Practical Peripherals	Supra Corp. Supra	Ven-Tel 14400	Zoltrix 2880	Zoom Fax/Modem
<b>FEATURES</b>										
v.34	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Retail Price	\$99	\$199	\$135	\$179	\$275	\$259	\$199	\$349	\$145	\$269
<b>External</b>	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UART card included	n/a	No	No	No	Available	Available	No	No	Available	No
Serial Cable Included	n/a	Yes	No	No	No	No	No	No	No	No
Retail Price	n/a	\$249	\$190	\$199	\$325	\$279	\$249	\$349	\$165	\$299
<b>MAXIMUM SPEED</b>										
Fax	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
Data	19.2	28.8	28.8	28.8	28.8	28.8	28.8	14.4	28.8	28.8
<b>windows Software</b>										
Data-Comit	Fax-Comit	FaxWorks for fax & data	Data-Comit Fax-FaxWorks	WinFax Lite DOS Fax/Link	QuickLink II for fax & data	QuickLink II for fax & data	FaxTalk - fax Comit-data	QuickLink II for fax & data	Bit Fax-fax BitCom-data	WinFax Lite Comit-data
<b>SERVICE &amp; SUPPORT</b>										
Warranty	5 year	5 year	5 year	5 year	5 year	Limited Lifetime	5 year	5 year	5 year	7-year
Toll-Free Tech Support	No	\$2/minute 900	No	No	Yes	No	Yes	No	No	No
Weekend Support	No	No	No	No	No	No	No	No	No	Saturday
BBS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Phone	905/882-2600	407/997-6227	800/854-7800	800/936-7829	800/487-1456	404/840-9966	800/727-8667	800/538-5121	510/657-1188	800/666-6191

## PRODUCTIVITY TOOLS

### Dimension Guru - Automatic dimensioning for CADKEY

By Mark Lyon

Adding dimensions to a CADKEY part file can be time-consuming and tedious. First you choose the type of dimensions you want to add, then you select the geometry and place the dimensions. Once this is done, you must go back and start over with the next type of dimension and repeat the whole process. You then have to go back and clean it all up, moving text and changing various dimension attributes before your task is completed. With Dimension Guru, a new product by Unitech Inc., all this takes just one key click.

Unitech was started by former Cadkey senior staff members. Their intimate knowledge of CADKEY is apparent in Dimension Guru's (DimGuru for short) operation. Written as a CADKEY Dynamic Extension (CDE) by the inventor of CDEs, the automatic dimensioner uses direct calls to CADKEY and DraftPAK routines for speed and accuracy.

Basically, Dimension Guru quickly dimensions CADKEY part files in either CADKEY 7 or CADKEY 7 for Windows. All interactions use the standard CADKEY interface and toolbars. The user selects entities to dimension using the standard CADKEY selection mechanism (Single, Chain, Window, Polygon, Group, Plane, All displayed, All by type, and All except type). Then Dimension Guru will dimension points, lines, arcs, circles and polylines with any of the following dimension types: Linear / Ordinate, Datum / Chain, Radial / Diameter, and Centerlines.

DimGuru supports many DraftPAK features including Drilled, Ream, Tapped, Counterbore, Countersunk, Counterdrill, Pipe thread, and Slot / Pocket. DimGuru also includes a full undo function and the interface is enhanced with on-line help and on-screen prompts to help you through the functions.

An on-line setup screen allows DimGuru options to be changed at any time (see Figure 1) and options are saved between sessions. Setup lets you choose the type of dimension

and the dimension style (e.g., datum or chain style). A user-definable base reference point can be set separately for the X and Y values to either the minimum or maximum extents of the selected geometry (min-max box), or to a user-defined location. Fast Menus is a



Figure 1

option that bypasses the initial selection menu (Single, Chain, Window, etc.) for even faster interaction.

Text placement is configured by a user-specified offset. Horizontal and vertical placement can be adjusted to go on either side of the min-max box, or suppressed altogether. The min-max box itself can be defined automatically or by the user. Radial / Diameter dimensions can be set to be created in any of the four quadrants of the arc or circle being dimensioned.

DimGuru places a number of buttons on the toolbar for easy access and use. They include: AutoDim (Runs the automatic dimensioner), Setup (Runs the setup dialog box), Undo (Removes the dimensions added by the most recent run of the automatic dimensioner), and About (Displays information about Dimension Guru).

When the AutoDim button is pressed, Dimension Guru presents the selection menu, and collects a list of entities to be dimensioned. Once the list is built, DimGuru scans the list for endpoints and counterparts that should be dimensioned. If DraftPAK is loaded, the list is scanned for supported DraftPAK entities as well. Duplicate points are eliminated, multiple circles of identical diameters are counted, and only one is dimensioned with an "X" n appended where n = the number of identical diameters. From the list of entities, DimGuru also cre-

ates the radial dimensions. If a user-specified base point or min-max box is desired, the user is prompted for it. DimGuru then builds the linear or ordinate dimensions, determining optimal spacing and layout, and the dimensions are added to the database. If DraftPAK entities are in the list, DraftPAK is called to add these dimensions as well.

Since DimGuru uses DraftPAK and CADKEY to create dimensions, all system settings and options are supported and honored. Standard CADKEY modification techniques can be applied, and the dimensions are fully exportable, printable, compatible, etc.

In most cases, Dimension Guru will completely dimension your part files the way you want automatically. However, it will give you three ways of dealing with dimensions you want to alter:

1. Adding dimensions one at a time.
2. Adding new dimensions in groups, using multiple selection techniques.
3. Dimensioning, using all displayed, then modifying or deleting dimensions.

Dimension Guru will run in layout mode at this time.

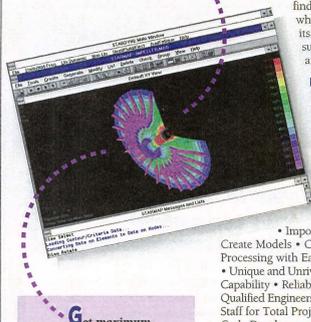
Dimension Guru costs \$99 and comes with a 30-day money-back guarantee.

For more information, contact Unitech Inc. at 203/743-8460.

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## INDUSTRY BRIEFS

### National Design Drafting Week

The American Design Drafting Association (ADDA) has designated June 5-8, 1995, as National Design Drafting Week. ADDA was founded in 1959 to recognize designers and drafters for the accomplishments of the profession. ADDA serves its member by opening new channels of communication among design professionals, and provides information, training, surveys, and peer networking.

Contact ADDA at (301) 460-6875 or FAX (301) 460-8591.

### CADman BBS Classified

Precision Design has developed the CADman BBS Classified. Access to CADman is free and categories include classifieds, utility programs, and e-mail discussions. Items for sale in the classifieds include printer/plotters, software and analysis tools.

Contact Precision Design at (206) 852-5070.

### CAE Learning Center

AC Technology North America will complete construction soon on a new 10,000-square-foot learning center for the plastics manufacturing industry. The Learning Center will be located in the Hurstbourne Green Office & Research Campus in Louisville, Ky. AC Technology North America develops, markets, and supports C-MOLD™, a mold-analysis software. The Learning Center will offer a variety of hands-on opportunities for customers and students in mold design, part design, and polymer processing.

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### VSA Receives Grant

Variation Systems Analysis Inc. has received a \$300,000 grant from the National Science Foundation to research and develop software to automatically optimize tolerance allocation for minimum cost and maximum quality. The approach couples a genetic optimization algorithm with VSA Monte Carlo tolerance analysis software.

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CADKEY has *view coordinates, pre-defined and user-defined views, and viewports*. In all these cases the word "view" refers to different things. Which is what? And what is which? And what do they do? This excerpt from "Using CADKEY & Its Applications" by Paul Restarini and Gary Bertolini from Delmar Publishers may help unravel the terminology.

and Z axes positioned as in Figure 1. No matter which "view" (see below) you are in, the axes will always be as listed below:

Axis	Position	Positive Direction
X	horizontal	to the right
Y	vertical	toward the top
Z	perpendicular	toward you from the screen

### VIEW COORDINATES

CADKEY offers two coordinate systems: World View and View. These two coordinate systems can be used interchangeably within one part. You may start constructing the two-dimensional shape of a part in View Coordinates and then convert to World Coordinates when the part is to be transformed into a three-dimensional part.

View Coordinates — The View Coordinate system is relative to the screen with the X, Y,

World Coordinates — World Coordinates are relative to the TOP view view 1. In view 1, the coordinate axes are the same for both World and View. In World Coordinates the axes of the object remain attached to the object so that as you look at different views of the object, the direction of the axes is moving relative to the top view of the object. Figures 3 and 4 will help you visualize the World Coordinate system.

### VIEWPORTS

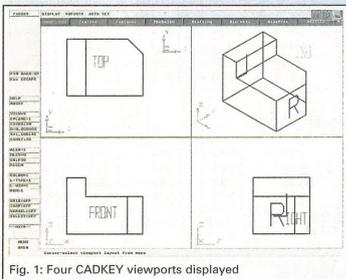


Fig. 1: Four CADKEY viewports displayed

The window on the screen where a drawing is displayed is referred to as a VIEWPORT. A viewport has many important features associated with it. It can be active, re-sized, and the view changed or a new view defined.

The viewport options allow the user to divide the screen into different simultaneous viewing areas, which is helpful when creating 3D models. With more than one viewport displayed, more than one view of the model can be dis-

played at once. Multiple viewports allow better visualization of a part during the 3D modeling process. When more than one viewport is displayed, you must specify the viewport that is active.

For a larger image, many users use a single viewport for drawing and simply change "view" or angle of a part by entering ALT-V or selecting DISPLAY-VIEW. The configuration program determines the default setting for the number of viewports displayed when CADKEY is booted up.

When more than one viewport is on screen, it affects many other CADKEY options. For example, if you turn the grid on when multiple viewports are displayed, you must choose to display the grid in all the viewports or only in the primary one. Most of the display options, such as zoom, pan, and auto-scale, also are affected by multiple viewport displays. The primary viewport is usually the view in which you are doing most of the construction. It is the active viewport in which all operations are assigned unless you specify otherwise.

### VIEW OPTIONS

The CADKEY VIEW options allow the user to manipulate a 3D wireframe part and view it from virtually any angle. CADKEY has eight pre-defined views and user-defined views. The first six are the regular 2D orthographic views; the next two are isometric and axonometric views. The nine defined views in CADKEY are: top, front, back, bottom right side, left side, isometric, axonometric, and

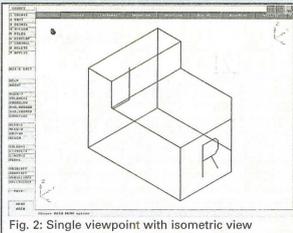


Fig. 2: Single viewport with isometric view

system.

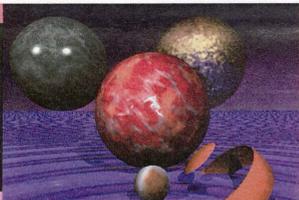
The user-definable view is of great assistance when you are finding the true size and shape of an auxiliary surface that is not parallel to one of the regular orthographic planes of projection. There are an unlimited number of user definable views. When you change views, CADKEY only changes the way you see the object; nothing in the data base changes.

The following steps demonstrate how to change a viewport to one of the eight pre-defined views.

1. Select DISPLAY-VIEW (ESC-F6-F4).
2. A prompt reads: Cursor select viewport. Pick the isometric viewport.
3. A prompt reads: Enter view number of choose menu option (1-8).
4. Enter the number 8 and press RETURN. The isometric viewport changes to the axonometric view. Enter ALT-A to automatically scale the view to fit in the viewport.

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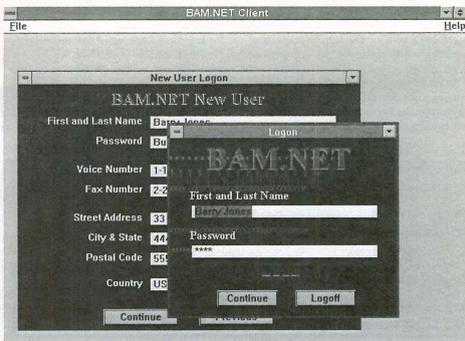
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B.A.M.NET login screen

## On-line DataCAD support helps users

By Michael Meighan and Barry Jones

areas, and access to common questions and answers.

In the era of the Information Superhighway, the growing need for DataCAD support and information led us to develop B.A.M.NET, a new online service for DataCAD users. B.A.M.NET is inexpensive, requiring only the free front-end software, B.A.M.NET Client, and a modem. Once you install the software, we encourage you to redistribute it to friends and associates.

Although the basic services are free to all users, upgraded services such as online chat, downloading of rendering materials, and technical information (i.e., fatal error listings/solutions, file recovery and updated driver libraries) will require the user to pay a modest annual fee of \$75 - \$150. Free services include user group listings, user group news, training center listings, mail forum

We are graduates of architecture and long-time users of DataCAD and the principals of B.A.M. Compugraphy Inc. At B.A.M. we specialize in DataCAD training and provide hands-on sessions at any level at our facility in Mt. Laurel, N.J. We know the product, what users expect from it, and the problems and questions that new users will encounter.

Since mid-1994, we have been developing B.A.M.NET to accommodate the growing need for DataCAD support in the Philadelphia area. Our ultimate goal was to provide 24-hour availability to DataCAD information and CADKEY products on a national level. To obtain the front-end software for B.A.M.NET or find out about our other services, call 609/235-1644.

## CONFESSIONS OF A WINDOWS SKEPTIC

By Ken Erman

Now that CADKEY for Windows is shipping, I have to look back in surprise at the transformation that has occurred in me over the last nine months. Nine months ago, I could easily have been mistaken for a charter member in the "I Hate Windows Society For DOS Power Users" and an associate member in the "UNIX Is The Only Real Operating System" fan club. I asked myself, "How can a good product like CADKEY be made better by creating a Windows version?"

Now I am excited about the capabilities of our first Windows offering. Just being able to move from CADKEY into Word for Windows or to e-mail with nothing more than an Alt-Tab is an enormous timesaver. I'm a 10-year CADKEY user and immediate mode commands like this really appeal to me.

That, coupled with the new interface, makes creating models quick and easy. From a user's point of view, I want to note the new efficiencies found in the interface. The icons alone save an enormous amount of time. For example, every CADKEY user knows that four key pushes (F6, F6, F7, F4) bring up the Levels List. Now, all I have to do is hit the Levels List icon. One selection and bingo! If I'm not sure what function an icon stands for, I pause or over it and a Tool Tip appears with an explanation, or I can see what the description is in the Status area.

You also will notice that the interface is "fatter." That's industry lingo that means it requires less user input to get to the point where you are actually working on your model. The executable His-

tory Line feature also saves time and keystrokes. Once a function has been used it appears on the History Line where it can easily be selected again. So, now you can bounce from creating icons, to aligning ordinate dimensions, to the hidden line removal function of Picture-It with a single mouse pick for each one.

If there is a function you use frequently, just add it to the Toolbar, where it always will be available. To modify the Toolbar, you simply hold the Shift key down, select an icon, drag it to where you want it, and release the mouse button and the icon drops into place. To remove an icon from the Toolbar, just drag it to the viewport area and drop it. An icon can appear as many times in a Toolbar as you like. You can even move an entire section of the menu to the Toolbar. Try placing the line icon into the Toolbar and select it, then watch what happens. Once you have created the Toolbar that is best suited to your use of the system, you can save it and share it.

Accelerator keys are one of my favorite features. I have always loved using the Immediate Mode commands in CADKEY. Now I can quickly make my own assignments and save them to a file. Just call the Accelerator Key function and scroll through the icons until you find the one you want (every CADKEY function has an icon). Then assign it to any combination of Alt or Control keys. Try assigning the main line icon to a key combination if you want to see something cool.

Words are not very adequate for explaining this, but once you start using the new interface you'll see what I mean. Hope you have as much fun as I've been having.

## Windows Tips & Tricks The Swapfile and Memory Errors

By Claudia Martin

The recommended minimum amount of RAM for satisfactory operation of CADKEY Windows is 16MB (more is better). However, you can run CADKEY Windows with only 8MB of RAM. Thus, it will be a little slower and with 8MB you may also run into Windows memory errors. If the user with 8MB of RAM is having trouble with CADKEY for Windows (getting it started or keeping it running), they should try removing expanded memory, setting the Windows cache no higher than 256K, and set a Windows permanent swapfile of 20MB. The Swapfile is hard disk space that Windows sets aside to fool programs into thinking that more RAM is available. This fix can do any of your memory-hungry Windows applications. Here's how you do it:

**Delete the old swapfile** — For best results, delete the old Windows swapfile before building a new one. Open the Windows Control Panel and select the 386 Enhanced icon. Click on Virtual Memory, then Change. Under New Swapfile Settings, select None as the Type. Windows will prompt you to Continue or Restart. Choose Continue. Now exit Windows.

**DEFRAG the hard disk** — A swapfile needs a big, uninterrupted chunk of hard disk space, which you won't have if you haven't defragmented your disk lately. MS-DOS 6+ includes a defragmentation utility. From a DOS prompt, type DEFRAG/F and follow the prompts. This could take a few minutes, depending on the size and speed of your hard drive.

**Create the New Swapfile** — Start Windows and open the Control Panel. Double-click on the 386 Enhanced icon. When you choose Virtual Memory, the dialog box shows that you have no swapfile. To create one, click on Change. Windows will look at available hard disk space and tell you how big you can make your swapfile. You also have a choice of a Permanent or Temporary swapfile. Permanent is faster and better. Specify 20000 as the new swapfile size.

CADKEY operation does not seem to improve with a larger setting, so CADKEY tech support doesn't recommend wasting the disk space with a file size over 20000. Click OK and answer Yes when Windows asks you if you want to save your changes. Windows will want to restart itself to build the new swapfile. After that, you're in business.

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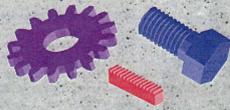
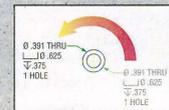
Views and redline notations in CADKEY (.prt) files and raster files without having to install CADKEY and without changing the original part files! Runs in Windows™ so there's no need to know CADKEY to run it. Users can copy and paste data to other applications for more efficient communication of changes back to the designer. Ideal for customer service resp. top floor people, sales engineers, and technical support applications.

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# Modeler finds CADKEY a perfect FIT for jewelry industry

By Pete Mancini

Dominic Ventura has come a long way in an industry where CAD is a new tool. In fact, when he purchased a PC in the summer of 1992, he mainly wanted to upgrade his computer skills. But, in the back of his mind, Ventura hoped to use the PC for CAD. Three years later, Ventura has become an accomplished CADKEY and FastSURF user. Now he talks excitedly about getting into rapid prototyping and stereolithography.

*"I have had fun, but remember, there are no footsteps to follow. There is a lot of trial and error."*

*- Dominic Ventura*

design tool.

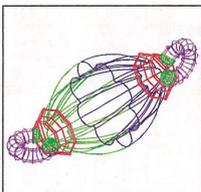
"I had been using 2D CAD products, but was getting nowhere with them due to a lack of support," explains Ventura. Early in 1993, Dominic received a CompuServe tip from Dana Seero of Computer-Aided Products. As a result, he decided to purchase CADKEY 5 and FastSURE.

On his own, Dominic began to explore and quickly found out how PC 3D CAD could be used effectively in the jewelry industry. After gaining more confidence through a training session at Cadkey headquarters, he began sharing his findings with associates at FIT. Samuel Beizer, chairman of the Jewelry Design Department, liked what he saw and encouraged Ventura to develop the first CAD-based jewelry design curriculum at FIT. Beizer, Ventura, and FIT now are preparing to expand the program from two years to four years.

Ventura received support from many sources, like Cadkey Inc., the Cadkey Educational Dealer Shortess-Rawson & Associates, and FIT faculty member Anthony Lent. Still, it has not been easy charting new ways through traditional waters.

"I have had fun, but remember, there are no footsteps to follow. There is a lot of trial and error," says Ventura.

And initially he was not able to get a lot of



Necklace design and the finished product help from his peers. "People in the jewelry industry are not usually eager to share with you your trials and tribulations, and there are no jewelry-specific design programs for the PC on the market," says Ventura. "Plus, I have to deal with scales that are in the tenths of millimeters. Thankfully, CADKEY and FastSURF can handle that. It's all about having the tools to design real three-dimensional jewelry."

Ventura predicts that more people in the jewelry industry will become involved with PC CAD in the next five years. It is very likely more people will do so once they see Ventura's work. He has progressed to the point where he is able to showcase his work with photorealistic output via 3D Studio. "The

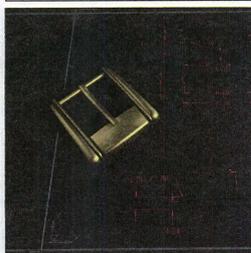
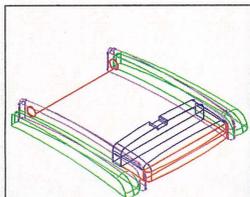


CADKEY and FastSURF geometry read easily into 3D Studio," notes Ventura. However, Ventura's ultimate goal is stereolithography because it lends itself to the complex forms inherent in jewelry. "Rapid prototyping processes are the way to go," Ventura says.

Based on the progress this pioneering educator and jeweler has

made in a few years, Dominic Ventura should surpass all his goals as he leads the jewelry industry into the 21st century.

*Dominic Ventura can be reached at FIT, Jewelry Design Department, 227 W. 27th St., New York, NY, 10011 or CompuServe: 74037,3471.*



The belt buckle above was designed using CADKEY.



A ring designed and produced by Dominic Ventura.



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# Recoverable hard disks offer a flexible solution for big files

By Bob Martin

Applications are getting larger and larger. Data intensive projects using CADKEY and DataCAD generate huge (spell that HUGE) drawing, surface and rendering files. If you're caught in a storage crunch and/or wonder how to transport those larger-than-floppies — even when compressed — files, a solution worth considering is a removable hard drive.

MountainGate Data Systems of Reno, Nev., offers an extensive line of 3.5-inch removable, transportable hard drives with storage capacities ranging from 270 MB to 4.2 gigabytes. We worked recent-

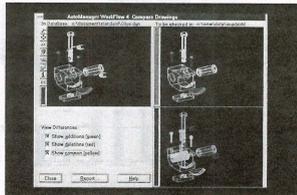


MountainGate's InoreMleg by the PassPort XL and IncoreMg™ models found them convenient and flexible — a nifty idea. Any

application where data must be removed and transported easily and safely (for example, classified government and business applications like CAD/CAM, legal, accounting or pre-press) is a good candidate. Just slip the drive out of its slot and lock it up or take it with you. For instance, I like to work at home and at the office on CAD files that simply won't fit on a floppy. All I need are two reasonably priced docking stations connected to my computers via the standard SCSI interface and one hard drive.

Removable hard drives offer definite

See MOUNTAIN, page 21 ⇨



AutoManager WorkFlow 4 compare feature

## AutoManager Workflow

# Speed up the design process and stop searching in-boxes

By Tim Volk

While in the Marine Corps, I implemented my first document management system on a word processor. Later, I designed a system using Lotus spreadsheets. At the time, we were lucky if we had aBase or something similar. I used AutoManager WorkFlow 4 recently and wonder how we ever managed with anything else.

AutoManager WorkFlow 4 from Cycso Software ("see-co") is that rare software package which transcends its advertising. AM-WorkFlow maintains all files for a project in one electronic folder, and users may view, redline, print, or transport files from many applications — drawings, spreadsheets, and text in many formats. AM-WorkFlow displays its full power in networked situations, but a small or home office also could benefit.

New features include an improved search and select utility (Navigator), enhanced electronic markup of drawings and other documents (redlining), transmission of data to other locations (BriefCase), and a viewing module compatible with most file formats.

The Navigator indexes descriptive fields of a project's documents and tracks the locations of all files, allowing fast access. The user may search for a document by project, application, author, or any other field selected by the system administrator.

AM-WorkFlow supports the redlining of many file formats and allows integrated review and approval for fast, efficient processing. The user can define several levels of redlining, each with its own security profile. A "floating toolbar" includes icons for text, geometric shapes, free-hand drawing, and a palette. The user also may associate redlines with memos. A Compare function simultaneously displays the old and new versions of a file, as well as a third view showing the differences. The user may zoom on a detail in any of these three windows, and all will update accordingly.

Supported file formats for redlining include CADKEY PRT drawings, HPGL plot files, and several other CAD applications; Windows and OS/2 bitmaps, GIFs, and other raster graphics; as well as Lotus 1-2-3 and Excel worksheets, dBase databases, WordPerfect and Microsoft Word text, and Windows Metafiles. In addition to formats available for redlining, AM-WorkFlow text viewer supports many additional file types with WYSIWYG (What You See Is What You Get) display. AM-WorkFlow can integrate third-party viewers, so all documents may be managed regardless of their origin.

Security is an AM-WorkFlow strength in a networked situation. The system administrator can define access levels for any feature of AM-WorkFlow, including document viewing, multiple levels of redlining, and extend various security options to other users. Also, the system can control which applications a given user may launch.

Security measures extend to the electronic transport of files to other CAD work groups, internal departments such as accounting, marketing, and the shop floor, or to outside parties such as subcontractors. A set of documents is checked out to a BriefCase using a compression utility that may be freely distributed, allowing controlled access to groups who do not use AM-WorkFlow. While checked out, copies of the files can be locked in the database to



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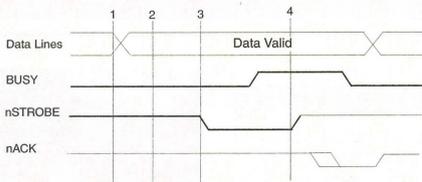


Figure 1

Newer parallel port adapter cards, such as the FarPoint Communications E/Port Card, can increase system printing performance tenfold by using hardware to perform all handshaking necessary to transfer data to the printer. This, coupled with a data FIFO, reduces the Compatibility mode data transfer to a single OUT instruction. This type of card has the capability to drive any laser

printer as fast as the printer can take the data, rather than being limited by the overhead of the printing software loop. The advantage of this type of card is that printing performance can be increased without changing your laser printer. Many installed laser printers can accept data from two to 20 times the rate they are being driven by the current installed parallel ports. Burst rates

are from 300K to 1MB per second, rather than the 12K to 20K typical with today's ports.

In addition to the Compatibility, Nibble, and Byte modes, EPP and ECP modes are being implemented on the latest I/O controllers by most of the super I/O chip manufacturers. These modes use hardware to assist in the data transfer. For example, in EPP

mode, a byte of data can be transferred to the peripheral by a simple OUT instruction. The I/O controller or adapter card handles all the handshaking and data transfer to the peripheral. See Figure 2.

Figure 2: EPP Data Write Cycle  
1 - Program executes an I/O write cycle to port 4 (EPP Data Port)

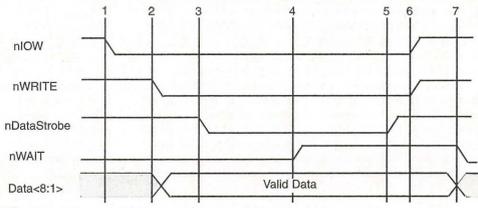


Figure 2

2 - The nWrite line is asserted and the data is output to the parallel port

3 - The data strobe is asserted, since nWAIT is asserted low

4 - The port waits for the acknowledgement from the peripheral (nWAIT de-asserted)

5 - The data strobe is de-asserted and the EPP cycle ends

6 - The ISA I/O cycle ends

7 - nWAIT is asserted low to indicate that the next cycle may begin

Data transfer rates from 1MB to 3MB bytes per second are possible with the EPP or ECP.

The next generation of printers is being developed to take advantage of the performance benefits of these new modes of operation. In addition to speed, the 1284 standard enables printer and job management capabilities that were available only on a network-attached printer. Some of these capabilities are seen today in systems such as the Explorer™ program from Hewlett-Packard, or MacroScan™ from LeCamar. These programs demonstrate the capability of having a remote control panel (controlling the printer from your PC) and being notified of printer status, such as "toner low" or "paper jam." In some programs, when a paper jam occurs, a window pops up with a picture of the printer showing the location of the jam.

In summary, the parallel port has gone from being the unidirectional bottleneck in the printing system to a high-performance bidirectional channel that enables intelligent fast printing and peripheral connectivity. For existing printers, solutions such as the E/Port card enable a simple upgrade to an existing printing system. For future printers and printing systems, such as those to be included with Windows 95, IEEE 1284 parallel ports with ECP and EPP will offer the highest performance connectivity solutions.

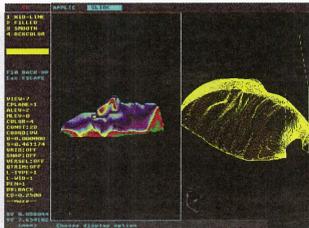
For more information on the 1284 standard, contact any of the following retailers:

- IEEE Std. 1284-1994\* standard.
- IEEE Document services, Phone 800/678-IEEE
- "An Introduction to 1284" Larry Stein, FarPoint Communications 805/726-4420
- CompuServe forum: GO EET:STDFRM - Section 2-1284 Parallel Port
- FTP Server: ftp.lexmark.com/pub/ieee/1284.3

Larry Stein is president and co-founder of FarPoint Communications in Lancaster, Calif. His professional involvement includes active participation in IEEE 1284. He is currently chairman of the IEEE 1284.3 working group.

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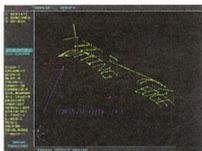


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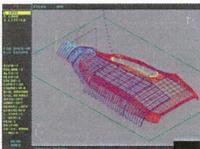


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CIRCLE 211 ON CARD

## BAT

### BAT keyboard enhances productivity

By Bob Martin

When I took the BAT™ Personal Keyboard out of the box, my first thought was that it looked funky and impractical. Not! This little seven-key keyboard can be a powerful adjunct to your mouse and keyboard and measurably enhance your "macroing" functionality.

You can type all the standard keyboard keys on the BAT keyboard through a system of chording and essentially replace the standard keyboard. This is an advantage to disabled users and those with RSI problems. However, for CAD, very great productivity benefits can be realized when the BAT keyboard is used in conjunction with the mouse and keyboard. You can program any macro that includes a series of keyboard strokes (including function keys) and recall it with the BAT

keyboard. Since both DataCAD and CADKEY menus are function key-driven, it doesn't take much imagination to see the possibilities.

Two things can adversely affect CAD productivity: the number of keystrokes and menu picks (the fewer you make, the faster you can go), and taking your eyes off the drawing to look for the right place on the keyboard or tablet. With the BAT Personal Keyboard, your hand stays in position and your eyes stay on the drawing. Setup and learning take a little time, but Infogrip's technical support is readily available and more efficient.

The macros are stored right in the keyboard using ChordEasy, the software bundled with the keyboard. ChordEasy is not a terminate and

See BAT, page 28 ⇨



BAT Personal Keyboard

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## DIGIBOT II

# DIGIBOT II streamlines reverse engineering methods

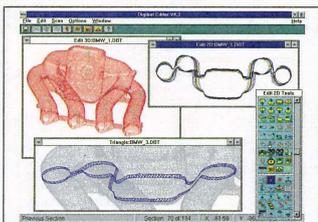
By Bob Martin

Traditional methods used to capture an object's measurements for reverse engineering—from calipers to coordinate measuring machines and, more recently, various forms of laser-based digitizing systems—have been plagued with problems. Some are very slow. Others gather data that is redundant and manipulated or translated easily for use with standard CAD/CAM systems. Further, capturing data accurately remains a problem in some cases.

InterMotive Technologies Inc., a design and engineering service company near Detroit, recently completed a reverse engineering case study with two new products that showed superior and enhanced performance. To reproduce a complex automotive thermostat housing, InterMotive used Digibot II, a four-axis 3D laser digitizing system developed by Digibotics Inc. and Surfacer (v. 3.1), a software environment for joint

processing, three-dimensional visualization, and surface modeling and analysis. Surfacer was developed by Inmagene Inc. of Ann Arbor, Mich. The initial result of these combined technologies was a shortened turnaround time for the reverse engineering process (from initial digitizing of the existing 3D object to the creation of production drawings) from an estimated four weeks to one week. In addition, the data gathered was accurate, easier to work with, and fully compatible with standard CAD/CAM systems. InterMotive also used the data to produce a prototype with 3D Systems' rapid prototyping system and created a toolpath for CNC machining.

Fred Nicholas, CAD/CAM manager at InterMotive and leader of the case study, was attracted to Digibot II and Surfacer software because of their ease of use. He states that InterMotive had used other types of contact and laser scan-



See DIGIBOT, page 30 ⇨

Digibot II's editor

## WORKFLOW from Page 18

prevent modifications. When the BriefCase returns, a check-in process compares the contents with the original files for review prior to their return to the database. Using third-party software, I was able to encrypt files before check-out, and virus-scan files waiting check-in.

The basic program should satisfy the needs of most users, but a macro language, BaseLISP (a full LISP implementation), offers further customization. The BaseLISP editor checks for typos and the correct number of parameters and parentheses, and the debugging utility supplies a backtrace function. The language provides for list handling and type conversions with access to many of AM-WorkFlow's features.

Other AM-WorkFlow features include saved searches, application integration through OLE (in the Windows version), messaging/mail enabling, improved imports, and archive and restore functions. Users familiar with Windows will learn AM-WorkFlow with little effort. After two hours and a couple peeks at the on-line Help, I was performing document searches, reindexing, comparing drawings, and building environments with ease.

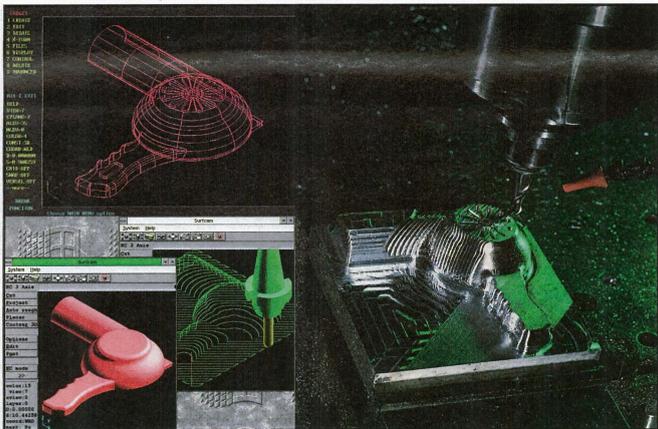
My few criticisms with AM-WorkFlow are minor. First, the user must disable screen savers. Complex drawings with multi-layered redlines require a few minutes to prepare, and the screen saver destroys the view. Second, when a view screen is maximized, AM-WorkFlow does not display any identifying information in the title bar. However, descriptions are available from the Document Information button on the toolbar. Finally, an image totally panned off-screen is difficult to recover using the Arrow keys. I would have liked the ability to press the Home key and return to the top left of the document. Again, the toolbar provides an alternative: clicking the Fit Document in Window button.

AutoManager WorkFlow 4 is a powerful system for managing documents of all types with many more features than described here. Although developed for the CAD industry, this product would be useful as is, in any environment requiring document management, like law offices and quality-control labs. Possible modules to enhance AM-WorkFlow which Cyco should consider including encryption, a virus-scanner for checking in BriefCases, and perhaps a multimedia editor with a file conversion utility for preparing presentations.

DOS and Windows versions are available. AM-WorkFlow 4 is priced at \$799 for the first license, with progressive discounts for additional licenses.

For more information, call Cyco Software, (800) 323-CYCO (2926), or from outside the U.S., call (404) 654-5302.

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By Walter Silva, President  
Conceptual Product Development

Conceptual models illustrate a design, but use the minimum amount of detail. For example, items such as molded part drafts, minor fillets and rounds, and intricate minor geometries are simplified or omitted entirely.

CAD's tremendous capabilities tempt designers and engineers to produce every wireframe, surface, and solid model in painstaking detail. While this is both necessary and desirable for the final design model of a new product, it is both unnecessary and counterproductive at most other stages of the design cycle. Why? An expert in conceptual modeling can produce a design concept in a fraction of the time required to produce an engineering model.

### Developing New Design

Let's examine the development of a new product design through each stage and evaluate the savings realized by using a conceptual model instead of an extremely accurate engineering model.

**Stage One: New Design Proposals** — Team members brainstorm many possible approaches for implementing the proposed product concept. This stage is most productive if creative team members are encouraged to "diverge" without application of strict "filters" on their proposed solutions. The following criteria allow maximum production of useable ideas with a minimum expenditure of time and resources:

1. Creation of a large pool of alternative solutions
2. Clear, lucid description of each proposed solution
3. Emphasis on major aspects of each

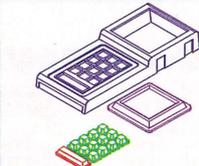


Figure 1

solution; avoidance of details  
4. No interim judgment on comparative worth of alternative solutions.

At this stage, the use of simple conceptual models to document alternative proposals dramatically reduces the time required to document comparative solutions, and substantially prunes budget dollars expended. Since time and cost to market are critical in today's fast-paced business climate, the competitive advantages of using conceptual modeling are impressive.

A less quantitative but equally important benefit is improvement in design quality, because there is a broader evaluation of alternative solutions before committing to one. If extremely complicated engineering models are used in the initial development stages of a product, there is a greater incentive to continue with a less-than-perfect design because of the amount of resource dollars already invested in it. However, when the investment is substantially less, the likelihood of replacing a borderline solution with a more robust one is higher.

**Stage Two: Design Evaluation and FMEA** — After a design approach is selected, the project team must thoroughly evaluate it

to determine potential design flaws and potential failures. Detailed engineering models will be started at this point, but valuable schedule time can be saved by using the conceptual models for the first design review and FMEA (Failure Modes Effects Analysis) meetings. These relatively simple models can be manipulated easily to produce conceptual studies, with renderings from different viewpoints and isometric sections displaying complex internal features.

Quickly produced rapid prototypes of simplified part models also can aid in the evaluation process. For helping very minute parts, it can be useful to make rapid-prototype models in a scaled-up size. This allows members of the design team to interactively look at and discuss features which would otherwise be difficult to see. These simpler geometries (without draft, minor fillets and rounds) do not detract from the usefulness of the models. In fact, they remove potentially distracting "noise" from the evaluation.

**Stage Three: Manufacturing Evaluation** — Good design includes extensive evaluation and development of the machines and processes that will ultimately produce the product. Simpler representations of the product are ideal for evaluating transfer lines, tooling clearances, and packaging considerations. The lower entity count of conceptual models is especially advantageous when animating process sequences.

An exceptionally useful variant of the normal conceptual model used by many astute manufacturing and industrial engineers is one often referred to as a "significant characteristics model." By eliminating the majority of the features from the part, a net shape envelope is produced. Only "significant characteristics" (such as external mounting lugs that might hang up on machine parts or be used for locating in a machine nest) are modeled. These models are ideal for animating process steps, evaluating tooling clearances, and determining fixture locations.

**Stage Four: Preliminary Marketing** — Shortened development cycles also can strain sales and marketing staffs. Initial conceptual models can be used by the "front-line" troops to block out brochures and even be pressed into service for preliminary market surveys. Quite often, pictures of rapid prototypes (made from the conceptual models and hand-finished) to demonstrate the most important features) are used successfully in preliminary trade releases. And, obviously, placing a rapid prototype, even a simplified version produced from a conceptual model, in a customer's hands beats describing what you're going to produce. Remember, it's difficult to raise a customer's interest unless you can actually produce a tangible prototype.

**Stage Five: Product Documentation** — Many company activities require substantial documentation (including graphical representations) for the successful production and selling of a product. A few of the major areas of need are:

- Inspection Documents
- Customer Service Screens
- Catalog Sheets
- Marketing Surveys

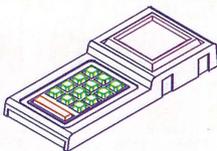


Figure 2

- Assembly Sheets
- Owners Manuals
- Project Records

Graphical documentation needs can be met more quickly and economically if you use a conceptual model instead of a complex engineering model. The lower entity count of a conceptual model results in smaller final part file size which, in turn, contributes to smaller translated file sizes (such as DXF) that often are used in documents. These smaller files process faster and place less overhead on RAM capacity during a Windows sessions.

The smaller file sizes substantially reduce the amount of hard drive space needed to provide archive storage for the thousands of images typically filed in an active company's catalogs, manuals, etc. Simpler part representations take less time to create, modify, and process than equivalent engineering models. This drastically reduces the resource time and dollars spent in the development of documents.

For many forms of illustration, the cleaner lines of a conceptual model contribute to a clearer, more concise graphical message. You can help your customer "zero in" on the items you want to accentuate by eliminating a large portion of the extraneous information.

### An Engineering Model and Equivalent Conceptual Model

Figures 1 and 2 show the differences between an engineering model and a conceptual model of a product that has a case, keys, and an insert lens plate. Notice that in both the exploded assembly and the completed unit the conceptual model completely portrays the basic concept; it shows relative orientation of the parts, overall shape, and basic design concepts. The engineering model provides a greater depth of detail (including drafts, rounded corners, and recesses) but none of these is absolutely essential for many of the documentation needs for the part.

Figure 3 shows the relative file sizes for different types of files related to these two wireframe models (which represent only a small portion of the actual components that would comprise an actual design). The approximate 10-to-1 ratios in file sizes shown here are typical.

If you need to create extensive catalog files, inspection documents, or customer service screens with graphics, the potential savings in hardware memory to archive these documents is dramatic. Combined with the other savings discussed, a tremendous incentive exists for implementing use of conceptual models on a wider basis in your organization.



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### Comparative File Sizes Conceptual vs. Engineering Models

Part Files	Engineering Model Part File:	923,252 Bytes
Conceptual Model Part File:	74,760 Bytes	

DXF Files of Hidden Line Renderings	Engineering Model - Isometric Rendering - Assembled:	323,880 Bytes
Engineering Model - Isometric Rendering - Exploded:	767,687 Bytes	

Conceptual Model - Isometric Rendering - Assembled:	36,566 Bytes
Conceptual Model - Isometric Rendering - Exploded:	62,945 Bytes

Figure 3

We found great DataCAD tips on the Internet DBUG forum during the past few weeks. For those who have neither the time, interest nor inclination to proof the web, we reprint a few here. There were many more. Perhaps this will inspire you to go on-line and check out the forum for yourself.

### Custom Hatch Patterns

Rjfnshn@aol.com asked:  
"Is it possible to create custom hatch patterns? How is it done?"

Evan H. Shu, AIA of Cheap Tricks, responded:  
"Christopher Glass wrote a very nice article

on how to create custom hatch patterns in the February '93 issue of "Cheap Tricks." We will review this article to see about including it on our freebie reprints available via this forum, but it is the type of article where it would be helpful to see the illustrations.

"Simple patterns are indeed easy to produce, but once you get into a little more complex patterning, you will find the procedure quite mind-numbing. There is a tool called "Hatch Manager" by John Fornaro, available off the Cheapware listing as a "Mega" disk that helps to automate the process for you by taking a pattern you have drawn in DataCAD and converting it into a hatch description for your DCAD.PAT file.

### Text Editing Tips

livesel@atnet.org asked:  
"I have just begun to use DataCAD in my architectural practice. I need a greater understanding of effective text editing in drawing files. I use standard notes with symbols and would like to know effective ways to enter and edit this data."

### Answers Galore

Patrick J. Shoaf — pjsboaf@infknets.com or works\_jshoaf@netlink.mpl.com responded:  
"In DataCAD you can import ASCII text files into your drawings. Simply select TEXT, then FILE I/O, then TEXT IN. Use your mouse to place the text (point and click). You can also adjust size, etc. before placing text.

The text is one item that can be deleted and re-created easily. GOOD LUCK."  
John Fornaro elaborated on some of the finer techniques:

"You can use the Text I/O function in the text menu to bring in a blob of ASCII text as a group, with each line of text separated by a return as an entity in that group. If you hit the comma key, you will erase each line of text in reverse order, as they are entered into the drawing in the order of the text file, top to bottom. The period key will un-erase only the last line of text entered. If you hit the less than key '<', or 'Shf.' + '<', you will delete the last group entered, i.e. the entire block of text. Of course, the greater than key '>' will undo the last group entered."

"The text will be entered according to the current text settings, so it is a good idea to set the text settings of size, aspect, font, etc. before you import the blob of text. If you group and have just imported 87 lines of text as 3 foot high Block ... (Arrrrgh), you can go to the Change menu (Alt-C) and change most (but not all) of the various text settings. Remember to do it by group, and you only need one mouse pick to change the text."

"Word processing is agony in DataCAD. If the number of characters per line of text is not to your satisfaction, and you can't fix it by changing aspect or size, you're better off to delete the group of text, exit to the DOS shell, call up the DOS Edit program, modify the text, and re-import it. I do have a "Fast Case Changing utility (SC, R117) on Evan Shu's Cheapware listing which helps if you want to change text to ALL CAPS, Init Caps, or lower case."

"One more thing: Unfortunately, you cannot change the line feed factor (Factor, on the Text menu) from the Change Text menu. Do some experimentation. For example, the Font ARCWY2GP at a Size of 12" and a line feed factor of 1.38 will advance text in 18" increments, while giving you 12" text and a 6" inter-line spacing ... an old timer's testing standard. Not as old as the 2/3 standard, but I digress ..."

### Solid Walls

Greg Dyarrt — wslanson@worldlink.tacoma.wa.us asked:  
"I'm a new user and still haven't found a way to create solid walls (or fill them). Is there some missing in DataCAD or am I just missing it?"

Greg Dyarrt — wslanson@worldlink.us responded:  
"There is no direct command to fill in walls. Many users instead "hatch" their walls with "lines" found as one of the hatch types. A 45-degree angle usually works. Keep in mind that the hatch giving you 12" text and a 6" inter-line spacing will get 32 lines in one inch (drawing scale) with a spacing of 1. Spacing of 32 will give you 1 line every inch and so on. Use associative hatch so your drawing won't get so huge, or rename your drawing and hatch the new copy. If you have trouble with hatching your walls, try drawing over them with polylines, which will hatch easily. It's time consuming but works well. It would be great if there was an easier way to get a commonly desired end effect."

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## Methods for Selecting Geometry

By Ron Brumbarger and Scott Workman

This article is part of a continuing series on the CADKEY LISP programming language. This month we discuss different methods of selecting geometry. We combine these new selection methods with those discussed in previous articles on DXF codes to copy the selected geometry. If you have suggestions or an idea about topics that we should cover in these articles, leave a message via CompuServe - User ID: 72730.1314

## Introduction

Last time, when we talked about selecting entities via DXF code, the `ssget` function was used to allow the user to select entities using CADKEY LISP's default selection process. This month's program provides more control of the selection process. While the end result may appear similar, the differences within the program should demonstrate the process of using LISP to select geometry.

## Facets of SSGET

The `ssget` function was used in last month's program as in its simplest form. However, the `ssget` function is actually quite robust; it can select geometry at a specified point, within the boundaries of a rectangle, the last entity created, all entities in the drawing and more.

We use several forms of the `ssget` function in this month's program. We will mimic some of the internal selection mechanisms of CADKEY LISP by allowing the user to specify which method to use. Finally, we explain the selection methods used in the example program in detail.

## Selecting a Single Entity

There are two functions that can be used to select a single entity. One allows the user to interactively select the entity and the other allows the program to select the entity using a point variable. The `entsel` function prompts the user to select a single entity. If the user successfully selects an entity, the entity name and the actual point picked are returned in a single list. If the user picks empty space or cancels the function, `entsel` returns nil. The `entsel` function should be used only if user interaction is required.

The `ssget` function can also select a single entity, but it is not interactive. By supplying a point variable to the `ssget` function, the entity that crosses the point will be returned as the only entity in a new selection set. If no entity exists at the point specified, the `ssget` function will return nil. As an example of the `ssget` function, the code `ssget ("I")` will select the entity that crosses the point at `x=1, y=0`.

## SSGET Function Modes

Other `ssget` function modes require a parameter to indicate what type of selection is to take place. The parameters that follow the mode will depend depending on the mode being used.

**Last Entity** — To select the last entity created in the part file, the "L" mode is used. The code `ssget "L"` selects the last entity in the part file. The last entity created in the drawing will be returned in a selection set.

**All Geometry** — Selecting all geometry in the part file uses the

"X" mode. The code `ssget "X"` selects all entities.

**Window** — To select entities contained entirely within a rectangular area, the `ssget` function requires the two opposing corner points of the rectangle. The "W" mode selects only geometry that lies entirely within the window; the "C" mode can be used to select all geometry that lies even partially within the rectangle. The code example `ssget "W" (0 0) (3 2)` will select all entities that lie completely within the rectangle bounded by the corners at `x=0, y=0` and `x=3, y=2`.

## Using Selection Sets

What happens after the `ssget` function has selected the geometry? First, the `ssget` function returns the geometry in a special LISP variable type called a selection set. A selection set is simply a collection of entities that is managed by CADKEY LISP. The selection set is uniquely named by CADKEY LISP so that more than one selection set can exist at one time. CADKEY LISP provides functions to manipulate the selection set by querying the length of the selection set, adding entities to the selection set, removing entities from the selection set and identifying if a specified entity is a member of the selection set.

Another multifaceted function, the `ssadd` function, is used quite extensively in the example program. If no parameters are supplied to `ssadd`, it creates a new selection set with nothing in it. If an entity name is supplied as the only parameter, a new selection set is created with the specified entity as the only member. If both an entity and an existing selection set are specified as parameters, the entity is added to the existing selection set and the newly formed selection set is returned.

## Source Code for COPYSEL LISP

```
; CopySel.lisp
; S Workman

; The program will allow for the selection of entities
; using various
; selection methods. While (ssget) can be used to
; achieve
; the same result, the example code will demonstrate
; several uses of
; manipulating selection sets. Once a selection set
; has been formed,
; all LINES, CIRCLES and ARCS will be copied
; from a base point to
; a displacement point.
;
(defun copyssel / ss kw ss2 ent idx p1 p2 lst)
  (setq kw "" ; Empty selection set
        ss (ssadd) ; Empty selection set
        )
  (while (/= kw "Copy")
    (initget 0 "Single Window All Last Copy")
    (setq kw (getkword "\nSelect:
Single/Window/Last/All/Copy: ")
          )
    (cond
      ((= kw "Single")
       (setq p1 (getpoint "\nSelect an entity: ")
             ss2 (ssget p1))
       )
      ((= kw "Window")
       (setq p1 (getpoint "\nWindow corner: ")
             p2 (getcorner p1 "\nOther corner: ")
             ss2 (ssget "W" p1 p2))
       )
      ((= kw "Last")
       (setq ss2 (ssget "L"))
       )
      ((= kw "All")
       (setq ss2 (ssget "X"))
       )
      (t (setq kw "Copy"
                ss2 nil)
        )
    )
  )
  (if (/= ss2 nil)
    (addss ss ss2)
    (ssfree ss2)
  )
)

; The slength function can be used to query
; the number of entities that are members of
; the selection set. The length can then be used
; to find the end of the selection set when stepping
; through entities in the selection set.
; The ssnam function will return the entity
; name that occupies the index number specified.
; Index numbers begin at zero and continue
; to the length of the selection set minus
; one.
; The smemb function can be used to identify
; whether an entity is already a member of
; the selection set. If the specified entity name
; is found in the selection set, then the entity
; name is returned. The smemb function will
; return nil if the entity does not yet belong
; to the selection set.
; The sdel function will delete an entity by
; name from a selection set. If the entity was
; not a member of the selection set, then nil is
; returned. Otherwise, the new selection set
; with the entity removed is returned.
; The ssref function should be used to indicate
; to CADKEY LISP that the selection set is no
; longer needed and can be deleted. Do not
; attempt to use a selection set after it has
; been freed.

; The example this month is a simple program
; that uses the methods described above
; to select geometry that is to be copied. DXF
; codes (discussed in previous articles) are then
; used to create new entities and applied to the
; portion of the code that copies all selected
; entities using a base point and displacement
; point as the copy vector.
; The program starts by initializing the key-
; word variable to an empty string so that the
; while loop is executed at least once. It also
; creates a new selection set with nothing in it
```

by using the `ssadd` function. The selection set variable will be used to hold all entities selected by the different methods.

The program then prompts the user for the selection method desired. The `getkword` function will only accept the keywords listed. A loop allows the user to continue selecting geometry until the Copy keyword is entered. By specifying a 0 as the first parameter of `initget`, the user can press enter without typing anything. In this case, the T condition will select the Copy keyword as the default.

Each selection keyword is handled by a separate condition clause in order to use different forms of `ssget`. The selection set returned by `ssget` is then added to the global selection set, the temporary selection set returned by `ssget` is freed and the loop is repeated.

Once the user has typed the Copy keyword or pressed Enter, the loop is exited and the copy process can begin. The base and displacement points are obtained from the user. These points represent the relative distance along each axis to copy each entity in the selection set.

Another loop is set up to step through each entity in the selection set until the end of the selection set is reached. The `idx` variable is used to index the selection set using the `ssnam` function in order to return the entity name at the `idx` position.

Once the entity name has been retrieved, the DXF code list is obtained using the `entget` function and the type of entity is checked. The entities that the program will copy are LINES, CIRCLES and ARCS. The DXF code 0 is used to check the entity type. If any other entity types are found, then an error message is displayed.

If the entity is a LINE, CIRCLE or ARC, the `movept` function is called to displace the specified point by the relative distance between

the variables `p1` and `p2`. The DXF code containing the point to move is specified in the call to `movept`. For LINES, both DXF codes 10 and 11 must be used to move both endpoints. CIRCLES and ARCS only use a DXF code 10 to specify the center point.

After the points specified by the DXF codes have been moved, the modified DXF list is passed to the `entmake` function to create a copy of the selected entity.

The end of the program frees the selection set created at the beginning of the program that was used to gather all of the entities selected. The `addss` function uses a loop to step through all entities in the new selection set returned by `ssget` and adds each entity to the global selection set by using the `addss` function.

The `addss` function first checks to see if the specified entity name exists in the selection set. If it does not yet belong to the selection set, it is added by using the `ssadd` function.

The `movept` function modifies the X, Y and Z coordinates of the point specified by the DXF code passed as the first parameter. After the point has been changed, the DXF code is replaced in the list using the `subst` function.

## Conclusion

We have expanded the use of the `ssget` function this month, but we're not done with it yet. While we have shown different forms of the `ssget` function that give the programmer more control over the selection process, there is much more power

See LISP, page 28 &gt;

## ELIMINATING STEPS IN DATA CAD

By Carol Buehrens

An obvious way to be more productive in DataCAD is to streamline or reduce the number of steps required to perform an operation. DataCAD provides two easy ways to accomplish this: Alt quick-keys and icons. Both are programmed in similar ways. If you're an advanced DataCAD user or have read my previous articles in this journal explaining how to create Alt quick-keys, you know that these "macros" are simply a list of DataCAD commands which utilize the Function keys, and single stroke quick-keys (for example, "F6" which takes you to the Utility menu, then "F6" takes you to Geometry).

**"Macros" are simply a list of**

**DataCAD**

**commands**

**which utilize**

**the Function**

**keys, and sin-**

**gle stroke**

**quick keys.**

This month, you'll create an Alt quick-key for making two steps ("offsetting lines at a distance" and "one-line trimming to an existing line") a one-step process. To create any Alt quick-keys or icons, first you must list all the steps you'd use working from the menu and the keyboard. For example, to offset lines, you'd select Utility, Geometry, Offset, and Perpendicular Distance from the menu, then type in a distance. The list of steps looks like this: F6 F3 F2. For trimming to one line, you'd select Edit, Cleanup, 1 Line Trim, Entity, pick the line to trim to, and then Entity again. This

sequence is a little trickier because you'll want the "selection mode" preset to Entity. If "Group" is set by accident it's a real mess. So, the steps to accomplish this are: Edit, Erase, Entity (sets selection mode), Edit, Cleanup, 1 Line Trim, Entity (this "Entity" is the trim feature). The steps listed are: F7 F1 ; F9 F4 F1.

This quick-key support file is in the DCAD6\SUP directory as DCAD\_MCR (DataCAD macro file). Before editing, always make a backup copy of this file. I suggest naming it DCADMCR.SAV. You can use the DOS Editor or Windows' free text editing program called "Write."

To use the DOS Editor, from the DOS prompt change to the DCAD6\SUP directory by typing cd \cad6\sup and pressing Enter. Then type: copy dead.mcr deadmcr.sav. Finally, type: edit dead.mcr and the file will be displayed. The text lines in this file are listed in alphabetical order, corresponding to the Alt key used with that letter. The funny ASCII characters in the front and end of each line are used to turn off and on the display of menus and messages. To enter an ASCII character on a line (indicated as Alt+183), for example) hold down the Alt key, type in the numbers using the numeric keypad, and then release the Alt key. Each step in the macro must be separated by a caret (^).

To create the quick-key for Offset, you can edit the O line. (Right now, Alt-O turns on perpendicular object snap, a feature seldom used.) Move the cursor to the O line and type the following:

O^ (Alt + 183) ^ (Alt + 200) ^ ^ (Alt + 184) ^ (Alt + 201) ^ F2

Your line should look like Figure 1.

Notice that the ASCII characters turn on the menu and messages prior to the last option, F2, which is the PerpDist offset value. Otherwise, the quick-key would stop at the point the offset value is requested, and the menus and messages would remain off in DataCAD.

To create the Alt quick-key for 1 Line Trim, edit the L line (Alt-L goes to the Linetype menu). Move the cursor to the L line and enter the following:

L^ (Alt + 183) ^ (Alt + 200) ^ ^ (Alt + 184) ^ (Alt + 201) ^ F1

Your completed line should look like Figure 2. Save the file by selecting the options File, Exit, and Yes to save. Then start DataCAD and create an empty drawing. Draw a few lines. Press Alt-O. (If

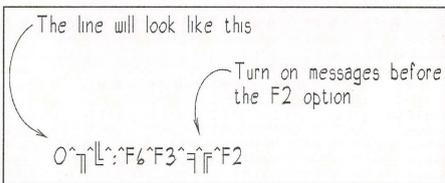


Figure 1

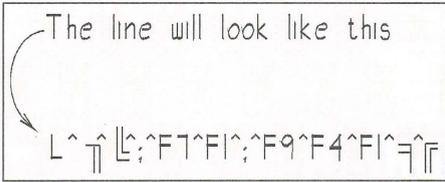


Figure 2

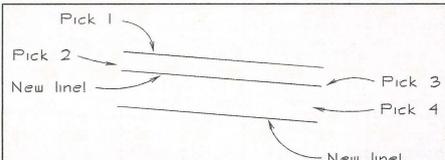


Figure 3

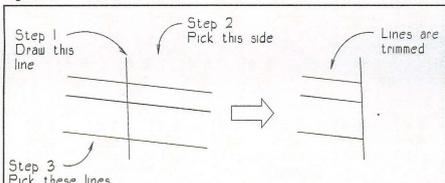


Figure 4

Dynamic is ON, select it to turn it off and press Alt-O again. Type in an offset value of 1 and press Enter. Refer to the Figure 3. Pick one of your lines (pick 1) and then pick the side to offset to (pick 2). Press Alt-O again and change the value to 2, press Enter and pick one of your lines and offset it (pick 3 and 4).

Once you've tested Offset, refer to the next figure to draw another line that crosses over your offset lines (step 1). This will be the trim line. Press Alt-L. Pick the trim line, then pick to one side of the line indicating the "erase" side (step 2). Now pick the lines to trim (step 3). I hope these quick keys will become an integral part of your everyday working with DataCAD. Look in next month's DataCAD Tutor for instructions on creating icons that change the entire dimension and text setup in one pick for easy scale changes.

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## PRODUCTIVITY TOOL

### NEW TRAINING VIDEOS SHOW DataCAD USERS THE 'REAL WORLD'

A new set of professional training videos for DataCAD versions through 6.0 are now available. The set, created for and valuable to all DataCAD owners, is focused at new and intermediate users. Instruction is designed to be productive, efficient and effective. DataCAD conventions are presented via a "real-world" approach, in which the viewer produces initial drawings within the first hour of instruction and then adds detail to the drawings over the next five hours. The friendly training is accomplished at a comfortable, individualized pace.

The basics needed to use DataCAD for producing working drawings are covered thoroughly. The viewer learns to efficiently draw

wall types; insert doors and windows; accurately dimension drawings; place text on drawings; develop and position notes; draw with different line types (thin, thick, dashed, center, etc.); place hatching and fill background for concrete, earth and other materials; use electrical, plumbing and other symbols; make changes to and edit drawings; develop a title block; and print or plot the drawings.

The viewer also learns to create and edit DataCAD templates; work with polygons, grids and macros; and see how DataCAD can assist in drawing a roof, developing 3D views and fly-arounds. In addition, the instructor shows how to organize work into layers, file drawings

to minimize storage space, and adjust DataCAD settings to increase

its value as a productivity tool.

Instructor Kristen Kurland is both



Trainer Kristen Kurland leads users through DataCAD instruction.

knowledgeable and education. Her background and education are deeply rooted in DataCAD and several other CAD packages. She has a degree in Architectural Studies from the University of Pittsburgh and has written many training manuals for various software packages used by design professionals.

DataCAD has been used under the direction of John Richman since 1986 by Smith and Associates, an architectural firm in Columbiana, Ohio. They also are charter members of the Northeastern Ohio Users Group. Three draftsmen at Smith and Associates recently used the tapes and wrote about them in the Users Group Newsletter.

"The three videotapes feature Kristen seated at a computer with

the camera focused primarily on her monitor. Each topic covered has a number displayed in the lower right hand corner of the screen which corresponds to the index located on the tapes case. This is a handy reference for quickly locating a desired topic. Each topic is first discussed by Kristen and then she walks the viewer through the involved steps.

"Viewing the tapes in conjunction with sitting at a system would be the ideal scenario. However, good note-taking would also work well. These tapes would serve as a training timesaver and provide the new user with a firm DataCAD foundation prior to involving the valuable time of others in the office. At this point, office procedure could be taught to the new user."

Comments from a discussion about tape utilization at the Ohio Users Group follow:

"Completely professional in composition and presentation."

"I want the tapes so I can reduce my time in working with new people."

"As a long time DataCAD user, I learned new techniques and tips on efficiency."

The tapes were produced by KeyStone Learning Systems Corp. of Provo, Utah (800/748-4838) and SCR Associates of Pittsburgh, Pa. (800/876-5676). KeyStone has had experience in publishing and marketing training tapes for more than 50 software packages listed in their catalog. Currently, DataCAD tapes for highly advanced and modeling instruction are in the design stage. SCR Associates are DataCAD dealers and have provided DataCAD drafting and training since 1991.

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CIRCLE 239 ON CARD

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ners, "but the set-ups were much more complex and time-consuming, and the data we received was harder to process and use. With this system, resulting data is very organized, and it's not redundant because you don't need to do multiple scans in different positions. And Surfacer provided the link we need to use the data in our CADDSS system."

Digibot II is different from other laser digitizers; its ranging system measures individual surface points without using complex, non-linear imaging optics or sophisticated detector array-processing techniques. In addition, its adaptive scanning procedures minimize shadowing effects, provide optimal measurement orientations, and produce homogeneous point-spacing with no measurement redundancy. By measuring sequential points and producing a standard list of  $x/y/z$  coordinates, the Digibot interfaces to any CAD/CAM/CAE imaging or animation software that reads 3D points, contours and triangular facets. In the InterMotive study, the file created by Surfacer was converted to an IGES 5.0 NURBS file. This file was imported into CADDSS for processing and into ProEngineer and AutoCAD to demonstrate the IGES compatibility with a wide range of CAD systems. It would work as easily with CADKEY.

The Digibot II can be used in many industrial and academic applications involving 3D design, inspection, replication, analysis, visualization and animation.

For more information, contact Digitobits Inc. 512/832-9040/fax 512/832-1163.