

KEY SOLUTIONS

THE MAGAZINE FOR CADKEY & DATACAD

ISSUES

ORGANIZING
For Success

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BOBSLED

An Historic Building
Rejuvenated

Products

Understanding
OPTICAL
STORAGE



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Puma Plus



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Cover Photo and photo on page 28
courtesy of Michael Furman Studios, Philadelphia, PA



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KEYTALK

If you're a CADKEY user and familiar with **KEYSOLUTIONS**, you may be surprised to find articles and columns in this issue about DataCAD. No, you didn't get lost in some convoluted space/time warp or get the wrong publication. From now on, every issue of **KEYSOLUTIONS** will include information on the entire Cadkey family. DataCAD is Cadkey's very powerful architectural CAD package.

What happened was Reference Point (the counterpart of 3D World for CADKEY) was discontinued last winter. This meant DataCAD users did not have an up-to-the-minute source of information. Cadkey asked us if we could help fill the gap. The answer is in your hands.

It's a logical step, because at an elemental level, CAD is CAD. Users of CADKEY and DataCAD have many of the same interests and needs. DataCAD and CADKEY users deal with design issues, work with customers, manage projects, shop for hardware and software, etc. It's why the entire field is routinely grouped under the umbrella - A/E/C (architecture, engineering, construction).

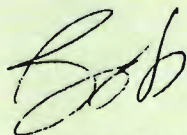
The other fact is that **KEYSOLUTIONS**, in addition to software specific how-tos and tips on CADKEY, has always contained a healthy number of rather "generic" articles -- stories that would be of interest to almost anyone with a computer. Articles on hardware and general purpose software apply to all. The one on rewriteable optical storage in this issue is a good example. The story on how to organize work and people is another. All readers will undoubtedly be interested in the stories about the Stanley Building (refurbished using DataCAD) and the Olympic bobsled (designed for the U.S.A. using CADKEY.)

Nothing will change for readers who use CADKEY. Articles on how to use your software and all the columns you're familiar with -- CADL Toolbox, CDEs, CADKEY Corner, etc. will be there for you.

For DataCAD, we will have similar software specific articles and columns. Our thanks goes to Philip Hart, a writer and editor of Reference Point, for contributing to this issue. Thanks also to Dr. Leonard Nassman for providing an excerpt from his book "An Introduction to DataCAD."

Anyway - a hearty welcome to all you DataCAD users. Remember though, communication is a two-way street. (This goes for everyone, not just DataCAD.) Please let us know what kinds of articles you're interested in. And tell us about your designs and projects so we can share them with others.

Nothing is lost -- something valuable and exciting has been added!



Bob Martin
Technical Editor

KEYSOLUTIONS

The Magazine for CADKEY & DataCAD

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Cadkey Forum

by Malcolm Davies, President and CEO - Cadkey, Inc.

Cadkey Grows from Strength to Strength

This is Cadkey's most successful business quarter ever. Our low-price strategy is really working and I would like to say a big "THANK YOU" to:

-All of our customers who have recognized exceptional value for money, and who through the purchase of our products have enabled us to achieve the current success.

-All of our Authorized Dealers for embracing and supporting our new low-price strategy.

-Our technology partners, particularly FastSURF, Baystate Technologies, Vibrant and Bitwise for enabling us to deliver exciting new products in record time.

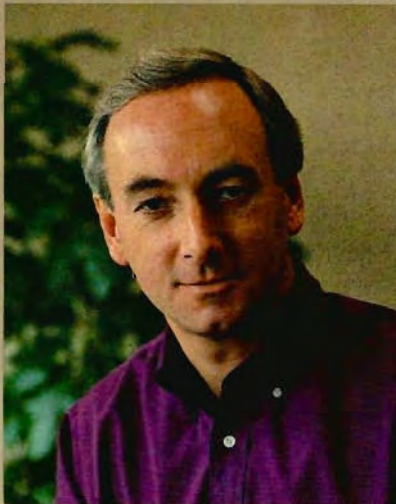
-Our CADKEY and DataCAD Applications Developers who continue to increase the rate of development and introduction of add-on products.

-The whole Cadkey team who continue to work long and hard to achieve our ambitious corporate goals.

Did you know that you can now purchase CADKEY and DataCAD, plus a 486 computer and a plotter, for less than the cost of our major competitor's PC software alone?

It has been interesting hearing our competitors justify their high prices by describing ours as a "going-out-of-business strategy." I hope that they retain that illusion for a long time. We have proven the obvious - provide excellent products at prices far below the competition and customers will buy in large numbers. We had already taken appropriate steps to reduce our costs, and to outsource much of our operations, so we are able to sell profitably at these low prices. Our intention was to greatly increase our market-share, revenues and profitability and we are achieving all of these goals.

Our success encompasses both CADKEY products and DataCAD products, and I am delighted that KEY SOLUTIONS has begun, with this issue, to address our DataCAD customers as well as continuing excellent support for CADKEY.



CADKEY 7 will ship this month and contains dramatic new features, including a new user interface with "bird's eye" and "worms eye" viewing windows, FastSURF Light, the Advanced Drafting Module (a subset of DRAFT-PAK), as well as CADKEY LISP. The suggested list price of this product will be \$495, and the suggested upgrade price from previous versions will be \$250. CADKEY LISP opens up our system to the thousands of Applications Developers who have written their software in LISP or AutoLISP, and will greatly expand the availability of new applications. We demonstrated CADKEY 7 at the recent National Design Engineering show in Chicago with enthusiastic response. It shipped in April 1994.

We are about to announce a series of add-on product modules for DataCAD, as well as audio training tapes. Information will be mailed directly to all registered users. We listened to our customers, and as a result, future plans for this year also include a Framing Module, an Estimating Package, and a DWG translator. Join us at the A/E/C Systems show in Washington, D.C. in June where we will be demonstrating the latest DataCAD products.

These are exciting times at Cadkey. Thank you for your support.

Late Breaking News

CADL/CDE Training Kit

The CADL/CDE Training Kit "Exploring CADKEY's Open Architecture Using CADL & CDEs" is now available. This manual and sample file disk is a step-by-step introduction to writing custom applications using CADKEY Advanced Design Language (CADL) and CADKEY Dynamic Extensions (CDE) using the C language. The Training Kit also contains sections on macros and menu customization. It offers numerous examples and the files on the source disk have source code.

The \$50 cost for each kit includes shipping. "Exploring CADKEY's Open Architecture" can be ordered directly from Cadkey with VISA, MasterCard or cash. Phone orders are not accepted, but you can send your order to Cadkey, Inc., Attn: Customer Service, 4 Griffin Road North, Windsor, CT 06095-1511 or fax 203/298-6401.

DataCAD Professional at AEC

DataCAD Professional will be featured at the AEC trade show in Washington, D.C., June 21-24. Cadkey will demonstrate and sell the product from the floor in Booth #1141. Complimentary show passes are available after May 15 from Danielle at 203/298-6424.

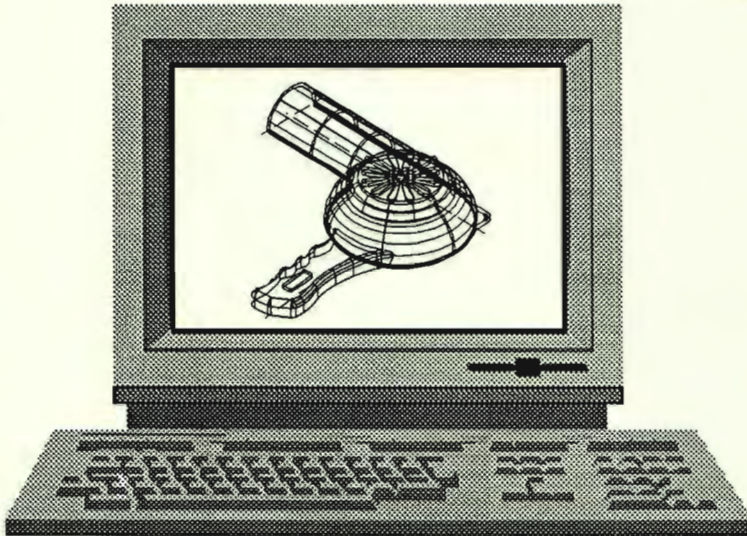
DataCAD Easy Learning Tapes

A set of audio tapes to make learning DataCAD fast and easy is now available for \$39.95. The tapes provide three hours of comprehensive instruction and cover a wide variety of topics. The six, 30-minute lessons are: Organizing a Drawing, Laying Out Wall, Doors and Windows, Adding Symbols, Dimensions and Hatching and Finishing Touches. You just put a tape player or Walkman next to your computer as you work with DataCAD and go. The *DataCAD Easy Learning Tapes* were developed by Lew Robins, a training specialist with over 35 years experience and an expert DataCAD user. Order the *DataCAD Easy Learning Tapes* by calling 800/282-1368 or faxing the 24-hour service fax at 716/873-0906.

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KEY NOTES

CADKEY In the News

CADKEY 7 Features Productivity Enhancements

CADKEY 7, released in April, has a new look and many productivity features, including a Motif-like Graphical User Interface (GUI) surface construction, a LISP programming language, advanced drafting features and links to a state-of-the-art 3D input device, the SpaceController®.

SoftEngine™ technology from Vibrant Graphics provides on-screen birds-eye and worms-eye viewing capabilities. Version 7 also has floating tool bars and 3D button displays which replace the previous menu structure and macros (or Cadkey 6 interface can be used if wanted). Surface modeling capabilities are integrated with FastSURF® Light which allows creation and editing of true surfaces and provides many different display modes including wire mesh and shaded polygons.

Priced at \$495, CADKEY 7 is available through authorized dealers or directly from Cadkey. CADKEY 7 is provided free to existing customers with maintenance and upgrade contracts, to CADKEY 6 customers for \$99, and to earlier customers for \$250.

Authorized Support Centers

Cadkey, Inc.'s revitalized technical support program is based on a national network of Authorized Support Centers. These Centers, comprised of select Cadkey Gold Dealers with outstanding credentials in sales, customer service and technical support, will provide the majority of Cadkey technical support. All 30-day technical support calls coming through Cadkey's toll-free number will be automatically routed to the appropriate support center.

Each Authorized Support Center offers dedicated technical staff for support and training, a minimum six-station training facility and monthly CADKEY classes for

(Continued on next page)

Cadkey Meets the Press

Since Cadkey's industry-shattering price cuts and innovative marketing strategies were instituted early this year, industry analysts, the press and others have had a lot to say. Here are a few excerpted comments --

Hartford Courant - February 17, 1994 - Referring to Malcolm Davies and Charlie Ferrucci - "If these men were into horror films instead of computer software, they'd be called slashers." Referring to the competition between Autodesk and Cadkey - "So the beefy hunk is sitting pretty in Sausalito by the bay, and the skinny squirt is in Windsor by the highway, looking for ways to kick sand in the big guy's face." Quoting Malcolm Davies - "It's our chance to take over the industry." Referring to Cadkey's goals - "In 1992, sales were \$15 million. Davies is looking for them to grow to \$20 million this year, and to \$100 million in three years. About 40 percent of that amount will be generated internationally."

PC Week - January 31, 1994 - "Cadkey's recent restructuring effort, price slashing and direct response launch could have significant impact on the CAD market according to industry observers"

San Francisco B - February 26, 1994 - "Davies, who is largely credited with having lifted Sausalito-based Autodesk into the realm of world-class software companies during his four-year stint as the company's senior vice president of marketing and sales, has embarked on a new strategy he believes will result in bringing Autodesk to its knees - chopping prices by a whopping 87 percent ... despite the kudos and the rock-bottom prices, some analysts say that it is unlikely Cadkey or anyone else will make a major dent in the Autodesk fortress anytime soon."

A-E-C Automation Newsletter Jan/Feb 1994 - "This (Cadkey) is one company with founders (Livingston Davies and Peter Smith) who recognized that no matter how good their technology or how technically strong their company, their success -- perhaps even their survival --- was dependent upon a marketing presence that was even stronger --- With Cadkey reporting a total of more than 110,000 installations before the promotion (versus 900,000 AutoCAD users) will this be felt in Sausalito, the home of Autodesk? Could this launch a new round of price cuts and further test the financial strength of the desktop-CAD industry?"

Malcolm Davies in A-E-C Automation - "the promotion (DataCAD) is proving to be wildly successful; we sold an additional 10,000 copies of DataCAD 5 in less than three months." (Editors Note: Similar Cadkey promotion as of April 1 was producing sales far above expectations.)

Charles Foundyler, President, Daratech Inc. Cambridge, MA - "It's a bold move, and I don't think anybody's sure what the outcome could be. They're going into uncharted territory. Selling it for one-sixth the price is working so far, but before we celebrate and crack the champagne, we've got to see if they can sustain it."

Rudolph Kunzli - "After reviewing Cadkey's technologies and future plans, I believe this company is ready to take a leadership position in the CAD market worldwide. The winners will be those companies which bring new technologies to market fast, break the price-performance barriers on mainstream CAD products, and offer integrated suites of quality software systems customized for local markets." (Mr. Kunzli, one

of thirteen original Autodesk founders and responsible for Autodesk's European operation until retiring in 1990, has invested \$2 million in Cadkey and become a member of the Cadkey Board of Directors. SKW, one of his companies, has been capitalized and merged with Cadkey to become Cadkey Europe AG, based in Switzerland.)

Everybody's Granny - "Time will tell."

A/E/C Systems and Virtual/Design '94

Virtual/Design '94, the first virtual reality exposition specifically for the design professions will be held in conjunction with A/E/C Systems '94 on June 22 in Washington, DC. The conference entitled "Virtual Reality in Design" features discussions on what virtual reality is, what applications are available for design and engineering, who is using virtual reality, how they are applying it, and the future of virtual reality. The concurrent A/E/C Systems '94 conference will also offer many sessions on virtual reality and 3D animation.

New Partner Joins Unitec

Mark Lyon has joined Unitec, Inc. of Rocky Hill, CT as a partner in charge of research and development. Unitec, is one of Cadkey's fast growing resellers. As a lead programmer at Cadkey for ten years, Mark was responsible for many of Cadkey's early successes and the author of numerous Cadkey CDEs.

Good News for the Environment

Energy Efficient Plotters from Summagraphics

Summagraphics Corporation has announced that its entire line of HiPlot® 7000 Series pen plotters and HI JetPro® ink jet plotters meet EPA Energy Star requirements and are accepted by the EPA as "Energy Star Efficient". The EPA Energy Star Computers Program, a voluntary partnership effort with the computer industry, promotes the introduction and purchase of energy efficient personal computers, monitors and printers, reducing air pollution caused by power generation.

A "Green Keyboard" from Maxi Switch

Maxi Switch of Tucson, AZ has introduced its first "green" product, a computer keyboard in which the majority of the keyboard's components and packaging are reusable, and some parts are manufactured from recycled material. According to Maxi Switch's director of sales and marketing, the plastics in keyboard construction and packaging are very relevant to today's environmental issues. The Maxi Switch green keyboard features an enclosure, keytops, plungers and housing made from recycled plastics. For the packaging, the poly bag, the foam end-blocks and the corrugated box are made from reusable plastics and recycled paper. Maxi Switch has also changed the color of its standard shipping box from white to brown to encourage recycling of the container and prints on the box with environmentally safe inks. The green keyboard, identical to the Tucson-101, retails for \$39.95.

CADKEY In the News

new and experienced users. The first Centers are operating in Texas, Illinois, Michigan and Massachusetts with other locations under evaluation and planning.

CADKEY LISP

CADKEY® LISP, a new product included in CADKEY 7, offers a programming interface that supplies full support for LISP, including an application development environment, a LISP interpreter, and command line interface. This program's function set "gives it the ability to run AutoLISP® programs with minimal changes," explains Malcolm Davies, Cadkey president. "Most third party programs written on top of AutoCAD® are written in AutoLISP. We are providing those developers with a low-cost alternative to AutoCAD as their core graphics engine. For the first time, CADKEY LISP bridges two user environments -- Cadkey's CDEs and LISP, the programming language used by Autodesk, Inc. This combination facilitates multi-CAD system development by providing access to an abundance of AutoLISP programs, and expands the developer market -- all on a \$495 CAD product," states Davies.

CADKEY LISP is the result of a joint venture with BitWise Solutions, Inc. of Indianapolis, IN. BitWise develops, markets and supports multiple CAD programming applications and provides consulting and development services. Other products developed and sold by BitWise Solution include AutoBasiC Professional, an implementation of the BASIC programming language for AutoCAD®. In addition to CAD, BitWise Solutions pioneered the fast growing market of multimedia business-to-business advertising software with its Adware Studio product line.

NEW PRODUCTS

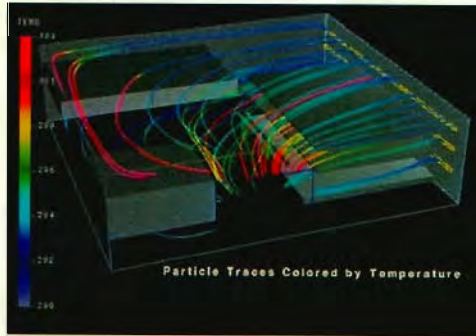
SOFTWARE

Computational Fluid Dynamics

Adaptive Research Corp. released CFD2000/Storm version 2.0, a computational fluid dynamics software which provides an integrated environment for the modeling and analysis of fluid flow and heat transfer phenomena. From the intuitive Windows-like environment the user can define geometry, generate structured computational grids, apply boundary conditions, specify fluid and material properties, monitor and control the solution procedure and manipulate flow visualization graphics. Four main modules comprise the CFD2000: the graphical user interface (GUI); EasyMesh-3D; Storm finite-volume flowfield solver; and scientific visualization software. The package includes whole-field 3D solvers, a non-staggered grid which stores all velocity components and scalar quantities in the center of the cell and grid sequencing methodology. Contact Adaptive Research Corp. at 205/830-2528 or Fax 205/830-2528.

Draftsman PLUS for Windows

Arbor Image Corp. has released Draftsman PLUS for Windows, an automatic raster to vector conversion



Adaptive Research's CFD2000/Storm

package that includes optical character recognition, heads-up digitizing and raster and vector editing. Printing is supported through Windows drivers; both raster and vector drawings may be printed directly - individually or together. Vector and text editing is done with more than 20 editing tools. Drawings of lines, polylines, arcs, circles and text entities can be created and exported to all popular CAD and desktop publishing programs. More than 16 vector formats including DXF, IGES and CGM are supported. The three available models vary only in the size of image each will process. The LF model supports scans up to 100" x 100" (\$1995); the PF model supports scans up to 11" wide

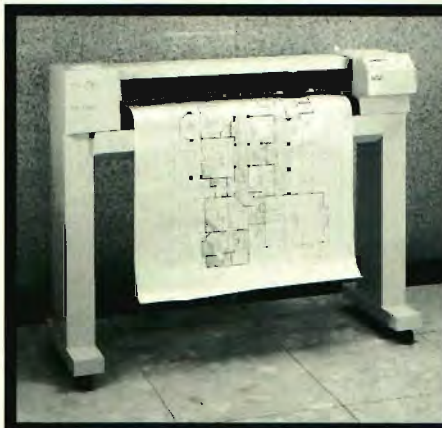
(\$995); and the HS supports scans up to 6 1/2" wide (\$339). All support scans up to 300dpi.

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

Electronic Document Control

Document Control Systems released Electronic Document Control Department (EDCD), a PC-based, networkable document management software application that fully automates document control functions, and satisfies the ISO 9000 document control requirements calling for system auditability, document revision history and document relationship tracking. EDCD enables control and management of any document including word processing, spreadsheet, CAD, graphics and scanned files. The system facilitates fast searching, retrieval and viewing of documents, and can automatically assign user-defined document numbers. A graphical project tree enables visual management of configuration control, work breakdown structures and document relationships.

Contact Document Control Systems at 801/484-4100 or Fax 801/484-9070.



gcc.

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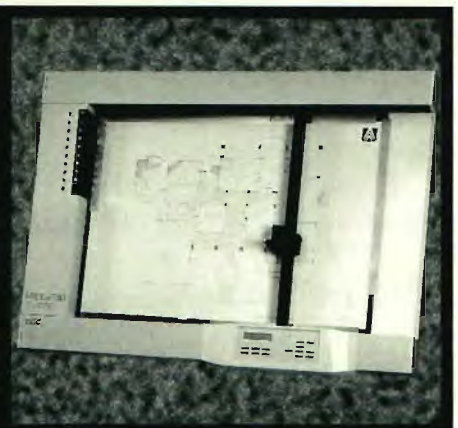
Marksman & PlotPal

1-800-688-4496

Dealer's wanted

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5320 Derry Ave. #H, Agoura Hills, CA 91301
Fax: (818) 707-0587



HARDWARE

Economy Color Monitors

ViewSonic released the Economy "E" Series of 14" color monitors, the ViewSonic 4E (\$339), 6E (\$359) and 14E (\$399), and the 15" ViewSonic 15E (\$499). All monitors provide a 0.28mm dot pitch, ergonomic up front control panels, tilt and swivel bases, non-glare screens and 1,024 x 768 resolutions. The 14" monitors have a VESA® DPMS™ compliant power management system and support the EPA's Energy Star Program. Opti-Green software is included free. ViewSonic 15E has a flat square screen for edge-to-edge image display. Includes 2-year limited warranty.

Contact ViewSonic at 909/869-7976 or Fax 909/869-7958.

Plug-and-Play Optical Subsystems

The Optical Memory Division of Olympus Image Systems released two new plug-and-play optical subsystems for the Macintosh and DOS/Windows (\$1295) environments. The products contain a SCSI cable, installation instructions, 3.5-in. ISO standard media cartridge with 120MB of storage, and driver software. The DOS/Windows package contains a SCSI host adapter card and the industry standard Corel ISO driver software. The subsystems achieve an average seek time less than 38msec and a disk rotation speed of 3600rpm generates a 768KB/sec data-read transfer rate.

Contact Olympus Image Systems, Inc. at 714/453-5935 or Fax 714/453-4425.

INPUT

Optical 2D Digitizer

Science Accessories Corp. introduced the first optical two-dimensional digitizer, OD-1, with the highest resolution (minimum of 1000 lpi) and accuracy (+/- .005in.) in low cost digitizers. OD-1 optical

digitizing technology utilizes infra-red, high resolution angle measuring sensors to triangulate digitized points (patent pending). The active digitizing area is 36" x 46" (E-size drawing) and the unit is supplied with a standard 4-button cursor. The OD-1 can digitize on any flat work surface plus projections and light box images without requiring a tablet. The user can choose from eight standard output formats or program a tailored output. OD-1 is compatible with all major software packages, and no pin or dip switch setting

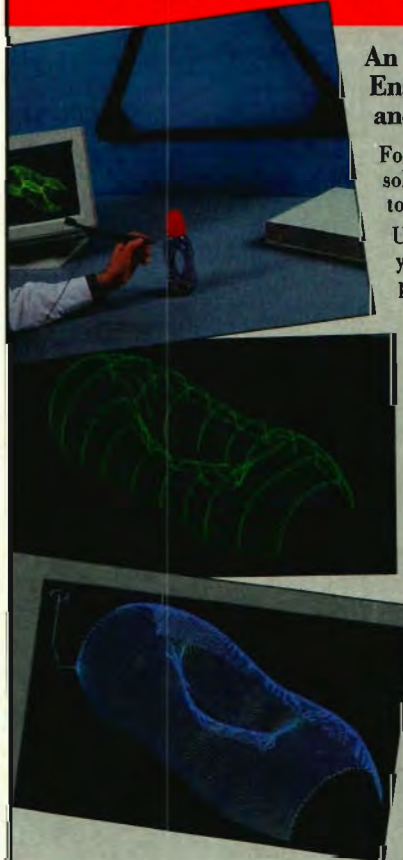
adjustments are required. The OD-1 operates with all major hardware configurations from PCs and Macs to workstations and mainframes. Contact Science Accessories Corp. at 203/925-1661 or Fax 203/929-9636.

Cordless Pressure Tablet

Summagraphics Corp. has introduced a self-adjusting stylus for its new SummaSketch® FX™ Series, a cordless pressure sensitive desktop tablet. The stylus, called SmartPen™, senses and adjusts user pressure

PULL THE TRIGGER ON

RAPID PROTOTYPING



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sensitivity automatically, eliminating the need to control minimum and maximum pressure through hardware locking or driver control panels. The SummaSketch FX incorporates 256 levels of pressure sensitivity. The pen-like, three-button SmartPen stylus ships with two different refills to accommodate different user and application requirements: a spring loaded refill for finer control and more fluid transitions within pressure sensitive applications, and a rigid non-spring refill. The Summa Sketch FX features 2540 dpi resolution, 0.010" standard accuracy, an Apple Desktop Bus™ interface, Autodesk® Device Interface driver, WINTAB™ driver, Microsoft® Windows 3.1 driver, and Tablet.com driver for Microsoft Mouse emulation. List price for the 12" x 12" tablet with pressure stylus is \$649 and \$1149 for the 18" x 12". Contact Summagraphics Corp. at 203/881-5400 or Fax 203/881-5367.

OUTPUT

LED Plain Paper Plotters

Mutoh America, Inc. announced a new line of wide format plotters utilizing LED electrophotographic technology. Called the LD-2000 Series (LD-2001 priced at \$19,995; LD-2002 priced at \$23,995; and LD-2003 priced at \$28,995), the plotters are capable of plotting 3.1 D-size images per minute on plain paper and are suited for applications involving CAD, GIS, scanning/raster editing, mapping and graphics design. The LD-2000 Series can generate A-size through D-size monochrome output on opaque bond, translucent bond, vellum, and film. The print engine features 400 dpi LED array print heads and a plotting speed of 1.98 inches per second. Interface options include two Centronics bi-directional parallel ports, an RS232C serial port, and an IEEE 1284 port. All models have a dual media roll that allows switching between two medium in midstream.

Media is automatically cut to size reducing operator intervention. Contact Mutoh America, Inc. at 708/952-8880 or Fax 708/952-8808.

High-Speed Plotter

Océ-Bruning, a division of Océ-USA, introduced the Océ 9055 series of direct thermal plotters for decentralized, low-volume CAD environments. Producing two E-size plots per minute with a resolution of 400 dpi, the Océ 9055 plotters provide plots on demand, accelerating the design process from development to distribution. Tailored for use by engineers at remote, networked workstations, the Océ 9055 is designed for virtually hands-free operation, allowing for plot generation at the stroke of a key. Contact Océ-USA, Inc. at 312/338-1700.

Printer Sharing/Print Server

Tanstaaf Mfg. Inc. offers the XL-100 Series, a 10 (XL-100) or 18 (XL-110) port printer sharing device with an optional ethernet interface card that allows it to become a print server for Novell or UNIX networks. Any port can be connected to any type of computer, plotter, or printer. By connecting an external FAX/Modem to any serial port, an HP printer becomes a plain paper FAX. The 10 port model has 8 serial ports and 2 parallel ports. The 18

port model has 16 serial and 2 parallel ports. All serial ports operate at up to 115,200 Baud. The XL-100 is priced at \$995; the XL-110 is priced at \$1149.

Contact Tanstaaf Mfg. Inc. at 800-776-5676

WORKSTATION

Sturdy Modular Workstation

Anthro Corp. announced the 72 inch wide AnthroCart, a sturdy, modular workstation with a 6 foot surface. The AnthroCart accommodates several computer systems and accessories, and a generous workspace. The center support leg reinforces the cart shelves so that it easily holds 150 lbs. Shelves can be attached at any height for stand-up or sit-down applications. Extension tubes, additional shelves and other accessories can be added to build the workstation up or out. AnthroCart comes standard with two adjustable shelves, 5 legs, a base tube and 5 dual wheeled 2-3/8" rubber castors. It measures 72" wide, 30" or 36" deep, and 28" or 35" high.

Contact Anthro Corp. at 503/241-7113 or Fax 503/241-1619.

ENGINEERING

Roundness Measuring System

Mitutoyo has introduced the RA-661, an instrument designed for roundness measurement and analysis. The RA-661 determines 17 different roundness parameters including: roundness, flatness, diameter, thickness, concentricity, parallelism, squareness, co-axiality, cylindricity, mean cylindricity, straightness, taper, spiral cylindricity and more. The unit also features user-friendly functions such



Mitutoyo's RA-661

as automatic centering, leveling and measuring modes and measuring magnifications from 100X through 100,000X and can accept large workpieces up to 132 lbs. and 21.6" in diameter (maximum measuring diameter 11.8", maximum measuring height 13.7").

Also from Mitutoyo is a water-resistant, electronic digital micrometer. The model is designed to provide IP-54 level sealing protection against water or coolant spray from any direction. This feature makes the gage highly resistant to dust penetration. Other features include a large LCD readout and automatic shut-off after 20 minutes idle time. Contact Mitutoyo at 708/820-9666 or Fax 708/820-7403.

Analog Laser Probe

Romer Supratech Inc. introduced an analog laser probe which allows inspection of parts covered in fabric, foam or any other surface where deflection is a problem. Designed to work with all ROMER™ portable coordinate measuring systems, the probe attaches directly to the ROMER's articulated 6-axis arm and provides non-contact point measurements with a linear accuracy of better than +/-0.005 inch. The laser probe uses a red (680nm), class 3b laser beam to produce its non-contact point measurements. Measurements are taken and recorded when the probe is within 45mm to 55mm range from the part surface. Guided measurement using SUPRASTUFF™ software allows the

operator to retrace critical points and to perform section cuts on scribed lines.

Romer Supratech also introduced two new translation programs for its SUPRASTUFF™ software package, the graphical interface for its portable 6-axis coordinate measurement machines. The new programs allow the software to translate data from DMIS (Dimensional Measuring Interface Specification) to IGES (Initial Graphics Exchange Specification) and back. With the new translators theoretical part data from a CAD drawing can be input into SUPRASTUFF while measured data from the ROMER arm can be input into the CAD package.

Contact Romer Supratech Inc. at 619/438-1725 or Fax 619/438-3512.

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How To ORGANIZE Work And People For Success

by Roger K. Allen, Ph.D. and Preston C. Pond, M.A.

There are some bright spots amid the gloom that many people are feeling about the economy and the condition of American business today. Consider these results:

A *Sherwin Williams* auto paint plant boasts of 30% higher productivity, 45% lower costs, 25% fewer employees for equivalent volume over sister plant.

Tektronix Portables Division reduced inventory from \$40 million to \$15 million and reduced cycle time from 12 weeks to 4 weeks.

Shenandoah Life Insurance Company increased the employee-to-supervisor ratio from 7 to 1 to 37 to 1 and yet service improved and complaints and errors declined.

Digital Enfield plant does equal volume to sister plants with half the people and half the space while realizing 2.5 times higher rate of first time perfect modules.

American Transtech decreased head count by 56%, increased sales volume by 46%, increased customer satisfaction and had an average of 158% improvement in shareowner services.

These are just a few of literally hundreds of businesses that are achieving outstanding results in this country. They are doing so by changing the way work is organized and empowering the people who do that work.

THE TRADITIONAL MODEL

The model that has dominated most modern businesses has been based on a set of principles and practices formally defined by

Frederick Taylor in 1903 and known as "scientific management." The principles of scientific management were very useful a century ago when this country was moving from a rural society in which people were self employed, produced their own food, made their own clothes, and educated themselves to an urban society based on mass production and interdependence.

**HIGH PERFORMANCE
WORK ENVIRONMENTS
REQUIRE A DEEP RESPECT
AND TRUST IN PEOPLE.**

With these changes in the structure of society and the way in which work was organized, it was necessary to create bureaucratic organizations to manage and control masses of untrained people.

Taylor believed that work could best be accomplished by breaking it down into simple and repetitive tasks for workers and that management's job was to control the means and speed of production. Some major features of job design that came out of the industrial revolution are the following:

- Simple, narrowly defined jobs.
- Division of labor that keeps different functions separate.
- One best way to do a job.
- Uniform and strictly enforced policies.
- Management's role to control the means and speed of work.

Although this model may have been useful in moving us to an industrial society, it does not fit with the complex and changing nature of the economy, market place, technologies and people today. It is seriously flawed in two primary ways. First, traditional organizations are structured around function, e.g. engineering, manufacturing, sales, etc. in a manufacturing company or customer service, accounting, billing, etc. in a service company.

The problem this creates is that work is fragmented in such a way that people do not see or feel responsibility for a "whole process." They over-identify with their own jobs and fail to understand or care about the overall good of the company or customers they serve. This leads to poor communication, redundancies of effort, turf battles, delays in decision-making, and general inefficiency. It is most noticeable when a piece of work is completed and "thrown over the wall" to another department to be forgotten. Or, when an urgent decision that directly impacts a customer is delayed for a couple of days because it needs someone else's signature. Or, when work is inspected after it has been built.

The former Soviet Union was the paragon of inefficiency and bureaucracy. It took five years for the government to approve construction of the first MacDonalds restaurant. And to change a single ingredient in ketchup took numerous levels of government approval.

A second flaw of the traditional model is the assumption that it is management's job to control the work of employees. Management sets goals, makes decisions, measures progress, evaluates performance, etc. Managers are the thinkers and planners and employees are the doers. These organizations fail to tap the tremendous intelligence and creativity of their people. Power exists at the top and people on the "front lines" and closest to the core process of the business have less

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authority to make decisions, solve problems or significantly contribute to the mission or goals of the organization.

Most people do routine, repetitive and somewhat unchallenging jobs without much sense that they really make a difference in the overall direction or success of the business. This results in organizations that are bureaucratic, rigid, unconcerned about quality, lacking innovation, unresponsive to customer needs and generally unsatisfying places of employment. Unfortunately, in spite of such limitations, that traditional paradigm continues to dominate the practices of most businesses throughout this country today.

THE HIGH PERFORMANCE MODEL

There has emerged in recent years an exciting new model known as high performance or high commitment work systems that is changing the way we think about people and how work is organized.

A high performance organization could be defined as an organization in which each person is a contributing partner to the business. High performance work environments require a deep respect and trust in people. People are not viewed as extensions of machines, objects to be manipulated nor costs to be controlled but rather as thinking and feeling human beings who bring enormous energy, creativity and talent to their work. Most people want jobs that are meaningful and allow them autonomy to make decisions and contribute to the company in significant ways. Effective organizations are those moving beyond attempting to control people to trusting and empowering them with the resources, information, tools, skills and support to manage their work processes and create products and services of unprecedented quality.

Of course, lots of companies espouse a philosophy that values people and yet are not experiencing

the kinds of performance described at the start of this article. That is because they are not designed to do so. "You can't put new wine in old bottles." The hallmark of high performance companies is that they have designed all of their systems (work flow, use of work space, organization structure, roles and responsibilities, communication and information sharing, decision making, performance feedback, personnel policies, how people are rewarded, etc.) to match their philosophy. Only a holistic and systemic view of the organization in which all aspects of the organization are aligned behind that philosophy will realize the true value of their people.

In high performance organizations people understand the business, are committed to getting results. They are organized into self-regulating, customer-focused business units or teams that take full responsibility for making decisions, solving problems and continuously improving the quality of their work. Boundaries are created around core processes rather than functions.

Core processes are the major tasks or steps involved in building a product or delivering a service and the basic reason for an organization's existence. Assembling a keyboard, approving a loan for a new home, treating a patient at a medical clinic, processing an insurance claim all involve a series of interdependent tasks and can be thought of as core processes. Everyone involved with a particular core process is a member of the same team and is empowered with full authority for the success of a whole product, service or major segment of work. Roles and responsibilities are much broader and more meaningful in scope than in a traditional organization.

The team is responsible for setting goals, coordinating and scheduling their work, interfacing with the customer, training, making decisions and problem solving, monitoring quality, and even measuring performance and making hiring and selection decisions. The role of management changes from that of controlling workers and solving day-to-day problems to being facilitators and

Major Features of Traditional and High Performance Work Environments	
Traditional	High Performance
Internally focused.	Customer focused.
Centralized and bureaucratic structure.	Decentralized structure with autonomous, self-regulating work units.
Planning/coordination done by management.	Planning and coordination done by work teams.
Specialization and narrowly defined jobs.	Jobs broadly defined; employees possess multiple skills.
Standardization of performance. There is one single best way to do a job.	There may be many ways to achieve same level of performance.
Uniform and strictly enforced policies. Do things by the book.	Minimum number of rules. Values and common sense govern behavior.
Department boundaries determined by similarity of function (e.g. Engineering, Manufacturing, etc.)	Department boundaries determined by task inter-relationship (product or process focused).
Training focuses on technical skills.	Training focuses on total employee development (business understanding, team work, etc.)
Rewards based on individual performance.	Rewards based on contribution to team effectiveness.
Employee viewed as tools of management.	Employees viewed as partners.
Alienated and unhappy employees accepted as given of industrial life.	Employee's quality of life imperative to company.

coaches. They define outcomes, manage boundaries, interface with other departments and, in general, insure that the team has the resources, training, information and support they need to carry out the job.

Perhaps this movement could be summarized by four basic principles:

- People are the organization's greatest resource and need to be trusted and empowered.
- Work must be designed so that people are allowed to do "whole and meaningful" tasks that integrate all work aspects into a singular and total system.
- Cross-functional teams are the natural work units of high performance companies and are responsible for managing all of the tasks and processes to accomplish business goals.
- The role of management must change from controlling workers to providing resources and training as well as managing the environment so teams of workers can be most effective.

WHAT IF YOU KEEP ON DOING WHAT YOU'RE DOING?

Research and experience indicate that companies organized by principles of high performance consistently outperform their more traditional counterparts. In fact, a recent review of 100 companies that have recently redesigned their work environments consistent with these principles showed an average improvement in productivity of 37%. Pretty remarkable.

There is an old truism that "If you keep doing what you've been doing you'll keep getting what you've been getting." Most leaders, owners or managers have not yet tapped the full potential of their work force. And yet, they won't do so by doing more or even better of what they've done in the past. I would suggest that only through a redesign of work and the structure of the reorganization can outstanding improvements in productivity and quality be realized.

The good news is that over the last several years there has evolved a proven methodology to assist businesses in making the transition

from a traditional to high performance paradigm. It is known as the "socio-technical systems theory" and can be used in all sorts of organizations, manufacturing and service, large and small, whole companies or subunits.

Roger K. Allen, Ph.D., received graduate training in organizational behavior and a doctorate in psychology from the University of Minnesota. Dr. Allen has provided seminars, team development, process consultation and redesign consulting to numerous organizations including Procter & Gamble, Honeywell, US West and Humana Hospitals. He has authored Making Things Happen (1989), Mastery: A Workbook in Personal Effectiveness (1991) and co-authored with Preston Pond, The Team Book (1992).

Preston C. Pond is a Management and Organization Design Consultant in Littleton, CO. He has a B.A. in English and Asian Studies and a M.A. in Organizational Behavior from Brigham Young University. He spent several years with Procter & Gamble as an internal Organization Development Consultant. As an external consultant and president of Preston Pond Associates since 1985, Preston has worked with new plant startups and redesign projects in the U.S., Mexico and Puerto Rico, implementing organization design and team development strategies at all organization levels. Together they have co-founded the Center for Organizational Design, Inc., through which they provide a comprehensive methodology to help businesses achieve high performance. For more information call 303/290-8560.

LOOK AT WHAT'S NEW

Parametrics for **CADKEY® 6**

Parametric Solution (PS) stretches Cadkey's abilities in mechanical design a step further. It allows you to mold Cadkey to fit your individual needs. Cadkey contains a powerful programming language called CADL. Unfortunately, developing programs in CADL takes time and experience. PS changes this by converting dimensioned drawings into easy to use parametric programs. Using PS, anyone who can draw and dimension in Cadkey can make their own parametric programs. Once a parametric program has been developed, it can be used over and over to generate any variation of...

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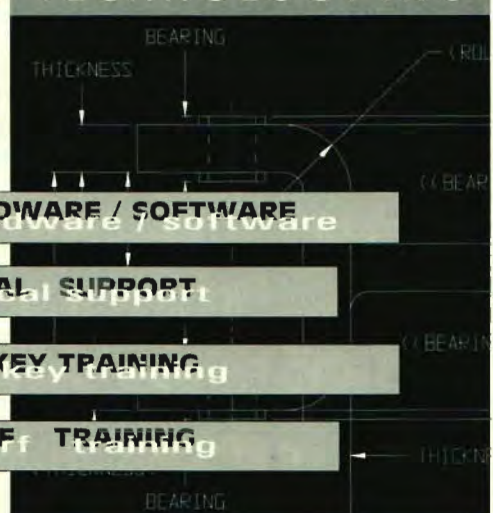
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TECHNOLOGY INC



Understanding Optical Storage Before You Buy!

CAD is a disk-space-eater -- big time! Not only are the programs huge (CADKEY 6 requires 13 megs and DataCAD nearly 4), but the drawing files often become enormous. The result? Hard and floppy disk capacities that seemed enormous a few short years ago are not adequate today. Also, CAD users often need a reasonable way to transport and/or store large numbers of files and large files. The humble hard drive just can't do the whole job.

That's where a removable mass storage medium fits in. Common mass storage choices include floppies, cartridges, tapes, and various kinds of optical storage devices. All have pros and cons. But if you need storage that can perform a variety of functions (backup and archive; be a transportation media for large files; serve as temporary holding storage), rewriteable optical storage could be the answer for you.

Optical storage, however, is not currently a substitute for your magnetic hard disk drive. While optical storage technology has closed the performance gap over the last few years, hard drives still hold a fair edge in pure, raw performance. That being said, let's look at the different optical storage options available today.

Optical Storage

There are five basic kinds of optical storage: Writeable Optical Storage (WORM), Read-Only Memory (CD-ROM), Write-Once CD-ROM (CD-R), Rewriteable Optical

Storage, and "Floptical."

WORM - Writeable Optical Storage is referred to as "Write Once, Read Many," or WORM. The surface of the optical disk is physically altered when information is recorded to it, and once altered the information cannot be erased. WORM storage is excellent where an absolute audit trail is required or where a permanent record is desired.

CD-ROM - Every compact disk you listen to from your home CD player is actually a kind of read-only optical disk. CD-ROM disks are "pressed" by machines in a factory using a master disk. While they can offer a low per-unit cost in large quantities, the mastering and set-up costs are high. Further, they can't be used for custom, one-of-a-kind data.

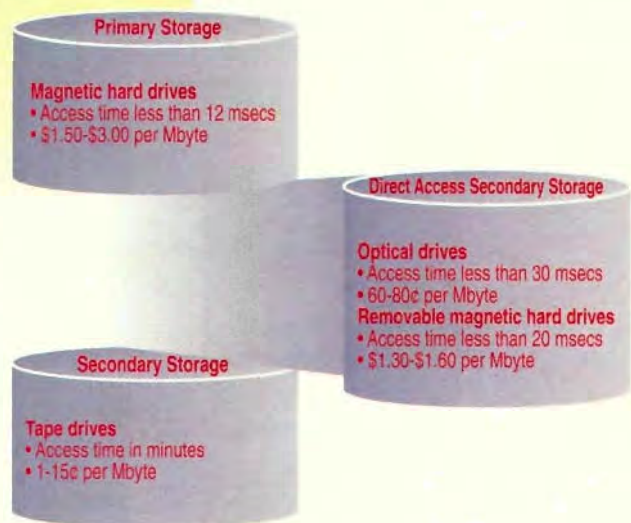
CD-R Drives - Several companies have announced write-once CD-ROM drives, which essentially allow users to create CD-ROM disks at their desktop. For certain applications (i.e., limited-run information publishing) this technology offers some promise, but currently has severe drawbacks. It can take up to

an hour to create each disk. And finally, the equipment is expensive - from \$4,000 to \$18,000.

Floptical Storage - Floptical storage is an alternative media designed to serve as a replacement for existing low-capacity floppy drives. Although it uses optical storage, it has the same problems as floppy drives including slow data transfer rates and limited capacity. The top capacity of 21MB is probably not adequate for most serious storage needs. Further, no standard exists for compatibility, and few floptical drives are currently in use.

Rewriteable Optical Storage - Of all the optical technologies, rewriteable functions are most like super high-capacity floppy drives. Rewriteable storage offers excellent permanence, high capacity, faster access times than other optical storage and the ability to be written over. It combines excellent data transfer rates, low cost-per-megabyte, good data performance and outstanding transportability in

STORAGE HIERARCHY



There is a large gap between primary and secondary storage in terms of access time and cost-per-megabyte. Optical storage fills the gap to give you more options for your applications.

one package. In reality, rewriteable optical serves many needs. Those who need to transport or distribute information can view it as a floppy drive with excellent performance and extremely high capacity. Those who need to backup data can view it as a very reliable, very fast, random access alternative to tape.

Jukebox Optical Storage - For the ultimate in storage, many large companies and universities have turned to "jukebox" storage. These systems operate like their namesake devices. A robotic mechanism selects and loads an optical disk from a rack of many disks. This process is automatic and invisible to the end-user, and results in storage capacities nearing the astounding. This technology offers a very real growth path for users of "single platter" rewriteable optical drives.

Cost Per Megabyte

You can't evaluate any storage device based entirely on its initial cost. A 200MB magnetic hard drive costs more than a 20MB hard drive, yet its cost-per-megabyte is usually lower. The same goes for optical drives. Add the total drive cost to the expense of a few 600MB cartridges, and the cost-per-megabyte of optical storage far undercuts that of mag-

netic media. Traditional tape systems offer a lower cost per megabyte, but do not allow random access to data and use a highly fragile recording media.

then have to decide which rewriteable MO drive to purchase. You will be doing this in a mine field of conflicting claims, misleading or inappropriate specifications and statistics, and the rapidly changing nature of the technology and products.

Normally, you'll see statistics associated with rewriteable MO drives. You need to learn what they mean and how to interpret them. Performance statistics are commonly quoted. Performance is the sum total of many different variables, yet some manufacturers quote only one, which can be misleading. Here are the most important.

Seek Time - Seek time is the amount of time it takes for the drive head to find and then begin reading the information on the disk. Obviously, the faster the drive head finds the data, the sooner it can begin. Seek times are so short, they

are measured in milliseconds (msec). Fast magnetic hard drives deliver sub-10 msec seek times. MO rewriteable optical drives can deliver seek times ranging from the low 30s up to nearly triple digits.

Here's the rub on seek time statistics. If all the data that's needed to be accessed could be contained within a narrow band on the disk surface, seek times would appear to be lower because the read head on the drive isn't moving as fast. This is

exactly what some manufacturers and resellers do. One even goes so far as to confine all the head activity to a narrow 50 megabyte band on a disk with 325 megabyte capacity. This means the head will never have to traverse more than 1/7th the total disk surface, resulting in unreasonably low seek times. Take seek time statistics with a grain of salt.

Data Transfer Rates - While seek times are often offered as proof of outstanding performance, shoppers are probably better off looking at data transfer rates. These rates, which are affected by several variables, are an excellent measure of true performance, especially for those who are moving large files, where the head does very little seeking and a whole lot of transferring.

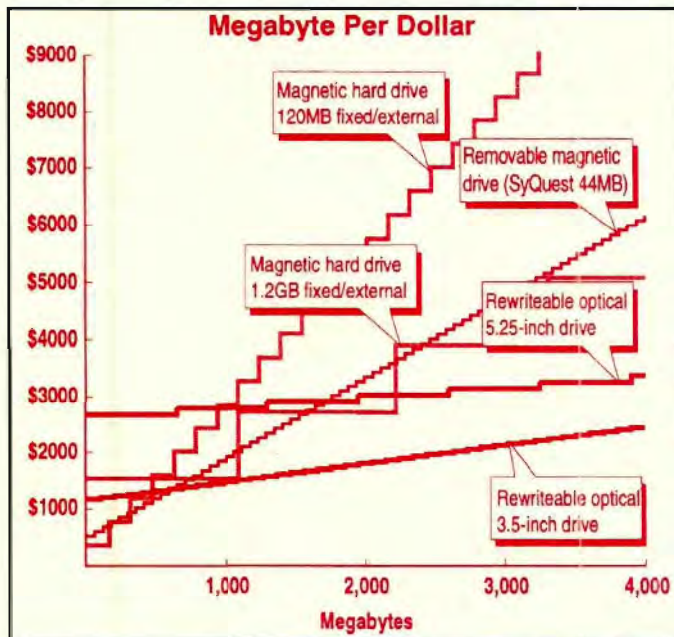
The data transfer rate can be measured in two ways. The first is "burst mode" or top speed rating. The controller can move this much data, but it cannot sustain that high a rate of transfer very long. The second measure (the most important one for rewriteable optical buyers) is the sustained rate of data transfer. This is the amount of information the controller and the drive can expect to move over a sustained file transfer. Unfortunately, some manufacturers show only burst mode transfer ratings in the advertising.

The drive's total transfer rate is affected by the controller interface, the controller data buffer and the rotational speed.

Controller Interface - Most optical drives use the SCSI (Small Computer Systems Interface, often pronounced "Scuzzy") to interface with the computer. SCSI is standard equipment on Macintosh computers and many Unix-based workstations, but usually requires a separate adapter card for use in IBM-compatible PCs. Two standards exist: the older SCSI-1 and the new SCSI-2, which offers tighter electrical and conductivity specifications. An optical drive conforming to the SCSI-2 standard will often deliver better transfer rates than one using the SCSI-1 standard.

Controller Data Buffer - It's possible to significantly increase the performance of a rewriteable optical drive with a high speed buffer on the controller in the optical drive. Generally, bigger data buffers are better, although the law of diminishing returns is operative here. Dual port buffers, which both read and write to the disk, offer the best performance.

Rotational Speed - The faster the recording surface passes underneath the optical head, the more data can be read. While older drives offer 1200-1800 RPM performance, most of the newer optical drives now deliver 3000+ RPM.



The cost-per-megabyte of optical storage is less than that of magnetic hard drives. Rewriteable optical storage becomes much more cost-effective as the need for storage increases. At less than 600MB, storage on 3.5-inch drives beats 44MB SyQuest drives.

netic media. Traditional tape systems offer a lower cost per megabyte, but do not allow random access to data and use a highly fragile recording media.

How to Buy a Rewriteable Optical Drive

If you've decided you need features rewriteable optical offers, you

Caching - It's possible to dramatically improve a magneto-optical drive's performance through caching or holding data in a high-speed chip-based RAM memory. Caches are related to buffers except they are "intelligent" and manage the data they contain in one of several ways.

Caching technology is complex, yet a few general simple rules tend to apply. Bigger caches are generally better, and it's usually better to locate the cache as close as possible to the CPU.

Split Optics Design - This new design affects both performance and reliability. The first generation of rewriteable optical drives had heavy read/write heads because of the number of laser components and magnetic devices. The new split optics design removes most of the optical system to a solid mounting elsewhere in the drive, which reduces the weight of the head and greatly increases the speed at which the head can move. This reduces seek times.

Non-Performance Related Features to Look For

Speed isn't everything. The fastest drive mechanism does you no good if it doesn't work with your computer or doesn't do what you need it to. You should consider some of the following features when looking for rewriteable optical storage.

Compatibility on the Driver Level

Often, rewriteable optical drives for PCs are sold without a SCSI controller adapter. While end users and resellers can pair the drive with any SCSI driver software and adapter, different SCSI and software and controllers may not offer the level of interoperability that's desired. For example, the rewriteable optical disk created on one PC may not work correctly with the drive on another. Some SCSI driver software offers more interoperability than others -- Corel's SCSI driver software is rapidly becoming one such standard -- and you should look for other software bundles with the drive that can make working with it easier, including backup,

management and diagnostic software.

OROM Capability

This allows a 3.5-inch rewriteable optical drive to function much like a CD-ROM when needed. It allows the drive which originally writes a disk to designate it as an OROM disk which means the data on it can't be overwritten, a convenience if you want to distribute or store data that can't be accidentally overwritten. OROM-designated disks maintain all the performance benefits associated with MO rewriteable, that is, an order of magnitude faster than CD-ROM drives.

Common Sense Tips Before Buying A Drive

Identify Why You're Buying the Drive

Do you need portability? Raw storage? Performance? All of the above?

Decide How Much Storage Your Application Demands

Rule of thumb: With the growth of today's applications and files you can't have too much capacity.

Match the Drive's Performance to Your Needs and Budget

For example, those using rewriteable as an archiving or backup technology won't need the same performance from a drive that multimedia users will.

Understand What You're Getting

Be especially inquisitive about the kind of SCSI adapter, driver software, and any bundled software. Look for well-known software, and make sure the drive offers compatibility with other drives in the industry. And, don't be misled by marginally useful features like on-drive caches.

Look For the Right Manufacturer

Rewriteable optical storage is an investment. You want to make sure you're putting your money in the right place. You should look for a drive manufactured by a firm that's going to be

around a few years from now, and one that offers a complete line of products.

In addition, it's important to look for companies that understand the problems of end-users. Offering bundled software and belonging to standards organizations are two signs of a company that cares about you. A company that showcases misleading specifications is probably not your best choice.

Information for this article was excerpted from "How to Make Heads or Tails Out of Optical Storage" published by Ricoh Corporation, File Products Division. □

COMPANIES WITH OPTICAL STORAGE SOLUTIONS

While not comprehensive, this list should give you a place to start for gathering information about optical storage options.

Hitachi America, Inc.

(415) 589-8300
Fax (415) 244-7647

MaxOptix Corporation

(408) 954-9700
Fax (408) 954-9711

MOST (Mass Optical Storage Technologies) Inc.

(714) 898-9400
Fax (714) 373-9960

Olympus Image Systems

(714) 453-4417
Fax (714) 453-4425

Pinnacle Micro, Inc.

(800) 553-7070
Fax (714) 727-1913

Procom Technology

(714) 852-1000
Fax (714) 852-1221

Ricoh Corporation

(800) 955-3453
Fax (408) 943-9364

Sony Corporation of America

(800) 352-7669

A Better DOS Desktop for Windows

by Claudia Martin

Most folks have both DOS and Windows applications, but working back and forth between these two environments can be messy -- sometimes even schizophrenic. Phar Lap Software (developer of the TNT DOS-Extender) has a new Windows desktop that may provide the best of both worlds or at least a better way to deal with the frustrations of "bopping" in and out of DOS and Windows.

Phar Lap FrontRunner is designed to help PC users who need to run both Windows and DOS applications. It brings powerful Windows features to your DOS shell and a better DOS box to Windows.

FrontRunner's intuitive, productive DOS work environment integrated into a Windows shell lets you run Windows programs directly from the DOS prompt, scroll and view your entire DOS screen history, and copy, paste, and print any part of your DOS session. FrontRunner also provides a simple alternative to Program Manager that lets you run programs from a customizable Launch Bar or from a convenient run menu. Additional features such as a programmable real time Status Bar, new GUI Visual Batch Language Extensions for DOS, and other utilities make this an extremely versatile and unique product.

According to Phar Lap Software, FrontRunner was developed to meet the needs of developers and power Windows users who require a flexible work environment that allows them to quickly and easily move between Windows and DOS.

For Windows users who have been frustrated with sorting through Program Manager's groups and items and getting a screen full of real estate problems, The Launch Bar lets you keep your favorite Windows and DOS applications available at a click. You can also customize your work environment.

The new Visual Batch Language Extensions for DOS let you create easy-to-use visual front ends for DOS batch files. You can create modules for the real time Status Bar to keep track of whatever real-time information is important to you (i.e., displaying up-to-date currency exchange rates, manufacturing processes, or current stock prices.) Phar Lap FrontRunner may very well be the first Windows utility to truly integrate the DOS

and Windows work environments. FrontRunner lists for \$139.

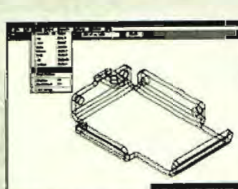
For more information call Phar Lap at 800/292-9622; 617/661-1510; Fax 617/876-2972.



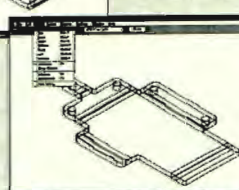
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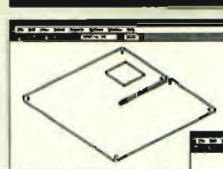
to folded or unfolded design views



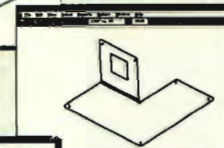
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\$895

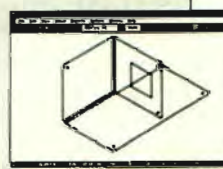
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Getting Ready for NT- Pentium PC Sizzles in DOS

by Robert Martin

I've now tried my first Pentium PC, the Evolution V, from Advanced Logic Research. Although this machine received kudos late last year in initial benchmarks from PC Computing, PC Magazine and others, I truly wasn't prepared for its performance with "humongous" CADKEY and FastSURF drawings.

At the time I was working on the drawings in the airplane article in the last issue. I was using a standard 486/33 with 16 megs of RAM. Some operations with those drawings brought that baby to its knees. I got lots of cups of coffee and spent megatime hanging out around the old water cooler while I waited. By the time I switched to the Evolution, the drawings had grown in size but the same tasks were accomplished astonishingly quickly. I slowed it down only once when I worked with the surfaces.

In formal benchmarks, The Data

Base Group clocked this system's speed as nearly twice as fast (47MIPS to be exact) as a 66Mhz 486DX2 system.

There is no secret formula behind good products. Careful and well thought out engineering always shows. It helps if you can be innovative and creative at the same time. ALR covered all the bases. The ALR Pentiums use system board designs that are completely new.

The basic Evolution V platform includes a 64-bit data path between the processor, memory and cache; 32-bit VL bus architecture; 8 MB RAM, expandable to 128 MB; 256K external read/write-back cache; and ALR's integrated MULTUS IDE multi-seek disk controller. The Evolution V has a small footprint but still includes six ISA slots and six drive bays for expandability. Three of the ISA slots have the 32-bit VESA VL extensions, which is the maximum allowed under the VL bus interface. Also standard is a new three-level password security that included floppy drive "write" disable.

A fully-configured machine, with the options needed by power CAD and workstation users, the Evolution V offers a 170 MB hard drive, high performance local bus video graphics card, 14" SVGA monitor, DOS 6.0, MS-Windows 3.1 and mouse. All this for around \$3,595.

The Evolution V was designed specifically with NT and other high performance environments in mind. So, its advanced multiseek capabilities can be used to advantage with any 32-bit multitasking environment such as Windows NT and Novell® NetWare®, OS/2™ and Unix.

Even if you're not ready to step into NT, this system will be ready for it when you are. In the meantime, you can get a lot of bang for your buck in the DOS version of CADKEY and any program you run under Windows 3.1. Depending on the application, you can expect a 60 to 70% improvement in performance. For more information contact: ALR 800/444-4ALR, 714/581-6770, fax 714/581-9240.

Two Trackball Options For Ergonomic Productivity

If mousing around has become the proverbial pain in the wrist (or elbow, shoulder, neck), it may be time you considered a trackball. Two interesting options are available from Key Tronic that integrate the trackball with the keyboard for efficiency and ergonomics, and saves valuable desk space.

The TRAK101™ keyboard features an enhanced 101-key layout (standard stuff) but its built-in

trackball unit improves on the design of a standard two-button mouse by adding a third button for drag-lock and a fourth for acceleration control. In addition to the four buttons on the trackball unit, keyboard keys can be assigned as standard mouse buttons. This allows the user to choose one- or two-handed operation.

As with other Key Tronic retail keyboards, the key feel on the TRAK101 can be customized. Custom Key Feel Kits are available ranging from a light touch responsiveness, to a firmer, more tactile feel. This keyboard retails for \$224 and is backed by a three-year warranty and unlimited toll-free technical support.

Another Key Tronic option lets you add TRAKMATE1™ (integrated trackball wrist pad) to an existing 101 keyboard. This provides the added comfort of an easily adjusted, free standing wrist pad. Its built-in track unit has two extra buttons with corresponding LEDs for changing pointing speed and engaging drag



TRAKMATE integrated trackball wrist pad

lock. The wrist pad itself features specially designed pads for user comfort and conveniently located thumb wheels for easy height adjustment.

The TRAKMATE wrist pad retails for \$149 and has a one-year warranty and unlimited toll-free technical support.

For more information contact, Key Tronic Corp. 509/928-8000; Fax 509/927-5248.



TRAK101 Keyboard

Infinite Disk Provides Unique Software Solution for Data Overload

by Claudia Martin

Name	Updated	Accessed	Size	Original Size	Migration Date
CONFIG.WIN	02/21/94	02/21/94	0	2510	Vol1:5317
CONNECT.DAT	02/21/94	03/17/94	0		
CONTROL.EXE	11/01/93	03/11/94	9261	15972	41%
CONTROL.HLP	11/01/93	02/21/94	0	12954	Vol1:5368
CONTROL.INI	02/21/94	03/11/94	1427	3833	62%
DESKEDIT.CDX	03/16/94	03/16/94	287	216	0%
DING.WAV	11/01/93	02/21/94	0	11598	Vol1:5276
DLLSCHED.DLL	11/01/93	02/21/94	0	7680	Vol1:5277
DOCKED.INI	03/04/94	03/17/94	1941	3117	37%
DOSAPP.INI	03/15/94	03/15/94	317	215	0%
DOSPRMPT.PIF	02/21/94	02/21/94	0	545	Vol1:5318
EFAXPUMP.DLL	11/01/93	03/11/94	38135	65024	41%
EFAXPLN.DLL	11/01/93	02/21/94	0	22016	Vol1:5278
EGYPT.BMP	11/01/93	02/21/94	0	630	Vol1:5279
EMMS386.EXE	11/01/93	02/21/94	120526		
EXPAND.EXE	11/01/93	02/21/94	0	16378	Vol1:5280
FANCODEC.DLL	11/01/93	03/11/94	8417	14848	43%
FAXCOVER.DLL	11/01/93	03/11/94	14526	24576	40%
FAXMGR.EXE	11/01/93	02/21/94	0	10240	Vol1:5281

When you run out of disk space, you have several options - most are awkward. The most common thing to do is to selectively offload files from the hard disk onto floppy disks or other off line storage media such as optical. But as your collection of floppy disks grows, it's easy to misplace a certain disk or forget which disk the file was placed on. Finding the file can be a time consuming and frustrating task.

Compression utilities provide the option of leaving a file on the hard drive and "squeezing" it to a smaller size so it takes up less room (usually about half). But when a file is needed, you must leave your application, find the file, select it and then decompress it to its normal size before you can use it. At best, compressing files in place is only a temporary solution. Eventually, even compressed files can fill up a hard drive, and to create more hard-disk space, the compressed files will end up on floppy disks. We've come full circle to option one.

A third option is to purchase an external hard drive to hold more files, but this is expensive and only temporary as you may fill it up as well.

Infinite Disk is different because it provides the best combination of these methods, but in a way that is completely automated. Infinite Disk, a software file management system, compresses and relocates data based on how long a file has remained unused, a process referred to as "automatic file migration." Files that have not been used for a specified number of days (you set a number, for example, 30) are compressed and remain on the hard drive. These files are automatically decompressed when

you access them. This is called "Level One Migration." The second step is known as Level Two. You specify a second, longer period of time at the end of which previously compressed, unused files should be moved offline. Each morning when you power up your PC, Infinite Disk will let you know which, if any, of the files compressed at Level One have reached the second aging period (perhaps 60 days) and you can begin the offloading process. Infinite Disk automatically offloads these files for you — all you do is insert the floppy disks.

You will have no problem

locating files, because all files transferred to the storage media of your choice continue to be represented on the hard disk by 0-byte directories. When you try to access a file that has been moved offline, Infinite Disk automatically lets you know the exact floppy on which the compressed file now resides. You insert the requested disk and the file is automatically opened without disturbing the application in use or your work in progress. To keep things organized, Infinite Disk comes with a series of pre-numbered labels. These labels are used to

distinguish archived data from regular disks.

Infinite Disk requires an IBM or compatible PC with at least one fixed hard drive and DOS 4.0 or higher. It is compatible with Windows 3.x. A terminate and Stay (TSR) module occupies 32K and may be loaded into high memory. The transient portion of the program occupies 500K of RAM. Less than 2.4MB of hard-disk space is required for installation. Free 24-hour technical support is available to registered users. Infinite Disk sells for \$129 suggested retail and can be purchased direct from the manufacturer.

For more information contact Chili Pepper Software, 1630 Pleasant Hill Road, Suite 180-200, Atlanta, GA 30136, 800/395-1812; 404/339-1812; Fax 404/513-7411.

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Creates New Opportunity

The historic Stanley Building on Myrtle Street, in New Britain, Connecticut, was once part of the growth of a world-renowned tool manufacturer. But new manufacturing technologies made the plant obsolete, and age took its toll on the 90-year old, eight-story brick structure. In 1990, TPA Design Group of New Haven, Connecticut, took on the challenge of giving the Stanley Building a new lease on life. They rehabilitated it into a facility for small businesses engaged in light manufacturing.

TPA Design Group provides services in architecture, engineering, planning, interior design, and landscape architecture. They specialize in the design of commercial buildings for office and manufacturing uses. "We have also gotten into quite a lot of 'rehab' work in the last few years," said Ian Scott, a computer technician with TPA. TPA became interested in the Stanley Building project because Constructive Workshops, a company which employs handicapped workers, needed larger facilities, and also wanted to offer space for small start-up companies.

TPA uses DataCAD® for their design work. "DataCAD works the way an architect or a designer thinks in doing a project," said Scott. "We use it to create a three-dimensional model of the building and to prepare the set of required construction documents. A set of construction documents usually requires a lot of time to coordinate and locate all the building components in space, and you can't beat this product for 3-D modeling."

Recreating the Building "as Built"

"Take the Stanley Building as an example," Scott continued. "TPA redesigned the interior of the building and did the exterior site work.

tions of all piping, stairways, elevators, windows and doors." With hard copies of these drawings in hand, TPA's field engineers went on site to confirm their accuracy and to note any discrepancies. Ian Scott



Variety of window types and sizes evident in this view of the south elevation of the Stanley Building.

Before we could do anything, we had to prepare a set of 'as built' drawings to get a complete grasp of exactly what we were working with. We recreated the building as a 3-D model in DataCAD, including loca-

used the field data to update the "as built" drawings in DataCAD.

"Accuracy is critical for any kind of engineering. Probably the most important thing about DataCAD for us is that when you are working with very finite dimen-

sions, you know it's dead-on accurate," said Scott. "Architects do not yet really know the language of computers. They can be intimidated by a fear of asking what they think may be 'stupid' questions, especially if they involve accuracy. Steve Kidd

Interesting Discoveries

TPA found that the Stanley Building had several different types of construction added as needed over its 90-year history. The original building had a brick exterior with a



East view of Stanley Building

of CIMTECH (Branford, CT) who supports DataCAD at TPA provides a very pragmatic, non-threatening approach to computers and computer-aided design. He does not offer a Rolls Royce to someone seeking a tricycle."

wood post-and-beam interior. Additions to the building about 10 to 15 years later still had the brick exterior, but used concrete columns, complete with flared capitals, in the interior. DataCAD's 'Clip Cube' function helped TPA to include detailed work easily in the "as built"

model. "Clip Cube' saved us from having to draw the same detail over and over," said Scott. We only designed the detail once, did a 'Clip Cube' operation, and placed this detailed work where needed."

The building had approximately 160 windows of 30 different types. The windows had 30 different sizes (height and/or width) and different placement locations in walls. "The variations in the windows did not cause us any problems," said Scott. "We modeled the original type of window and then made a symbol of it for placement wherever we needed it. If the style of window was different at a particular location, we simply modified the symbol."

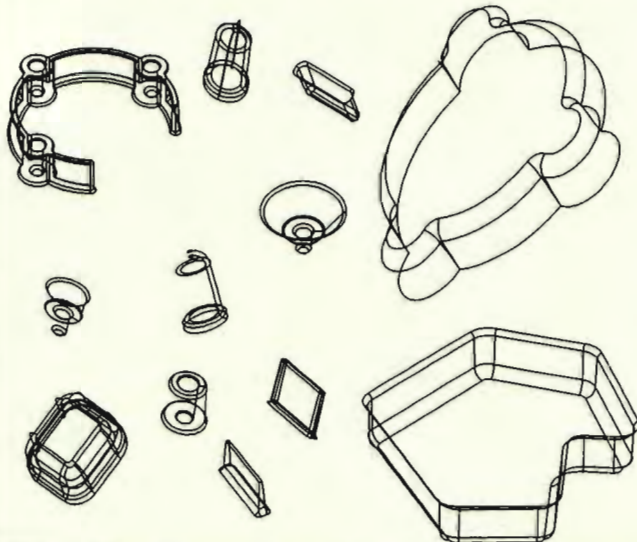
"After we had the 'as built' drawing completed, we laid out the placement of partitions and rooms. We sent the drawings to the client, and made changes as needed. This part of the project was easy," Scott said.

The new "old" Stanley Building will soon begin providing 150,000 square feet of space for small businesses engaged in light manufacturing.

"This was a fun project for two and a half years," Scott concluded.

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Yankee Ingenuity & Concurrent Engineering Design an Olympic Bobsled



As Geoff Bodine watched the bobsled events at the 1992 Winter Olympic Games, he had no idea he would be taking an active role in the 1994 Winter Olympics in Lillehammer, Norway. But, he did. When he learned that the U.S. Olympic Bobsled Team had not used an American-made bobsled in competition for forty years, Bodine, a renowned NASCAR Winston Cup racing driver from Julian, North Carolina, decided to help sponsor the development of new American-made, two-person and four-person bobsleds for the 1994 Olympics.

The story of the ensuing U.S.A. Bobsled Project is about people and ingenuity. It is about using technology in novel ways, concurrent engineering under very tight deadlines, and people working extraordinary hours (in addition to their regular jobs) because they were committed to and believed in the project. Other publications cover the sporting aspects of Brian Shimer and the U.S. Bobsled Team. This article focuses on the behind-the-scenes, informal technical team that made their Olympic participation possible.

The Beginning

In March 1992, Bodine shared his vision of designing and building new racing bobsleds with his friends, Robert Cuneo and Robert Vaillancourt of Chassis Dynamics, Oxford, Connecticut. Chassis Dynamics specializes in the design of racing cars. Cuneo and Vaillancourt had collaborated with Bodine in the development of his NASCAR Winston Cup racing cars.

At that time they knew nothing about bobsleds, but they were game. Cuneo approached Donald Barker of Creative Product Development, Oxford, Connecticut, with Bodine's idea.

Creative Product Development, Inc., a consulting engineering firm, specializes in mechanical design, engineering, prototypes, and inventing new products. Barker didn't know anything about bobsleds either, but his experience in computer-aided design told him that the complexity of the bobsled required three-dimensional design. Although Barker had experience with several CAD products, he selected CADKEY® for this project because of its 3D design capabilities.

The Sled Design

A month later Bodine, Cuneo, Vaillancourt, Barker and members of their companies became a design team. They met the bobsled athletes at Lake Placid, New York. They discussed at length what the athletes liked and did not like about the sleds they were using, and features the athletes would like to have in a new bobsled. The athletes gave them the four old European-made bobsleds they were using in competition. With Bodine providing the initial financing for the project, the team began.

First, they took detailed measurements of every part of the four bobsleds. Creative Product Development re-created the design of each sled and part in CADKEY, enhanced with DraftPak® and FastSURF®, third-party products that integrate with CADKEY. Each sled became a CADKEY file, and each part became a level of the file of the sled to which it belonged. "We re-created everything, right down to the nuts and bolts," said Don Barker. This engineering documentation required 120 hours for each sled.

The designs were 3D wireframe models, and the front views showed how much air each sled was pushing as it traveled down the track, an important performance criteria. Superimposing the front views of all four bobsleds on the screen provided vital information about varia-

THE U.S.A. BOBSLED
PROJECT IS ABOUT
PEOPLE & INGENUITY

tions of air pushing and air flow among all four sleds. Two other critical elements in how well a bobsled performs are the location of the sled's pivot point and the tracking alignment of its runners.

With this historical design data re-created in CADKEY, and with input from the athletes, the team started their new design from scratch. "We used a modular approach," said Barker. "To speed up the design process, we wrote our own macros to customize CADKEY, so every key on the keyboard could be used as a hot key in combination with the shift key."

The number of irregular curves in the sled's body required 3D splines to enhance its aerodynamics. "CADKEY splines made it easy to modify these curves as needed," said Barker. "We could not have done what we did without CADKEY," said Bob Cuneo. "We even made slices of the CADKEY model, at full size, to make the station templates for building the bobsled's body." The designs of the two-person and four-person bobsleds amounted to more than 300 megabytes of digital data.

Designing the Runners

Design and manufacture of the sled's runner blades expanded the U.S.A. Bobsled Project Team to include Reg Mohan, Jr., Manager of Application Engineering at MAHO Machine Tool Corporation in Naugatuck, Connecticut, and two of his engineers, Michael Shea and Kevin Carroll. It also led to using some off-the-shelf software products in new creative ways, and making use of people as they were available - within extremely tight time limits, while they did their regular jobs.

Shea collected data points at every tenth of an inch (0.100") from each runner on all four sleds using

a Lemoine Digitizing System® available at MAHO. This data was used to reverse engineer the runners.

Very slight irregularities in the data points revealed that part of the manufacturing process had involved filing by hand. One way to improve the runners for the new bobsleds was to design them for computer-numerical control (CNC) machining. This required creating an integrated smooth curve in the new runners where the steel meets the ice of the bobsled track. So, the data points had to be used in CADKEY.

Although the data points that Mike Shea had collected were in ASCII format, initially, there was difficulty in transferring them. Reg Mohan solved the problem by reformatting the ASCII point data with Microsoft® Excel®. Then the ASCII data points transferred into CADKEY through FastSURF and FastSURF created a spline through the collection of data points.

Gary Magoon of Cadkey, Inc. worked with Don Barker to devise a way to create, in CADKEY, the integrated smooth curve needed to manufacture runners for the sled. Reg Mohan received CADKEY part files of the runners to program them for CNC machining. Mohan began to post process the CADKEY part files in CUTTING EDGE™ three-axis machining software. However, Mohan was unable to complete this task when other responsibilities intruded. Kevin Carroll at MAHO picked up the project, but didn't know CUT-

TING EDGE. There was no time for him to learn and experiment with new software, so Carroll transferred the file, in DXF® format, into software he knew: TekSoft ProCAD/CAM®. Carroll created the CNC job files to be used with a MAHO MH-1000C universal machining center.

"We used who was available and what they knew; what was available, and when it was available," said Mohan.

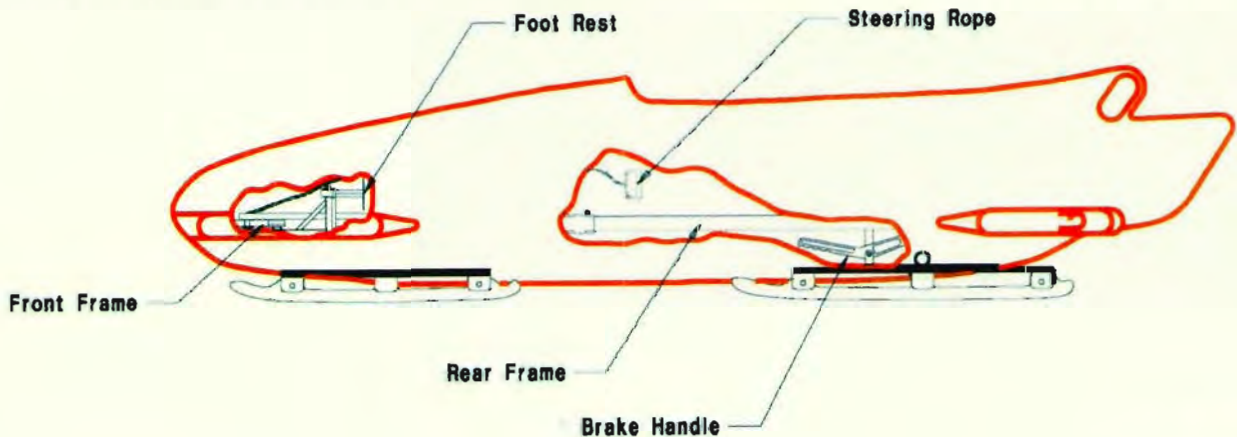
The Machining

Machining the runners is an adventure story all by itself. The longest runners were 48 inches long. The fixture to hold the steel in place was 60 inches long, 5 inches wide and 2 inches high. But, the MH-1000C's enclosed work area is only 40 inches long, 24 inches wide, and 32 inches high.

By mounting the fixture and steel diagonally on the table inside the work enclosure, it just fit. The MH-1000C was able to machine the runners. "Our fixture may have been a Rube Goldberg affair due to the time constraints," added Mohan, "but it worked."

The machining required six custom-ground cutters supplied by Joseph Barbiero of State Industrial Supply and Jack Saldamarco of State Cutter Grinding, both of Seymour, Connecticut. Machining proceeded well until one of the cutters broke. Mohan expected a delay of at least three weeks in getting a replacement. Working together, Barbiero and Saldamarco delivered a

THE DESIGNS OF THE
TWO BOBSLEDS
AMOUNTED TO MORE
THAN 300 MEGABYTES
OF DIGITAL DATA.



replacement cutter to Mohan in two days. Machining resumed. Cutting time for all the runners exceeded 200 working hours. MAHO delivered some finished runners to Chassis Dynamics at three o'clock in the morning because the assembly team was still working and needed the parts.

The Participants

Other Connecticut companies actively participated in the project. They included Gary Magoon, Senior Applications Engineer at Cadkey, Inc., Windsor, Connecticut, who provided technical support and engineering assistance, optimizing the team's hardware and software; Screen Tech of Watertown; DKT Drafting of Thomaston; Alloy Welding of Bristol; Universal Welding of Watertown; Mason & Madison of Bethany; All Custom Upholstery of Naugatuck; Monaco Ford of Glastonbury; Painter's Edge of Waterbury; the Mac Tools division of Stanley Tools, New Britain; Ericson Metals of Cheshire; Uniroyal of Middlebury; Tools Plus of Waterbury; and Tom Hill Realty of Waterbury. Quality Boat Repair of Wolcott supplied composite fabrication for the body of the bobsled. Jay-C Designs painted the sleds and provided artwork.

In addition to the Connecticut Yankee contingent, other

Americans contributed too. IBM Corporation of Somers, New York donated two PS/2® 95XP personal computers. Corning, Inc. of Corning, New York, supplied polishing equipment. Featherlight Trailer of Cresco, Iowa, provided a truck and enclosed trailer for transporting the bobsleds on land. Scandinavian Airlines' office in Newark, New Jersey, provided air transportation for the bobsled team's equipment, free of charge, to any destination in the world for testing or competition. The Family Channel of Charlotte, North Carolina, and the Indianapolis Motor Speedway of Speedway, Indiana, contributed funding.

A Surprising Twist

In today's global village, almost no story is without an international angle. This one is no exception. MAHO Machine Tool Corporation is the North American subsidiary of the German manufacturer, DECKEL MAHO, A.G. Another subsidiary of DECKEL MAHO is MAHO Seebach, GmbH, of Seebach, Germany. While MAHO Machine Tool Corporation was making the runners for the USA Bobsled Project, MAHO Seebach GmbH had already made runners for the German Bobsled Team's sled for the 1992 World Cup competition. "The companies are separate busi-

ness units," said Heri Söntgerath, Controller of MAHO Machine Tool Corporation. "Both projects took place completely independently of one another. They had no idea of what we were doing. We didn't tell them."

THE BOBSLED "TECHNICAL TEAM" PRODUCED AN INNOVATIVE FIRST-RATE BOBSLED.

Epilogue

The U.S. Bobsled Team did not win any medals in Lillhammer. Research into improved design and engineering of new sporting equipment does not always result in medals and trophies. Nevertheless, the engineering and manufacturing achievements of the Bobsled Team's "technical team" produced an innovative first-rate bobsled. As Vince Lombardi, coach of the Green Bay Packers football team (1959-1967) said more than once, "Winning is not everything. The desire to win is everything." The U.S. Bobsled Team and its technical team still have the desire. □

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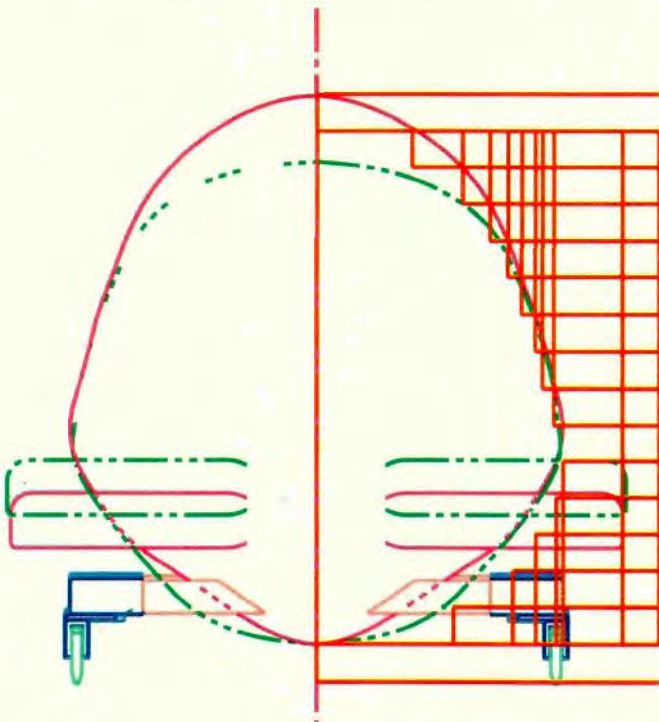
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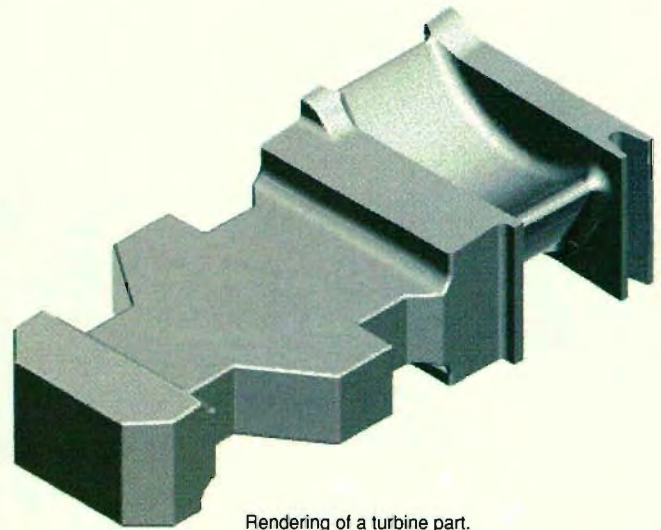
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WORKING IN A MIXED CAD ENVIRONMENT

by Frank Simpson

If you've thought about adding Unix-based CAD to your operation, you probably wondered about your existing PC-based CADKEY stations. Will they still be productive? Will that substantial investment in PCs and software be wasted? The experience of a Florida engineering firm shows that mixed platform CAD can be extremely productive. Varied platforms can work together quite efficiently - each complementing the strengths and features of the other.



Rendering of a turbine part.

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Turbine blades in electric power generating plants have a long life-cycle of productive service — 30 years and more. When they fail, however, a replacement part is not usually available off the shelf. STEAM-PATH Service, Inc., a small consulting engineering company in Fernandina Beach, Florida, provides third-party repair, refurbishment and replacement services for turbine blades. Founded in 1975, STEAM-PATH works with utilities and turbine service companies world-wide. Although most of their work is in North America, they have worked in Japan, Europe and South America.

STEAM-PATH entered the world of CAD in 1986 with 2D software on a Microvax 2 that still sees service. Because designing turbine blades as a 3D solid model is a more efficient way to work, STEAM-PATH began using Varimetrix®, a Unix-based solid and surface modeling program, in 1992.

“Our goal is to design a turbine blade as a 3D solid model,” says David Flood, Computer Engineer. “The ability to go from working in 2D in the Varimetrix Sketcher directly into the Modeler, where 2D geometry can be extruded into 3D, gives us the flexibility we need.” STEAM-PATH also transfers 2D design data from its other 2D CAD system into Varimetrix using DXF® and IGES translators. Other CAD files, including CADKEY files can also be easily transported back and forth.

STEAM-PATH's mixed platform environment works well. The three Varimetrix CAD workstations are Sun's; the company's turbine element, FEA and accounting applications are PC-based; and the Microvax continues to chug along. The Sun workstations are linked with an ethernet; the PCs are on a Windows LAN; and a software bridge between the systems allows data to pass back and forth freely. Methodical backup

routines to a tape drive provides a safety net in case of a problem.

Two-dimensional drafting still has importance in the creation of a three-dimensional model. STEAM-PATH uses the Sketcher and the Modeler quite interactively. "We use the Sketcher to design 2D geometry and to verify that an individual entity is on a particular plane," Flood adds. "Then we move the design into the Modeler where we extrude, revolve, and sweep the geometry to create 3D surfaces and solids."

According to Flood, Varimetrix provides several benefits for their work at STEAM-PATH. They include the straightforward menu system, extensive context-sensitive on-line help, and the ability to replay the history of the geometry that has been created at any time since the start of the design file. "Varimetrix lets you get a listing of the entities you have created, with the variables you defined for each geometric entity. For example, if you realize there is an interface problem for the tip of a turbine blade, which you defined as an angle of 20 degrees, you can do a parametric editing operation on the entity listing and change the angle of the tip to 15 degrees to solve the problem. Then it's kind of like a time machine. After you change the listing of an entity created a long time ago, you replay the history of the file and sit and watch the change ripple through the geometry you modified and through any other associated geometry affected by the entity modified."

This feature can also be used in another way. For example, what if you are designing two different turbine blades which are exactly alike except for their dovetails? The dovetail of a turbine blade is the base of the blade that fits into the hub assembly of the turbine. STEAM-PATH can build a second turbine blade by making a copy of the first blade and parametrically modifying the entities in the dovetail without having to create any new geometry. "Although we are relatively new to solid modeling, there are perhaps only a couple of options in advanced surfaces or advanced solids that we have not yet used," says Flood. "There is almost always a variety of ways to use every function so you are not locked into any particular way of approaching your design. Varimetrix is a really flexible design product," concludes Flood.

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DMS Dossier

by Martin van der Roest

I talked recently with an industry observer about technical advances in CAD these days. She indicated that a well known CAD vendor is coming out with a product data management (PDM) solution that will work as an extension to their CAD system. As part of the solution, it can track engineering drawings and documents. She asked, "Are PDM systems also engineering drawing and document management (EDM) solutions? And if PDM is doing EDM, does it make sense for a company to consider a PDM solution in place of an EDM solution?"

Excellent questions! The answers will come out as we clarify what EDM and PDM are.

An EDM solution is nothing more than a way of managing the design specifications (drawings and documents) that are used for the purchase or manufacturing of parts. It is a system that controls the state of those design specifications. These controls relate to the release and change control processes. So, an EDM solution (manual or automated or a combination) is intended to insure consistency between the part design and the way it is either purchased or manufactured. EDM systems maintain the engineering characteristics of a part.

The company's business system will maintain the administrative characteristics of the parts. This business system is often referred to as the MRP system. MRP (Manufacturing Resource Planning) supports manufacturing, planning, production scheduling, inventory, purchasing, sales, and other departmental activities.

Typically, for every part in an MRP system, there is a corresponding design specification in the EDM

environment. Some parts don't have design specifications. These might include parts purchased in bulk such as wire, tape, labels, etc. An EDM solution is a critical complement to the MRP environment. Parts ordered to incorrect information as reflected by outdated drawings is simply a costly and unacceptable mistake. A poorly designed EDM solution can have a detrimental impact upon many aspects of the business.

Now let's define PDM. The design and engineering activities in such diverse industries as defense, aerospace and communications have become more complex every year. This requires a better way to manage the product design effort. With the increased availability of computing power, the discipline of PDM has emerged over the last decade.

PDM's objective is to assist engineering organizations in the design process and the maintenance of the part design characteristics. It supports the results reflected in the engineering drawings and documents. It helps classify parts and supports an understanding of part relationships. It can help engineers understand the thinking that went into a particular design. For some of the more complex design activities it has been known to provide significant assistance to the engineering process.

As you may begin to see, there is an inherent requirement for a strict and disciplined use of the system to ensure accuracy and relevance of the information being generated. For many applications it may simply be an overkill. In fact, The GartnerGroup, a leading industry analyst organization, recently stated in one of their CIM Research Notes

that the PDM market "is either nonexistent or has failed ...". Wow! Strong words. The vendors that participate in this market have remained stagnant in growth. The acceptance by companies has been slow in coming, primarily because the solution is expensive, difficult to use, incomplete in functionality and poorly integrated with legacy systems (host based systems such as MRP).

Some folks in the PDM world obviously think that a natural extension of their discipline is going to be EDM. Make lemonade when life gives you lemons. Well, frankly, I don't know if that makes a lot of sense. It strikes me as the 'vegomatic' approach to the design engineering tool kit. Collective solutions have rarely worked in the past. Users and companies want the right application for the job. It is similar to what happened in the 80's when vendors tried gluing spreadsheets, databases and word processors together. The needs and advances of each application changed so readily that vendors had trouble keeping up. In fact, customers became confused about understanding the business that these guys were in.

PDM and EDM solutions do have a number of functional parallels. Both systems consider the life cycle of a part. EDM, of course, looks at the drawings and documents that are associated with that part. PDM considers the characteristics of the part design. Both need to track status, activities, and changes that will occur. So it is quite understandable that those in the PDM world would think about extending their system to include EDM functionality. I think PDM has a need to link into an EDM solution. However, I'm not

sure that PDM is the place for an EDM solution.

If we look at the issues from a "manufacturer's hierarchy of needs," it is clear that companies need some form of an MRP solution. Secondly, we have concluded that the parts in the MRP system have corresponding design specifications (drawings and documents) that exist within some form of an EDM environment. Hence, the MRP solution will be followed by an EDM solution. Now, how does PDM fit in?

The decision to go with a PDM solution will be based on the value it brings to the company. Each company will have to individually address this. Since mature EDM functionality does not yet exist within PDM solutions, the challenge will be the overall integration between the various systems.

Back to the original questions. Are PDM solutions also EDM solutions? No, not yet. Some vendors are or will try to make this inclusion. But will the 'all-in-one' approach work? Second, if PDM is doing EDM, does it make sense for a company to consider a PDM solution in place of an EDM solution? Probably not, at least not now. If PDMs are useful for complex applications, why would you use a half baked EDM solution to operate within the complex environment for which the PDM system was acquired for in the first place?

KEY SOLUTIONS

Document Management Forum / FAX Poll (No. 5)
PDM Attitudes / We'd like to hear from you.
FAX form to (714)-543-4931.

- 1a. Are additional design characteristics of a part maintained outside of your company's MRP and EDM systems?
Circle one: Y/N
- 1b. If so, is this being done in an automated fashion?
Circle one: Y/N
- 2a. Are bill structures and part relationships maintained outside of your company's MRP and EDM system?
Circle one: Y/N
- 2b. If so, is this being done in an automated fashion?
Circle one: Y/N
- 3a. Are you using a PDM system now?
Circle one: Y/N
- 3b. If so, is the system providing primary EDM functionality?
Circle one: Y/N
- 3c. If so, is it working out?
Circle one: Y/N
4. Should MRP systems expand to support EDM?
Circle one: Y/N
5. What do you think the 'virtual document control center' means?

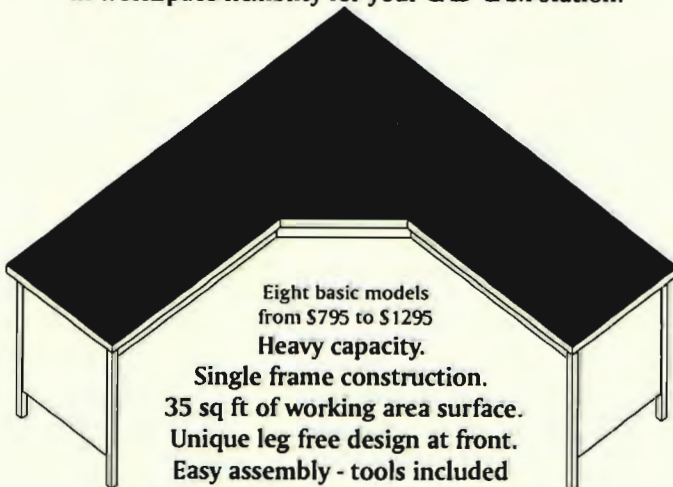
Would you be interested in knowing?

Circle one: Y/N

We'll talk about this in the next column.

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DataCAD Dialog

by Philip Hart

Because the ranks of DataCAD users has swelled phenomenally, many readers may be relatively inexperienced. So I will focus on a topic that will make working with DataCAD easier, faster and more productive -- default drawings.

I make several assumptions: 1) you have successfully installed DataCAD and configured your system to run it properly, 2) you have worked through the *Mastering DataCAD* tutorials and 3) you have started to draw a "real" project with DataCAD. A simple and highly productive way to review what you do and don't know about DataCAD is to learn about and create a Default Drawing.

What Is A Default Drawing?

A Default Drawing is any .DC5 file that is copied as a "template" to start another, new drawing file. A Default Drawing can be completely "blank" in terms of drawn entities, or can contain a tremendous amount of drawn information. Most importantly, though, it can be completely customized for the way you work. New drawings started as copies of a well considered Default Drawing can save you countless hours of menu adjustment and repetitious drawing.

Default Drawings are briefly discussed in the *Getting Started* manual on pages 4-3 and 4-4. They are one of the most powerful tools available to you. As you work in DataCAD, you notice that most of the user-selectable settings in the menu structure are saved in as part

of the drawing file. If you change a setting and save a drawing, the next time that you load the drawing, that changed setting is still in effect. The power of Default Drawings is based on this fact.

General Recommendations

First, I have some general recommendations about Default Drawings:

1. Create a separate subdirectory under \DCAD5 to hold Default Drawings.
2. In Config set the Path option for Default Drawings to this subdirectory.
3. Create one primary Default Drawing that you will use as the "template" for most of your new drawings and save it to the subdirectory specified for Default Drawings. For the purposes of discussion, I will refer to it as DEFAULT.DC5. You can name yours as you like.
4. In Config specify that drawing (DEFAULT.DC5) under the "Default Drawing Name" option.

Special Considerations for a Primary Default Drawing

What scale will you be plotting at most of the time?

Set the options in the Plotter menu to correspond to this scale. Set your Text Size appropriately for your scale. In the Dimension menu, enter the Text Style and Dimension Style submenus and set the options to correspond with your preferences relative to the selected scale.

What is your preferred Input Mode?
Do you use Relative Polar?

Relative Cartesian? (Most users find that Absolute Polar and Absolute Cartesian are useful only for very particular purposes under specific conditions). Press the INS key until you have it set to your preference. Go through the options in the Settings, Display, and Grids menus, selecting your preferences.

Do you have an office standard for plotter pen assignment?

If you do, set the pen assignment in the Plotter menu under the Color Plot submenu.

Do you want to create, pre-name, and set the colors for a group of layers?

If yes, do so in the Layers menu. *Do you want to include a drawing sheet border and title block in your Default Drawing?*

In short, take the time to review all the user definable options and set them to your preferences and ways of working.

Creating Secondary Default Drawings

Once you have saved the primary default drawing (DEFAULT.DC5), you can make and save variations. For example, you might make an identical Default Drawing that is changed only to reflect a different plot scale. If your primary Default Drawing (the one you have specified in Config as DEFAULT.DC5) has settings for plotting at 1/8" scale, you can very simply make a Default Drawing variation for 1/4" scale drawings.

Start a new drawing (using DEFAULT.DC5 as the "template"

once it has been created and saved as outlined above). Change the Scale setting in the Plotter menu to 1/4". If you do not use Text Scale, change the Size setting in the Text menu to 1/2 of that set for 1/8" scale plotting. Change the settings under Text Style and Dimension Style in the Dimension menu to 1/2 of the values

set for 1/8" plotting. If you have a title block loaded, use the Enlarge menu to reduce it to 1/2 of its 1/8" size. You should have a Snapping Point in the center of the drawing sheet border that you snap to for Plotter Layout; use it as the Center of Enlargement. In the File I/O menu, use the Save As and New Path options to save this drawing as

QDEFAULT.DC5 in the subdirectory specified in Config for Default Drawings. You now have two Default Drawings.

Remember, you set up DataCAD's Config to use DEFAULT.DC5 as the "template" for any new drawing file. By simply typing a new name at the initial DataCAD screen, a new drawing file is created, based on DEFAULT.DC5. To override this setting and use QDEFAULT.DC5 as the Default Drawing, or "template" for a new drawing, select the DEFAULT option (S9 at the initial DataCAD screen), select QDEFAULT from the next menu, type in the name that you wish to use for the new drawing file, and press ENTER. Your new drawing file will be started as a copy of QDEFAULT.DC5 and contain all of the settings that you have established in that Default Drawing.

Note that, if a drawing of the name specified in Config for Default Drawing Name does not appear in the path specified for Default Drawings, DataCAD will start new drawings based on its own internal

default settings - as it does when it is first installed.

The above example illustrates the use of Default Drawings as a means for pre-setting your drawing preferences and for dealing with plot scale sensitive settings in a drawing file. By extension, you can see that Default Drawings provide an excellent means for establishing consistency from one drawing to another. A series of plot scale specific Default Drawings can hold menu settings and drawn information (title blocks, minimally) so that uniform office standards are used throughout all drawings.

Free Zoom

Long-time users welcome the addition of Free Zoom [under WindowIn (/)] in DataCAD 5. When the option is turned on, you can easily zoom in to an exact view of the portion of the drawing which you want to see. There is, however one major drawback. When Free Zoom is on, Previous View (p,P) works in what can most generously be regarded as an "unreliable" manner. New users who have become accustomed to this behavior as a given are missing out on an extremely useful function (p,P). Long-time users are frustrated by the unreliability of the Previous View function when using Free Zoom.

My recommendation is to use Free Zoom only sparingly, i.e., leave it turned off most of the time so that you can take advantage of the Previous View function and turn it on only when you need to WindowIn on a very tight space. ☐

Philip Hart works in the offices of Stephen Platt, Architects in Portland, Maine. He has been a DataCAD user since 1986 and a member of the DataCAD Boston Users Group (DBUG) since its inception. He has written extensively on the practical application of DataCAD in the professional environment.

DATA CAD Productivity Tools

Command Performance 3.0

Command Performance is a package of 24 utility macros designed to speed up production of working drawings and presentations in DataCAD. Some operations in Command Performance are 33% to 67% faster than in DataCAD alone. Others (i.e., Clouds and CurvLedr) can't be done in native DataCAD. Trapdoors to most DataCAD menus and drawing functions allow the user to continue working within Command Performance.

The macros include: CurvLedr, a comprehensive notation macro that draws curved leaders from notes to drawing objects with custom curvature in a point and shoot fashion; Clouds draws revision clouds using 3 Point Arcs in 2 picks instead of 3, with a user definable bulge factor to control cloud consistency; Insert Layer allows the user to insert a new layer into an existing layer structure; Template Manager automatically reads symbols from a template and changes their colors according to a user defined mapping. This makes it possible to convert 3rd party symbol collections to existing office standards. Schema, a schematic design aid, draws rectangles automatically, given the area and a side. PlatTool dimensions plats in a point and shoot fashion, calculating and displaying bearing distances and angles, as well as tangent and non-tangent arc lengths and radii.

Many of the macros have PermaColor and PermaLayer which automatically places objects drawn by the macro on a predefined layer and in a certain color (defined by the user). The user is returned to the original lay and color upon exiting the macro.

Command Performance 3.0 retails for \$100 (upgrades to registered D/PA users are \$50). Write to Design/Program Associates at Route 1, Box 114-C Afton, VA 22920 for a six-page flyer.

Communications is a 2-Way Street

If you have questions, tips, tricks, a successful project using DataCAD or a favorite macro or routine you would like to share with other DataCAD users through **KEYSOLUTIONS**, please send it to DataCAD Editor, **KEYSOLUTIONS**, P.O. Box 11978, Spokane, WA 99211-1978 or Fax 509/928-4937.

DataCAD Tips

Getting Started and Configuring Version 5

by Mark Madura

Upgrading To DataCAD v.5.02

If you are currently running DataCAD v.3.6 or later, there are several special considerations you should take into account before upgrading to DataCAD v.5.02. The new version takes longer to install than previous versions, mainly due to the extended symbols library. The time required will vary depending on which features you choose to install. Allow adequate time, at least a half hour or so, to perform the new version installation and setup.

Third-Party Macros

If you use macros such as "Blocker" or "Touch-Up" by Bill D'Amico, that do not ship with DataCAD, you will need to get updates from the publisher of each macro before you can use them with DataCAD 5.

Custom Colors

The current version of DataCAD does not support custom colors. If you established a "gray" background color in version 4, you will probably find your existing drawings difficult to read. You still have access to 256 line colors if your video card supports 8 bit color. I would recommend purchasing CheapWare item #B25, 256 DataCAD Colors, to access all the color your video card will support.

The new graphical user interface "button-face" colors are not customizable. However, you can select from 16 different "text" colors for menus and commands. "Veteran" users of DataCAD may find the "old-style" menus easier to read. If you choose this option, I recommend set-

ting Function Key Highlight to Light Gray and Function Key Toggle OFF to Dark Gray.

Directories and Disk Space

You may want to install the new version of DataCAD to C:\MTEC instead of the default C:\DCAD5. This will overwrite "original" DataCAD files and conserve disk space.

NOTE: If you have modified symbols, keyboard macros, line-types, etc. that ship with DataCAD, they too will be overwritten! BACKING UP YOUR SYSTEM BEFORE ANY UPGRADE IS HIGHLY RECOMMENDED.

Drawing Compatibility

In DataCAD 5 you can open any drawing file, default drawing or symbol created in DataCAD v.4.x. However, you cannot open version 5.x files from previous versions of DataCAD. If you work with other firms that use DataCAD, check to see if they have also upgraded to the new version.

Input Devices

You no longer need to configure DataCAD for a mouse. DataCAD will use the mouse driver that is loaded when you start your computer.

The new list of supported digitizers is limited. Check to see if your digitizer is on the supported hardware list included with DataCAD. If your tablet is not list-

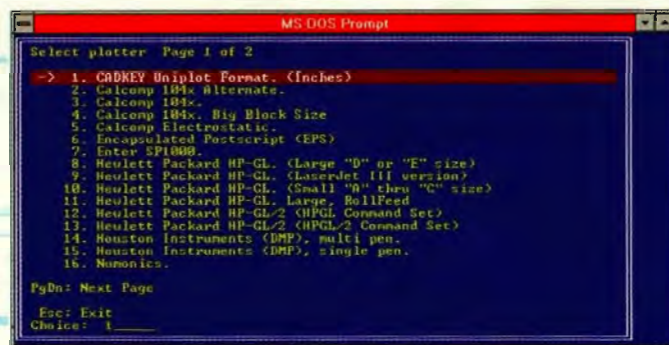


Figure 1

ed, check the documentation that came with it to see if it will emulate one of the listed devices.

On-Line Documentation

The new version includes On-Line Documentation, not to be confused with context sensitive "Help". It is simply the documentation "On-Line". [CTRL] + F1 invokes this feature if you have it installed.

Configuring DataCAD

Once you have DataCAD installed, you must configure the software for your system so that it will run properly. The following instructions assume that you have at least a 386 based computer with 20MB of free hard disk space, 1MB of RAM, a math co-processor, VGA graphics and a mouse. They cover a basic configuration. In future articles I will discuss "Optimal" configurations for getting the best performance from DataCAD.

After the initial installation process, you should be at the DataCAD configuration screen. In the future you can re-run the configuration program from C:\DCAD5> by typing "config". You can also run the config program from the

DataCAD DOS shell. However, changes made to the configuration while in the shell will not take effect until you restart DataCAD.

The two most sensitive areas of the configuration are the display device and plotter setups.

Device Drivers - If you don't know which video card you have or it is not on the list, #8 IBM Personal Systems/2 - VGA will work fine in most cases. If you know you have one of the other cards on the list, select it.

Plotter/Printer Options - Select CADKEY Uniplot format (see Fig. 1) if you have a dot matrix printer, FAX Modem or other non-HPGL compatible printer or select any of the other corresponding output devices on the list that match your output device.

Port selection is straightforward. Most of you will need to select COM2 for a pen plotter or other serial device; and LPT1 for a parallel device such as an HP LaserJet III or DesignJet. Select To File for CADKEY Uniplot format. You can also select To File for any device if you need to create plot files for service bureaus. Ask them which plotter to use from the available list. This option is also helpful if you want to create plot files to "background plot" at a later time.

The additional options for "COM" devices: Baud Rate, Word Size, Parity and Handshaking should work using the default settings. Check the documentation that came with the plotter.

Save any changes before exiting the config program. You are now ready to run DataCAD. Type "RUNDCAD" at the C:\DCAD5> prompt to begin using DataCAD.

Last Comments on Start Up

Before starting the software, type MEM and press [ENTER] at the C:> prompt to check available memory. If the largest executable program size is less than 512K, you might not be able to run DataCAD.

Your DOS manual has some suggestions for freeing conventional memory. There are also several good memory managers available such as QEMM to help you maximize available conventional memory.

Mark F. Madura is president of Madura Studios Inc., Boston, a consulting firm specializing in Architectural C.A.D.D.

TECH SUPPORT DIRECT

by Mark Hyjek and Frank Simpson

Five Most Common DataCAD Tech Support Questions

Working with a CAD program is a challenge, especially if it's new to you. As the number of DataCAD® users increased dramatically over the last few months, the number of questions fielded by Cadkey Technical Support has also increased. To save you the time and money involved in calling technical support, here are five questions most commonly asked about DataCAD 5.

Q In configuring my DataCAD system, I don't know which graphics display driver (video card) to choose. I don't see my system's card listed. What can I do?

A Select #9 IBM Personal Systems/2 VGA small font. This should work with approximately 98% of the graphics display cards on the market.

Q When I try to run DataCAD my system says, "Unable to find configured graphics driver." Then it puts me back at the DCAD5 prompt. What can I do?

A Use the RUNDCAD.BAT file instead of the DCAD.EXE file. At the \DCAD> prompt, just type RUNDCAD and press Enter.

Q I do not have a Quick Shader Button. What should I do? First, make sure that you have at least 3 megabytes of expanded memory (EMS) for QuickShader to use. Then go into DataCAD's CONFIG program, and turn on the QuickShader.

Q How do I plot with my printer?

A Use the utility DCPRINT that is included with DataCAD. Refer to Chapter 6 of the DataCAD Manual for instructions about using DCPRINT.

Q I am trying to run DCPRINT and keep getting the error message: "Selected file is not in CADKEY@UNIPILOT format." What should I do?

A Go back through DataCAD's CONFIG program to select #3 Plotter/Printer options. In the menu, first choose Plotter #1. Second, set up the plotter for CADKEY UNIPILOT format (option #1). Third, set the port to #2 File. Exit and save the changes in the CONFIG program. Then enter DataCAD and re-create the plot file in UNIPILOT format.

Mark Hyjek is Senior DataCAD Applications Manager at Cadkey, Inc.

Especially for DataCAD

Using Velocity

by Dr. Leonard Nasman

The **VELOCITY** program will produce high quality rendered images from files created with DataCAD. Using **VELOCITY** is not as easy as using DataCAD and requires some expertise with DOS to run successfully. If you are not familiar with the fundamentals of DOS, you should review Appendix H in "Introduction for DataCAD 5" or refer to your DOS manual or another text.

The **DataCAD Desktop Tools Manual** (included with the Professional Edition of DataCAD) has a lot of information about using **VELOCITY** which is not repeated here. A brief review of the process follows to get you started.

Before **VELOCITY** can be used to render a model, a 3D data file must be prepared using DataCAD.

1. Create a 3D view of the model.
2. Press the **y** (not the **Y**) key to jump to the **3D Views** menu.
3. Select **Go To View** from the **3D Views** menu. Select **Add View** and enter a name for the view.
4. Press the **:** key to jump to the **2D Edit** menu. Select **Macros**.
5. Select **Velocity** from the **Macros** menu.
6. At the prompt, "Enter name of output renderin file:", enter a file name.

NOTE: Be sure that you make a note of both the file name and disk drive path where the file is stored so that you will be able to find the file later.

Now you have to exit DataCAD and prepare the system to run the **VELOCITY** program. You will have to determine where the **VELOCITY** program and associated graphics display drivers are stored on your system.

7. Exit DataCAD.
8. Locate the **VELOCITY** directory and make the **VELOCITY\DRV** directory active.

9. List the contents of the **DRV** directory and identify your graphics display driver.

An example graphics display driver is **IBMV256.EXE**. You can run this driver by entering **IBMV256** whenever that **EXE** file is in the currently active directory.

10. Run your graphics display drive. Note the **grmode** value which will produce 256 colors on the display.
11. Make the **VELOCITY** directory active.

Next you have to communicate the graphics display parameters to the system. This is done by entering the command:

```
SET DC_GDT=Parm1,Parm2,Parm3,Parm4,Parm5,Parm6
```

For example, parameters for the **IBMV256** graphics adapter are:

- Parm1 - **IBMV256** (the graphics display adapter)
- Parm2 - **60** (always enter **60**)
- Parm3 - **0** (the **grmode** value noted in Step 10.)
- Parm4 - **0** (always enter **0**)
- Parm5 - **0** (always enter **0**)
- Parm6 - **1** (always enter **1**)

Our example command would read:

```
SET DC_GDT=IBMV256,60,0,0,0,1
```

After the graphics display driver has been loaded and the parameters set, the **VELOCITY** program can be run.

12. With the **VELOCITY** directory active, enter **VELOCITY** to run the program.

This will bring up the **VELOCITY** main menu. To make sure that the system has successfully loaded the display driver and set the parameters, you can try to display an existing rendered file.

13. Select the **Display Image on Screen** option from the main menu.

If you get an error message, you will have to try Steps 10 through 12 again. If everything is working properly, you will see a list of image files. Pick one that appears to have the appropriate resolution for your display (perhaps VSAMP320 or VSAMP640).

You should see a rendered sample image on your display. If so, you are ready to try rendering your own model.

NOTE: Pressing the **TAB** or arrow keys jumps between options in the **VELOCITY** menus. Pressing the space bar cycles through the option choices.

In general the following steps must be taken to render and view a model:

- Select a rendering file (use **Change Paths** main menu option if required).
- Specify attributes (either by loading an attribute file or assigning attributes individually).
- Select the view (or views) to render. Set the background and output format for each view.
- Specify the lighting.
- Begin rendering.
- View the images.

To create a high resolution image with **VELOCITY** requires a tremendous number of calculations and can take a very long time. Since there are so many memory and hardware variables in each computer system, it's impossible here to provide very much detailed information (or debugging help).

In addition to displaying rendered images on the screen, **VELOCITY** provides output options for printing on high resolution film recorders. See the **DataCAD Desktop Tools Manual** for more information.

This article was excerpted from "Introduction to DataCAD 5" published by Microcomputer Education Systems, Inc. For more information call 614/793-2730 or fax 614/761-0489. ☐

If you have a project you would like to share in The DataCAD Portfolio please send the information to DataCAD Editor, KEYSOLUTIONS, P.O. Box 11978, Spokane, WA 99211-1978



The DataCAD Portfolio

These images of the Egleston Center were created by David Munson of Stull and Lee, Architects and Planners of Boston, Massachusetts for the Edge Housing Corporation. The mixed use retail and office building will include a branch bank and a pharmacy. The structure occupies a prominent corner site and has been designed to hold the street edge and reinforce a sense of place at this important neighborhood crossroads on the Roxbury-Jamaica Plain Line.

Computer modeling in DataCAD was used for perspective line drawings that were part of the original submission to the city of Boston. The same data was then used to render multiple views in Velocity for a slide show presented several times to the community. The two views here were chosen for final renderings, with finishing touches added

with Corel Photo Paint. This flexibility to move from one software package to another has proven quite invaluable.

In fact, the ability for computer modeling to generate many images provided several advantages: a more visual design process, increased communication and eventually a better design. Producing elevations, perspectives, rendering and eventually section and floor plans all from the same database is the wave of the future and definitely the direction David Munson has taken.



MEDIA COST PER COPY: DRAWING A CLEAR PICTURE

Charts provided by Océ Graphics, manufacturers of direct thermal and electrostatic plotters.

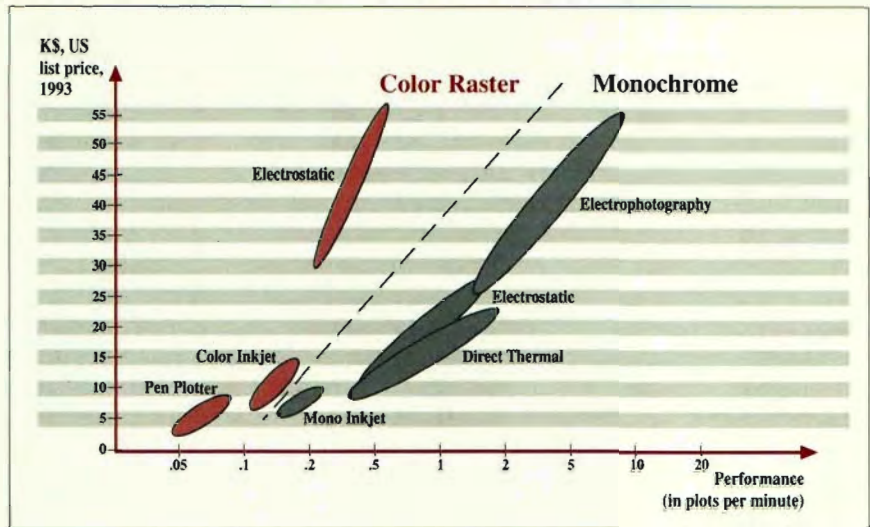
Media costs per copy are an important consideration in assessing plotter performance. These graphs show typical media costs for different densities (complexities) of A0 monochrome plots on both paper and film. Costs were calculated from average list prices in Europe (expressed in U.S. dollars).

More complex drawings use more ink (from pens, cartridges or toners) as the paper coverage increases. The only drawing cost that does not change is that for direct thermal papers, where the ink is bonded to the total area of the substrate, and therefore gives rise to a constant cost per copy.

The lowest density drawings for which costs were calculated were for simple line drawings. Ten percent density is typical coverage for a line map with some shaded areas and a fair amount of text. The high density costs correspond to drawings which have large amounts of color or gray scale fills (raster/vector overlays or satellite images, for example.) Inkjet

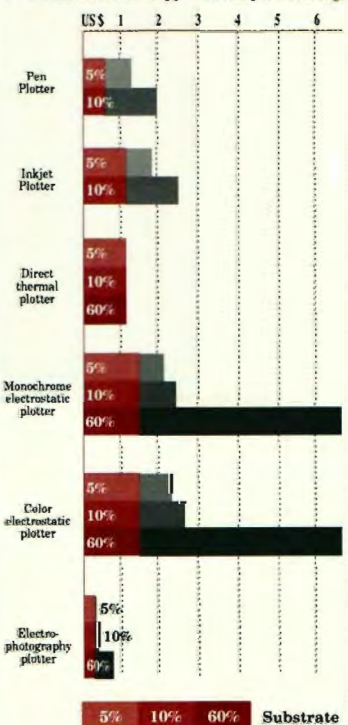
and pen plotters are not really suitable for producing such very dense plots.

In addition, costs are based on manufacturer recommended papers. Costs for film plots will be considerably higher, as not only is the substrate more expensive, but more ink or tone is needed to adhere to the film surface.

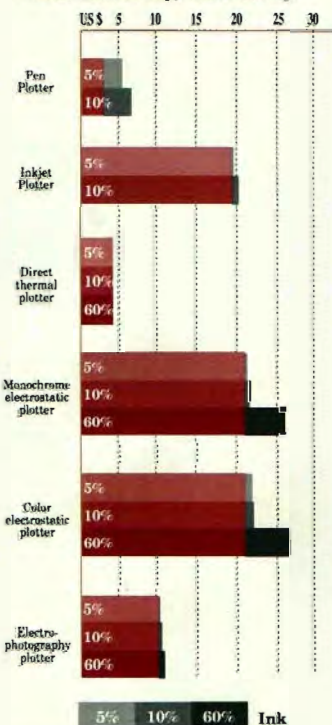


Complexity of Plot Drawing as % of Media Coverage

▼ Media Cost Per Copy—Plain Paper Drawings



▼ Media Cost Per Copy—Film Drawings



The following table compares the cost of supplies for an A0 monochrome plot on various plotter technologies. Costs were calculated from average list prices in Europe and expressed in U.S. dollars.

Clearly, if the requirement is for 5 to 10 prints per day, the inkjet is a cost effective solution. When the requirement is for 20 to 80 prints per day, the electrostatic or electrophotography are ideal technologies for doing the job.

Medium	Paper	Film
	(5% cover)	(5% cover)
Pen Plotter	\$1.34	\$ 5.67
Inkjet	\$1.87	\$19.66
Direct Thermal	\$1.13	\$ 3.83
Electrostatic	\$2.10	\$21.80
Electrophotographic	\$0.31	\$10.48

Medium	Paper	Film
	(10% cover)	(10% cover)
Pen Plotter	\$2.06	\$ 6.99
Inkjet	\$2.57	\$20.36
Direct Thermal	\$1.13	\$ 3.83
Electrostatic	\$2.50	\$22.20
Electrophotographic	\$0.36	\$10.53

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MACROS CADL CDEs

by Craig Storms, Usman Rashid, and Kurt Chase

Using the Calculator to Create Smart Macros

Macros are extremely useful in speeding up and organizing repetitive keystrokes. Macros are simply memorized keystrokes and cursor pick positions. Or are they?

Macros are generally "hard coded" commands. They do exactly what the person who recorded them intended, menu by menu, cursor pick by cursor pick. -- *most of the time*. This is useful because it lets you customize "hot key" commands by binding macros to keys, or similarly, to customize tablets by binding macros to tablet positions. These "do-exactly-as-you-are-told" macros are very popular. There is nothing like saving steps in highly repetitive work! But macros can do more. Macros can be recorded in a manner that makes them "smart."

There are two features which enable you to create smart macros:

- 1) Macros can access the **Calculator** and with it **User Defined Variables**.
- 2) Macros can **Jump** to new macros based on a logical operation.

You can use *formulas* in your calculations and your macros will adjust according to the values stored in your *variables*. This is the one big step that takes macros into the realm of programming, making them "smart." Also, you can add *logical program branching based on a condition* (the familiar *if-else* found in many programming languages). These features allow macros to perform more like programs rather than simple memorized steps.

In the example which follows, center lines are created to match the size and position of a selected circle. That is, the macro creates lines along the X and Y directions properly placed so that they extend slightly beyond the edge of the circle. The dashed centerlines occur in different locations and with different lengths depending on the location and size of the circle selected, as shown in Figure 1. The dimensions have been added for reference and are not part of the macro execution.

The strategy behind recording this macro includes the use of **CONTROL, VERIFY** to display the *x,y,z position of the circle centerpoint, along with the radius of the circle*. This is an important trick in storing data in system variables. Once the values are displayed on the CADKEY prompt line, the Calculator allows you to grab these values using the system variables @1, @2, @3, etc.

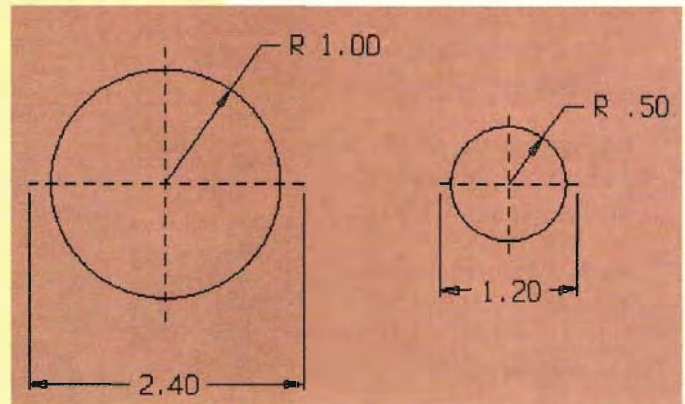


Figure 1

and assign them to your own variables for later access. The first numerical value displayed on the prompt can be accessed using @1, the second using @2, and so forth. This is one important trick to making a macro "smart." Each time a circle is selected the unique position and radius of the current circle will display on the prompt line and be stored into the user defined variables x, y, z, and rad. The basic steps to recording this macro are:

- 1) Press **ESCAPE** several times to assure you start at the main CADKEY menu.
- 2) Set the line type to dashed using **ALT-T**.
- 3) Use **CONTROL, VERIFY** to obtain the x, y, z, and rad values. **ALT-M** allows masking on arcs/circles to prevent users from selecting lines or other invalid entity types. This macro is intended to work only on circles.
- 4) **ESCAPE** to the main menu and choose **CREATE, LINE, ENDPTS**.
- 5) Use **KEY-IN** to indicate the x,y,z end point positions for each of the two lines. A simple formula adds (or subtracts) $1.2 * \text{rad}$ from the center position to place the end points slightly outside the circle.

Note: The exact representation of center lines is defined by Drafting Standards, and minor modifications to this macro may be needed to properly customize it to your specific needs. For example, you may choose to include a combination of solid and dashed lines to properly define your center lines. The example shown here is intentionally simple to clearly illustrate general techniques. Once you successfully complete the

example shown here, modifications are easy to implement. The general approach to creating the macro remains unchanged.

The example uses macro PAUSE commands (CTRL-K) and custom prompts (CTRL-O) which can be combined with pauses to overwrite the standard CADKEY prompts. Note that in a macro recording session the PAUSE must occur prior to using CTRL-O to create a custom prompt. The following text describes the specific details of the macro program *centerln*. The macro was created by recording a macro (CTRL-J) and using the TEXT-OUT option. The macro itself did not require any text editing to perform correctly. The text is shown for clarity, and also allows you to copy the program and recreate it inside CADKEY by using the TEXT-IN option. Be sure to name the file with a .txt extension and *text-in* to a current library before trying to execute the macro. Do not copy the comments on the right side (marked with *), they are included only for reference and are not part of the CADKEY macro output. Place the file in the MAC directory and, with a macro library loaded, *text-in* the file and a macro named CENTERLN will appear in your library. **Caution: this will overwrite any macro that exists with the same name!** Execute CENTERLN using CTRL-E or the LIST/EXE macro option.

Centerln.txt:

```

CENTERLN      * Name of macro
ROOT          * ESCAPE (to main menu)
ROOT          * ESCAPE
ROOT          * ESCAPE
LSTYLE       * ALT-T Change Line Type
MAC_DBL_RC (-3, 1.000000, 0.000000, 1)
              * Cursor Pick DASHED Line Type
MENU7        * F7 CONTROL
MENU1        * F1 VERIFY
MENU2        * F2 COORDS
EMASK        * ALT-M Masking Dialog Box
MAC_DBL_RC (-3, 6.000000, 3.625000, 24)
              * Cursor Pick ARCS/CIRCLES
MAC_REPEAT(55)
MAC_SHORT(-7)
ACCEPT       * Press ENTER
PMPT_MACRO  * User Defined Macro Prompt (CTRL-O)
Select Circle To Construct Center Lines*
              * Text for custom prompt
PAUSE_MACRO * Pause to allow User Selection (CTRL-K)
CALC        * TAB or CTRL-I Calculator
x=@1        * Create variable x, store first value
ACCEPT      * ENTER
ACCEPT      * ENTER
y=@2        * Create variable y, store second value
ACCEPT      * ENTER
ACCEPT      * ENTER
z=@3        * Create variable z, store third value
ACCEPT      * ENTER
ACCEPT      * ENTER
ROOT        * ESCAPE from Calculator
ACCEPT      * ENTER
ACCEPT      * ENTER now prompt shows radius
CALC        * TAB or CTRL-I Calculator
rad=@3      * Create variable rad, store third value
ACCEPT      * ENTER
ROOT        * ESCAPE from Calculator
ROOT        * ESCAPE to main menu
MENU1       * F1 CREATE

```

```

MENU1        * F1 LINE
MENU1        * F1 ENDPTS
MENU9        * F9 KEY-IN
x+1.2*rad    * 1st pt: Center x plus 1.2 times radius
ACCEPT       * ENTER
y            * Center y
ACCEPT       * ENTER
z            * Center z
ACCEPT       * ENTER
x-1.2*rad    * 2nd pt: Center x minus 1.2 times radius
ACCEPT       * ENTER
y            * Center y
ACCEPT       * ENTER
z            * Center z
ACCEPT       * ENTER
x            * 2nd line 1st pt: Center x
ACCEPT       * ENTER
y+1.2*rad    * Center y plus 1.2 times radius
ACCEPT       * ENTER
z            * Center z
ACCEPT       * ENTER
x            * 2nd line 2nd pt: Center x
ACCEPT       * ENTER
y-1.2*rad    * Center y minus 1.2 times radius
ACCEPT       * ENTER
z            * Center z
ACCEPT       * ENTER
ROOT        * ESCAPE to main menu
IF 1         * CTRL-E (during recording)
JUMP CENTERLN * Condition 1 (true) jump to same macro

```

Note the use of a jump condition at the end of this macro. During the recording process, invoking the immediate mode command CTRL-E (execute macro) tells the system you want to **jump** to a new macro. In this example the jump condition entered is simply 1 (true). If you are familiar with programming you will recognize the **if (condition)** statement. In this case entering 1 makes the statement permanently true, meaning the macro program will always execute the same way - by jumping to itself. That is, when completed it calls itself again and continues to loop like this until the user presses ESCAPE.

The jump condition can be specified with variables and a condition that can lead to branching. Branching is not illustrated in the centerln macro, and will be treated in greater detail in a later article. Jumping always terminates the current macro. That is, pressing CTRL-E during macro recording forces the current macro recording to end with a condition that jumps to another macro.

Note: A brief example of program branching might be a macro which uses:

```

IF (rad>0.05)
    JUMP MACRO1
ELSE
    JUMP MACRO2

```

By using variables assigned using the Calculator in creating macros, your possibilities for customization are much more sophisticated. Variables make your macros "smarter," able to repeat basic commands without repeating hard-coded values. Use this technique anytime you see an opportunity to repeat tasks in a manner which adjusts for the size of existing geometry. ☐

CADKEY CORNER



The CALCAD Users Group in Southern California is one of the most active in the country. They have an Orange County and a Valley (north Los Angeles) division. In addition to regular meetings and workshops, they produce an excellent monthly newsletter. The topics in this CADKEY Corner appeared in the CALCAD Newsletter in January and February of 1994.

by Ed Manes

A Macro for Polar/Delta Line Projection

At one of our meetings last year we had a visitor who was able to work in various CAD programs. He knew AutoCAD and other programs and had taught himself CADKEY in one day. In comparing CADKEY and AutoCAD, he noted that one of CADKEY's shortcomings was its inability to create drawings by projecting lines in the desired directions. We defended ourselves, claiming that CADKEY's LINE PARALLEL could do the same thing, but our words lacked conviction.

Now through the power of the CADKEY Position Menu and the use of the macros below, you can project lines quickly and easily in any direction. Use the POLAR Macro for polar direction, or the DELTA Macro for Cartesian projection.

The following instructions will help you create and load the macros. These macros will be loaded into the macro library named CADKEY.MAC because it's loaded automatically when you load CADKEY (if you do a standard "plain vanilla" installation). A library must be loaded before you can create a macro.

Part 1 - Creating the Macro

1. Load CADKEY and draw a short line across the screen. This will be used later as a pseudo "click point" for your cursor.
2. Press Esc twice to clear the History Line.
3. Press Ctrl-J (starts recording macro and asks for macro name) and type name (POLAR, for example).
4. Press Return, Esc, Return, Esc, Esc, Esc (clears previous functions).
5. Press F1 Create, F1 Line, F1 Endpts, F3 Endent.
6. Press Ctrl-K (interrupts Record mode and begins Pause mode).
7. Click on screen line drawn in Step 1.
8. Press Ctrl-K (toggles Pause mode Off and Record mode back On).
9. Press F7 Polar, F3 Endent.
10. Ctrl-J (ends) macro).

Next, we will assign a keyboard "call key" and save the macro.

Part 2 - Assigning of "Call Key"

1. Press Esc, Esc, Esc.
2. Press F5 Files, F5 Macros, F2 Binding.
3. Press F4 Key (asks for macro name).
4. Type POLAR (example) and press Return (asks for key).
5. Press a key or combination that you want to be the key to use this macro (for example, Ctrl-F1).
6. Press F10 to go back to the Binding Menu.

7. Press F2 Sav Binary (Cadkey loads binary faster than ASCII).
8. Press Return (accepts "Cadkey" binding file).
9. Press F2 Yes (replace file).

This completes the creation of the macro. For the DELTA macro, follow the above procedure except use F8 Delta in place of F7 Polar, give it a different name and assign a different Binding Key.

To use the macros, press the key assigned in Part 2 (in our example, Ctrl-F1) and click twice on the line end from which you wish to project. Then enter the values asked for in the amount you desire. You must recall the macro for each line projection needed.

Finding the Lost Keys

Did you ever think maybe a page was missing from your CADKEY6 Reference Manual on the subject of the macro's binding file -- especially if you're wondering which key you used to store which macro.

First, Cadkey advises that the bindings file in binary form loads faster than it does in ASCII. No mention is made of the fact that you can't read the file in binary form which only shows "BIN^Z"

Once you understand the problem, it's easy. The keystrokes F5 Files, F5 Macros, F2 Binding, and F1 SAV ASCII for looking or F2 SAV Binary for storing will toggle back and forth easily between the two forms.

Look for the file in an ASCII text editor such as WordPerfect or DOSSHELL. If you have loaded your Cadkey program with the defaults used in the INSTALL program, the file you want is CADKEY.BND. The file will be in the \CADKEY6\MAC directory.

The displayed file will look something like the following:

```
POLAR    #15E
DELTA    #15F
LEVELS   #154
etc.
```

Each name in the list above represents a macro you have written followed by a key code. On page 6-33 of the Reference Manual, Cadkey explains the code is a **hexadecimal** number for an ASCII character showing, for example, that #13B is ANSI for F1. But F1 by itself is one of the characters we're **not allowed** to use! The chart on page 6-34 is also misleading. The last line states that #169 equals CTRL-A -- but this is another key we would not use because it is the Immediate Mode command for the ARROWS toggle.

The chart below shows fifty of the most likely "call keys" and their ANSI code. Note that this code is not the same as in the MS-DOS book, but it is what Cadkey uses.

Key	w/Shift	w/Ctrl	w/Alt
F1	#154	#15E	#168
F2	#155	#15F	#169
F3	#156	#160	#16A
F4	#157	#161	#16B
F5	#158	#162	#16C
F6	#159	#163	#16D
F7	#15A	#164	#16E
F8	#15B	#165	#16F
F9	#15C	#166	#170
F10	#15D	#167	#171
1	#21	n/a	#178
2	#40	n/a	#179
3	#23	n/a	#17A
4	#24	n/a	#17B
5	#25	n/a	#17C
6	#5E	n/a	#17D
7	#26	m/a	#17E
8	#2A	n/a	#17F
9	#28	n/a	#180
0	#29	n/a	#181

For more information on the *CALCAD Users Group* - contact James Moschenross at 818/845-1235.

TECH TIPS

Here's a grab bag of tips to make using CADKEY a little easier. This batch is from Larry Maldarelli at CALCAD Users Group in Los Angeles County.

Productivity Tip

If you have modified your batch file that loads CADKEY (or any other application) to run CHKDSK /F on loading, and have subsequently upgraded to DOS 6.2, your batch file is no longer well behaved. Billyboy Gates is so proud of his new Scandisk that he put an irritating plug for the *!@#*!!! thing in CHKDSK and ends it with a Y/N that requires an answer to proceed!

Adding CHKDSK /F to batch files is a tip to keep lost clusters from accumulating on your disk. These little pests are the prime cause of fragmentation of files which in turn slows your computer to a crawl.

There is a workaround. Delete the new version of CHKDSK.EXE. Copy the old version of CHKDSK to the new DOS directory and run SETVER to indicate to DOS that it is a version 6 utility. You do this by typing:

```
SETVER [drive:path] filename
n.nn where:
drive:path is the location of
SETVER
filename is the name of the
program to modify
n.nn is the version of DOS
to report to the system
```

So, in this case, assuming you have installed your DOS files in C:/DOS, you would type:

```
SETVER c:\DOS CHKDSK 6.02
```

Note the space between DOS and CHKDSK and also between CHKDSK and 6.02. Note too, the inverted grammar in the statement. With just about any other DOS command, the path comes before the command name, not after. The programmer probably ran out of Coke and cigarettes when he coded this one. If you forget all this you can type: SETVER/? and a help screen will pop up.

CADKEY Idiosyncrasies

I have discovered another one of the construction procedures that drive solid modelers crazy.

Those of you who are doing D3STL (shorthand for stereolithography, may I never type that lousy word again) or just trying to process a part through PICTURE-IT will probably have run up against a really simple part that you are sure is correct, but that just won't go through. The culprit is the round-up errors generated by moving the assembly around in space. Particularly culpable is OLD-NEW when you are making a 2D move.

I had a very simple part -- a flat plate with five holes in it -- that I moved from one end of a casting to the other and then jockeyed into position with OLD-NEW. I then connected it to some existing features and tried to process it through PICTURE-IT. It left the holes out. I disconnected it from the casting and processed it again and it left the holes out again. Keep in mind that this configuration processed correctly only moments before. On close (>500,000 to 1) magnification you could see that the holes had moved out of the surface by several millionths of an inch! The most maddening part is that it doesn't always happen. I gave in and redrew the part which then processed without incident.

This brings us to a statement of the SEVENTH LAW:

If a solid becomes unruly and refuses to process through a solid modeler, STOP and redraw it at once.

And the first COROLLARY to the SEVENTH LAW:

Whenever possible, construct solids in their final location in space.

ANALYSIS



CAE Software Provides Design Insight

What can a design engineer do to perform a quick preliminary analysis of a design without tying up an expensive workstation dedicated to engineering analysis? CADKEY® ANALYSIS from Cadkey, Inc., provides some answers. It lets engineers quickly check temperatures or stresses (elastic and thermo-elastic) to make sure that a design will really work as a manufactured part. It can provide insight so that a design can be optimized early in the design-through-manufacturing process. It can help the engineer be more aware of how design changes will affect performance as a manufactured part or product.

The latest version of CADKEY® ANALYSIS has increased speed and functionality and is easier to use than its predecessor which was included with CADKEY Version 6. CADKEY ANALYSIS is included with Cadkey Professional Version 7 or can be purchased as a separate module for use with CADKEY Version 7. Once installed, CADKEY ANALYSIS becomes imbedded inside CADKEY.

"ANALYSIS 7 has new tools that give engineers enhanced insight into parts they're designing," said Joe DiPietro, CAE software engineer at Cadkey. "We know that a completed design must undergo rigorous engineering analysis and final verification before manufacturing. ANALYSIS 7 is not a replacement for that process. But, because it is easy to use and fast, ANALYSIS 7 is a tool for playing what if games during the design stage. It is intended to be the engineering equivalent of a spell-checker in a word processor."

ANALYSIS shows the designer

how a design will stretch and bend due to temperatures and/or stresses, not only on the outside, but also throughout the interior. If a part is pinned down in several locations and rotated, or if a force is placed upon a part at several different points, then you can see exactly how the part will distort on the outside and the inside. Sometimes it isn't enough to see the stress patterns. Seeing how distortions occur in the shape of a part due to stress is the other side of understanding the design. If you run a design through simulated real-world conditions during the design process, you can increase the design's integrity. By finding the maximum stresses, you can decrease the part's chances of failure by making it stronger or lighter, by the appropriate selection of material and modification of the part's geometry.

Increased Flexibility

The interface between ANALYSIS 7 and CADKEY is written in the C programming language to take full advantage of all the features available through CADKEY® Dynamic Extensions™. This makes it easier to configure CADKEY to work with ANALYSIS, and makes ANALYSIS execute faster.

ANALYSIS 7 has enhanced dialogue boxes through which the user makes selections and enters instructions. One in particular (a CADKEY-style file-list dialogue box) takes the guesswork out of specifying

ing file names and directories. The enhanced dialogue box interaction has also reduced and simplified the structure of the program's menu trees.

ANALYSIS 7 also has increased flexibility in implementing the Boundary Element Method (BEM) of engineering analysis. For instance, it can handle a wider variety of boundary conditions for two-dimensional thermal and stress/strain analysis. ANALYSIS 7 allows a user to select from a collection of standard distribution functions for placing boundary conditions. The user can speed up ANALYSIS 7's performance approximately ten times (perhaps more) by placing boundary conditions whose trend can be represented by mathematical functions, such as linear, cubic, quadratic, sine, etc. ANALYSIS 7 eliminates the need of placing varying boundary conditions one node at a time.

The new boundary conditions in ANALYSIS 7 include a radiation condition (steady-state heat transfer), a spring condition (elastic and thermo-elastic), and a distributed thermal source. All boundary conditions can now refer to either a global Cartesian coordinate system or to a local coordinate system established by the element's orientation (i.e., normal and tangent constraints).



The dialogue box above is used in assigning the thermal radiation boundary condition. A distribution function is being applied to set the ambient temperature parameter.

This allows the user to reduce ANALYSIS 7's modeling time and computation time still further by taking advantage of the geometry's symmetry. For example, the cartridge holder of an old Colt® six-shooter revolver could be modeled with one-sixth of the geometry. A pressure-vessel design provides a good application for ANALYSIS 7's axisymmetric capabilities. A distributed heat source/sink can be used to handle chemical reactions, or to solve torsion or flow problems.

ANALYSIS 7 displays the icons (arrows) that represent the simulated temperatures, pressures or stresses exerted upon the part in a scaled fashion, according to the magnitude of the boundary conditions. It clearly displays the units of measurement, e.g., degrees Fahrenheit, degrees Celsius, pounds per square inch, etc. ANALYSIS 7 also features an erasing capability to mask and/or remove boundary conditions quickly. If it is necessary to repeat an analysis session, ANALYSIS 7 rapidly regenerates the session, automatically scaling the boundary-condition icons.

Since ANALYSIS 7 works in 2D only, can it handle three-dimensional parts? The analysis methodology used by Moller International, Inc. of Davis, California, a company which builds rotary engines, is a good example of using ANALYSIS 7 with 3D parts. Although Moller has complete (thorough but slow) 3D engineering analysis capabilities, when

they need very rapid results, they use CADKEY ANALYSIS. They take a two-dimensional section of the part where a designer wants to examine deformations. If there are 3D features in the part that increase the moment of inertia, but which are not represented in the 2D section, the thickness of various parts of the section are increased in order to make up for the unrepresented features. Then, they put this part through ANALYSIS. This process used on many sections, in different orientations, produces a good idea of the total distortion.

directly inside ANALYSIS 7. It is no longer necessary to save the result plot as a pattern file in CADKEY.

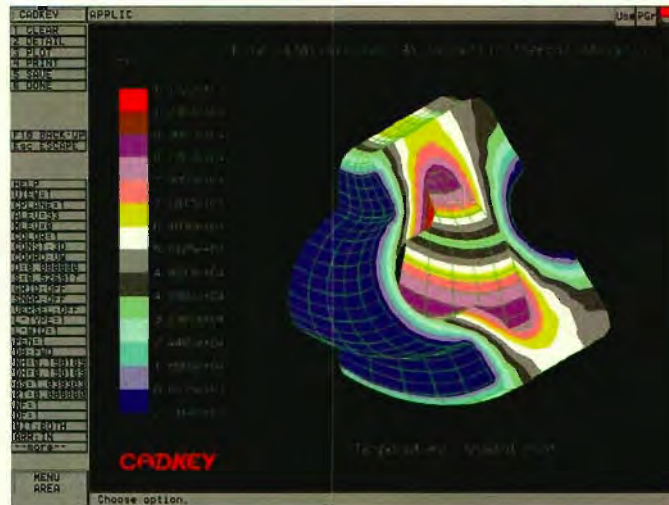
The post processor's bonus is a by-product of its viewing capabilities. Although ANALYSIS 7 uses the Boundary Element Method to make its calculations, it generates a mesh of the interior of the BEM model using an automatic Finite Element Method (FEM) mesh generator. The FEM mesh generator provides a somewhat uniform distribution of points inside the model and ANALYSIS 7 uses the Boundary Element Method to solve for the thermal or elastic responses at these points.

However, ANALYSIS 7 optimizes the band width of this FEM mesh, and this allows the user to output this FEM mesh in ASCII format for possible input to analysis programs that use the Finite Element Method. This ASCII data provides easy access to a second opinion about a design. ANALYSIS 7's optimization of the FEM mesh's bandwidth reduces the time that it takes for the FEM programs to calculate their results. This optimized data can also be used by other programs to perform types of analysis that CADKEY

ANALYSIS 7 is not designed to perform, for example, transient heat transfer.

"ANALYSIS 7 does not attempt to replace rigorous engineering analysis," DiPietro said. "It actually leads toward and contributes to it."

For more information contact Cadkey, Inc. at 203/298-8888.



Shaded temperature contour plot. ANALYSIS 7 allows users to rotate axisymmetric cross section to display results on a 3D section of the asymmetric geometry.

Post Processor with a Bonus

ANALYSIS 7's new post processor for viewing the results of an analysis session lets you save all the plots (line, shaded, and vector) and animations of those results. You can now view strain tensor, derived strains and strain energy on the part, as well. The new post processor also lets you annotate, plot and print

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CADL TOOLBOX

Here's a trio of CADL files submitted by John D. Frawley, a mechanical designer with QualiTROL Corporation, Fairport, New York, CompuServe 73237,674.

rem file name: cpy.cdl

```
rem pick a point, line or circle to start the command
*****
:top
ccol = @color
getent "Select (point, line or circle)", enttype
if (@key == -3)
goto exit
ent = @intdat[0]
if (ent == 1)
goto point
if (ent == 2)
goto line
if (ent == 3)
goto circle
:point
menopt = 1
getpos "Choose position for point", menopt
x1 = @xview
y1 = @yview
z1 = @zview
mode normal
point x1, y1, z1, ccol, 0, 0, 0, 0
redraw -1
goto top
:line
menopt = 1
getpos "Indicate 1st end position", menopt
if (@key == -3)
goto exit
menopt = @key
x1 = @xview
y1 = @yview
z1 = @zview
getpos "Indicate 2nd end position", menopt
x2 = @xview
y2 = @yview
z2 = @zview
mode normal
line x1, y1, z1, x2, y2, z2, ccol, 0, 0, 0, 0
goto top
:circle
deflt = .25
getflt "Enter new circle diameter (%f)", deflt, dia
menopt = 1
getpos "Choose new circle center position", menopt
x1 = @xview
y1 = @yview
z1 = @zview
rem divide dia by 2 to get radius
circle x1, y1, z1, dia/2, 0, ccol, 0, 0, 0, 0, 0, 0
goto top
:exit
clear ccol, menopt, deflt, x1, x2, y1, y2, z1, z2
```

rem File name: XYDIST.CDL

```
rem Get X - Y distance between two positions, points or
entities.
*****
:top
menopt = 1
GETPOS "Select 1st position", menopt
if (@key == -3)
GOTO exit
menopt = @key
x1 = @xview
y1 = @yview

GETPOS "Select 2nd position", menopt
x2 = @xview
y2 = @yview
xdim = x2 - x1
ydim = y2 - y1
PAUSE "X = %g, Y = %g", xdim, ydim
if (@key == -3)
GOTO exit
if (@key == -1)
clear x1, x2, y1, y2, xdim, ydim, menopt
GOTO top
:exit
```

rem file name: hlin.cdl

```
rem
rem Draw a horizontal line between two places
rem
*****
:top
menopt = 1
getpos "Select 1st end of line", menopt
if (@key == -3)
goto exit
menopt = @key
x1 = @xview
y1 = @yview
z1 = @zview

getpos "Select 2nd end of line", menopt
menopt = @key
x2 = @xview
y2 = @yview
z2 = @zview
mode normal
ccol = @color
line x1, y1, z1, x2, y1, z2, ccol, 0, 0, 0, 0, 0
clear x1, y1, z1, x2, y2, z2, ccol, menopt
goto top
:exit
```

Identifying The Components Between Two Points

When designing in 3 dimensional space, there is often a need to know the components dx, dy, and dz between two points. (See Figure 1.)

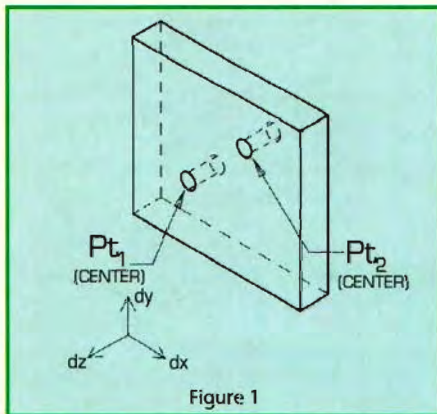


Figure 1

Quite often at least one component is required in order to move one feature relative to another.

Cadkey 6.0, straight from the box, offers several means for determining these components, none of which conveniently displays the components, especially when operating in the iso view.

Faced with determining the x or y component between Pt1 and Pt2 (Figure 1), a user will often change to the front view (Alt-V 2) so that the new viewing plane is parallel to the desired component. If the two points in question are not in line horizontally or vertically, the user typically adds or extends a vertical or horizontal line through one of the points. The user can then request the distance between the two points using the "POS+ENT" menu pick.

A single component is then displayed as the "perpendicular distance." If another component between the same two points is needed, the user often repeats the above process.

In an effort to improve this task, a simple CADL file (3d_dist.cdl) can be used to quickly display the dx, dy, and dz components between two points from any view. This program

becomes a time-saving tool when designing in 3 dimensional space. Also, when 3d_dist.cdl is converted into the .cdx binary format and then executed from a tablet pick or from a single key stroke, the benefits of this tool becomes even greater.

By George R. Winton, P.E., a mechanical engineer with Micromeritics Instrument Corporation in Norcross, Georgia

```

REM          3d_dist.cdl

REM This is an improved distance command that allows a user to
REM determine the dx, dy, and dz components between two points.
REM It displays the components in the world coordinates.
REM It also gives the absolute distance between the points.

CLEAR

defopt = 1

GETPOS "Indicate the first position", defopt
wx1 = @XWORLD
wy1 = @YWORLD
wz1 = @ZWORLD

GETPOS "Indicate the second position", defopt
wx2 = @XWORLD
wy2 = @YWORLD
wz2 = @ZWORLD

REM determine the coordinates
wdx = wx2 - wx1
wdy = wy2 - wy1
wdz = wz2 - wz1
dist = sqrt((wdx)^2 + (wdy)^2 + (wdz)^2)

REM display the results in world coordinates
PAUSE "wdx = %.4f wdy = %.4f wdz = %.4f dist. = %.4f", wdx, wdy, wdz, dist

:exit
    
```

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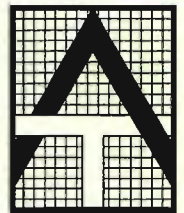
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A recent study comparing the efficiency of a TEMPLATE/DIGITIZER compared to a MOUSE found that the TEMPLATE/DIGITIZER offered up to 54% GREATER efficiency. If you've used CADKEY you've hunted up and down CADKEY's HIERARCHICAL MENUS looking for a particular CADKEY command like, for example VERIFY ANGLE. (Mmmm...now, is that command under EDIT, maybe it's under DISPLAY.....well, I know it's somewhere.) Anyway, CADKEY Users realized long ago the MOUSE/KEYBOARD combination of command execution in CADKEY is not nearly as fast as the TEMPLATE/DIGITIZER/KEYBOARD - especially if you have a well designed Template like CADJET. Have you ever noticed how many function-key strokes (and/or Mouse 'picks') are involved in executing CADKEY commands. CADKEY's 40 or so Immediate Mode <ALT> Commands help some if you could memorize that many. (do you know anybody that have them all memorized) But, you don't have to worry about this with the CADJET Master Template as all 40 <Alt> Commands are on it. Exclusively executing CADKEY Commands with a MOUSE/ KEYBOARD is not only time consuming but extremely unproductive. With CADJET Master Templates, you'll save as much as 5 or more keystrokes for every CADKEY Command. (Considering how many commands the typical user uses, this can add up to hours of unnecessary finger-hopping and command hunting!) Whether you're a NOVICE or EXPERIENCED CADKEY User, you'll really appreciate the way CADJET Master Templates works in excellent tandem with KEYBOARD entry and coincidentally eliminates much repetitive, tedious command entry. Layed out exactly like CADKEY, the Template is easy to learn and use! And, don't worry when CADKEY comes out with major new versions for we have Template Upgrade Kits for existing CADJET users providing instant access to all the latest and greatest CADKEY commands. CADKEY users with many years of experience on CADKEY have told us that they wish they had gotten the CADJET Master Template much sooner. Considering how many satisfied CADJET Master Template users around the world are using our product everyday, day in and day out, we think it is safe to say that the CADJET Master Templates for CADKEY save the user time and effort. If you're using CADKEY with a MOUSE/KEYBOARD, then you are wasting minutes and sometime hours each day. So, convert from your old, unproductive MOUSE/KEYBOARD and see why CADKEY users around the world have made the switch. Don't take our word for it. All our products can be tried FREE. SEE FOR YOURSELF HOW EASY AND FAST CADJET Master Templates CAN MAKE YOUR CADKEY! (Cadjet Master Templates - sold separately or with a DIGITIZER.)

"CADJET is well laid out. It groups commands in an order that makes sense to CADKEY users. The bright background colors and logical icons make it visually appealing. It is easy to see that CADJET will add to the productivity of any CADKEY user. With all of the CADKEY commands at the user's fingertips, less time will be required to learn the system."
Paul Resafarits,
 Co-Author - USING CADKEY

"The CADJET Template made our part-time designers into CAD experts in a very short period of time. My two previously CAD-shy toolmakers literally fought over who was going to use the CADKEY system first. CADJET is undoubtedly one of the best products to come along in a long time. It speeded up training and increased productivity considerably. As long as I'm in charge, we'll never work without it. It makes CADKEY fun to use."

Brian Gross,
 CAD Manager



12"x12" Digitizer w/ 11"x11" Template - \$499
 18"x12" Digitizer w/ 17"x11" Template - \$799
 CADJET 11x11 Template Only....\$195
 CADJET 17x11 Template Only....\$295

Templates available for CADKEY
 Versions 3 and higher including the new CADKEYv7.

"I've been teaching CADKEY to users for several years and I'm convinced that CADJET will result in significant productivity improvements for both the new and experienced CADKEY users. Very user-friendly....Excellent product.....A real winner!"
Tom Gray,
 CADKEY Dealer

"CADJET saved our company time and money. Now, we have instant access to CADKEY's commands right at our fingertips. Detailed drafting and design is easier and much improved in quality. I highly recommend CADJET to any CADKEY user."
Mike Decker,
 CADKEY User

"As I have been using CADKEY for several years, I was amazed at how fast and easy CADJET makes CADKEY to use. CADJET really works. Thanks for a great product."
Henry Dicken,
 CADKEY User

X Please ask us about our other products for CADKEY!
 Like Spell Checkers, Template Customization Kits, Ez Fonts, Drafting Utilities and more!

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We're so sure CADJET TEMPLATES will make CADKEY easier, faster and more efficient, we'll let you try it for 30 days FREE.

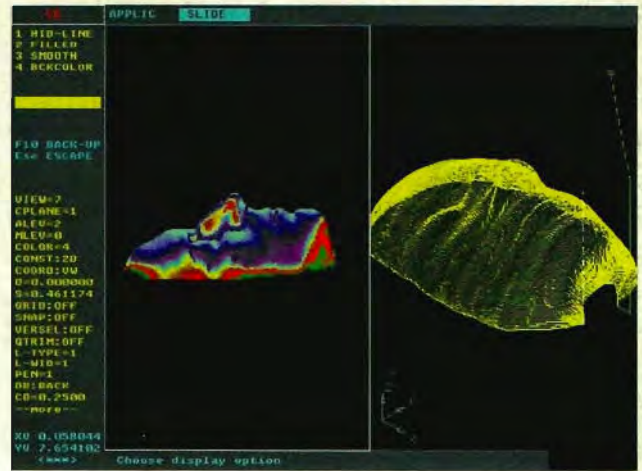
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If you use CADKEY and need a CAM program to machine surfaces at a price you can afford, you need ALL the facts and CUTTING EDGE SURFACES!



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- surface modeling of FASTSURF
- complete tool path editing
- a library of over 100 post processors

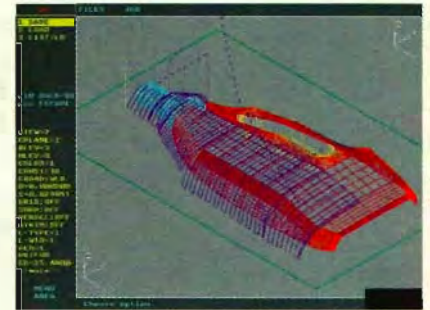
No other CAM package has :

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- 100% CADKEY human interface
- a complete CDE & CADL environment
- general NURBS surface machining
- CADKEY IGES capabilities



CUTTING EDGE SURFACES can be used as a stand alone CAM system for 3-axis milling, drilling, boring, reaming, slotting, pocketing, tapping and contouring. Immediate verification of the tool path before cutting reduces material waste.

CUTTING EDGE SURFACES is fully integrated into Cadkey's desktop engineering tools. Now you can manufacture your designs directly from CADKEY part files with 100% failure-free data transfer. NO TRANSLATION needed! You can also transfer other CAD files using IGES, DXF, and CADL.



CUTTING EDGE SURFACES offers ease of use unparalleled in the CAD/CAM world, an outstanding customization environment, general surface machining, and the ability to bring surfaces from any CAD system that supports IGES.

If you don't have a blue print or a CAD design, we can help with that too. Ask about the reverse engineering ability of CADDInspector.

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