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The Magazine of the North American Data General Users Group



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THE WATER'S FINE

Spring board is a launching pad for ideas

by Joyce Carter
NADGUG president

Have you noticed a recurring theme in your recent issues of *Focus*? The focus of this month's *Focus* is computer-integrated manufacturing. I love to read the articles built around a theme, especially when the theme is a buzzword or something I'm not familiar with.

I'm sure I will get an education when I read these articles. Most of us in the computer industry work in specific fields, not realizing some of the levels of sophistication that computers have achieved. Computers have invaded every corner of civilization, and none of us can quite imagine the many functions provided by our electronic nemesis.

Spring board meeting

By the time this issue is mailed, each board member should have received information about the spring Executive Board meeting to be held at the Wyndham Franklin Plaza Hotel in Philadelphia on February 25-26. I want to remind you to get your plans made right away. The spring board meeting is a two-day gathering for elected, appointed, and volunteered officers and chairpersons to conduct the business of NADGUG.

Every RIG and SIG (recognized or not) has the opportunity (possibly the obligation) to be represented on this board of directors by their current president or some other representative.

I am emphasizing the word "recognized," because there may be regional or special interest groups that exist and have not asked for NADGUG's recognition, or new groups that are attempting to organize. Recognition by NADGUG isn't required for your existence, but it can lend a group some much needed assistance.

Some types of assistance are financial, being listed in the RIG/SIG roster, and assurance of the support needed

by Data General. One of the greatest benefits for you and your interest group is representation on the board. Attending a board meeting and learning what aid and programs are available is only a part of it. Talking to heads of other groups and learning of their experiences, successes, problems, and even failures is invaluable. Beyond all of this is having a voice in the planning and decision-making of NADGUG.

I was roped into my first Executive Board meeting when representing my RIG. I was amazed and impressed at the amount of work accomplished and at the friendships that developed while accomplishing the tremendous task of running an organization, developing membership, and choreographing a conference.

Enough of this sermon. If your group hasn't received information about the meeting, please call the NADGUG support group at 617/898-4067 immediately. If you haven't planned to send a representative, you might want to rethink that position.

Post or pre?

In the first part of December, I attended a post-conference meeting in Westboro. This meeting was led by our Meetings chairman Lee Jones. In attendance were the NADGUG staff and others who carry the responsibilities of planning, staging, and executing the NADGUG conference.

This entails planning the theme, sessions, exhibits, brochures, speakers, banquet and receptions, spouse tours, call for papers, publicity, registration packets, and pricing.

All of these items were attended to, and the timetable was established for each phase of the upcoming, complex drama. Conference 87 was analyzed not only financially but for its successes and ways to improve next year.

You have all seen the cartoon showing what is accomplished by committee, but I was impressed by the innovation and creativity that evolved in this particular encounter.

Perhaps they should change the title of this meeting. Although it includes a postmortem of the last conference, it's a positive and truly useful planning meeting, if not the final planning meeting. Δ

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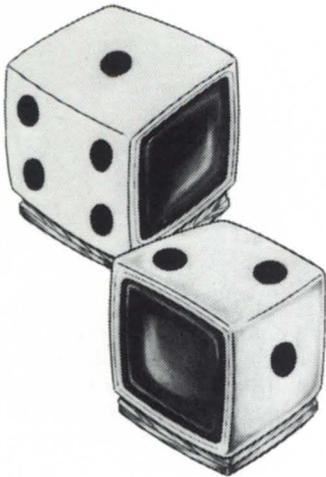
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Sequel to "Happy Ending"

It is always good to read about a happy ending like the one in the "Happy Ending" article by Phil Robson and Tony Deakin in the October [1987] issue of *Focus*. Being able to log off an RDOS Business BASIC system at 3:30 p.m. one day and log on an AOS/VS Business BASIC system at 8:00 a.m. the next day with virtually no change to the users' environment is really something good to hear. Phil Robson and Tony Deakin did a terrific job!

Something else that might help someone convert from RDOS Business BASIC to AOS/VS Business BASIC is chapter eight of the new *Programming with Business BASIC* manual (093-000480). It documents all of the problems mentioned in this article, as well as other issues that need to be considered when upgrading to AOS/VS Business BASIC.

Chapter eight discusses what you need to do to move files between operating systems and what compatibility issues you should keep in mind. There is an entire section devoted to operating system differences with a list of commands, statements, functions, subroutines, and utilities that are specific to each operating system.

I hope the additional information in this new manual will be useful, and would like to congratulate Phil Robson and Tony Deakin for the good work.

Ann R. Page
Data General

Corporate Systems Support
Research Triangle Park, NC

Macro of the month

Each month, I read *Focus* magazine with hopes of finding something that will aid me in my job. The Marketing Services division of Westinghouse Electric currently has seven MV/20000s and 16 MV/10000s with about 1,200 users. With such a large community of users, problems do arise. We are constantly developing new software to aid us in the maintenance of such a system. I am

submitting to you a macro that I developed to help us in this task. I hope other readers of *Focus* can also benefit from your magazine. Might I suggest that a new column be added to *Focus* called "Macro of the Month" or something along that line and that you request the readers to share their wealth, so everyone can benefit. Please consider the attached for your next [issue].

Richard D. Joslin
Westinghouse Electric Corporation
Pittsburgh, PA

DBLOCK

Have you ever needed a new utility or perhaps just an enhancement to an existing utility? I'm sure that most of you would answer yes. Not all of the utilities you need require creating new programs, but rather a new way of utilizing the programs you currently have. The AOS/VS CLI is the interface our analysts use for enhancing and maintaining our system. By creating more complex CLI macros, we have been able to simplify some of the common tasks of system maintenance. In solving some of the problems, from the simplest to the most complex, an analyst will use the DISPLAY program to view the actual contents of data files. Many times, they must view the data again and again, trying various switches in order to find the one bit or byte that was corrupted.

To simplify this task, I developed a DBLOCK macro (Display BLOCK) that allows a user to view single blocks of data while reducing keystroke time and errors. This macro (shown in Figure 1) retains the filename and the switches used when invoking DISPLAY. The user is prompted to enter the block number desired for viewing. The default accepts input in octal, but even that can be changed for those who prefer to work in decimal. Using commands, the user can change the filename while retaining the viewing parameters, or the user can change the viewing parameters while retaining the filename.

A good example of the usefulness of this utility is the tracing of chains in

the CEO_POA_DB. The CEO_POA_DB is a link-list data structure with each record being a single disk block. The block address is the block displacement into the file in octal format. To follow the chain, you enter the octal address of the next block. The next block or record contains the pointer to the next record, etc. By displaying one block at a time in octal format, it becomes a simple task to follow the link list. However, you need to know the format of the records, which is available in the CEO internal course offered by DG.

For those of you who don't know the benefits of CLI macros, you may find this one interesting. It is a recursive macro with three separate logic paths. It makes use of switches, arguments, and variables. It assumes that DISPLAY can be accessed by your searchlist. If this isn't the case in your environment, modify the PROG to use the full pathname to DISPLAY.

A help facility for DBLOCK can be accessed by issuing the command H. The following will be displayed:

```
Display Block Help
DBLOCK displays the contents of a specific
BLOCK of a file.
It takes two arguments: 1—the filename 2—the
block number
The block number is in octal by default.
Switches: /D for decimal input
All others are passed to Display
Commands
E—exit
F—change filename
H—this help screen
I—display information
Q—quit
S—change switches
```

The arguments are not required. If you do not enter them, DBLOCK will prompt you for them.

Examples of invoking DBLOCK:

```
DBLOCK :CEO.MAIL:CEO_POA_DB
```

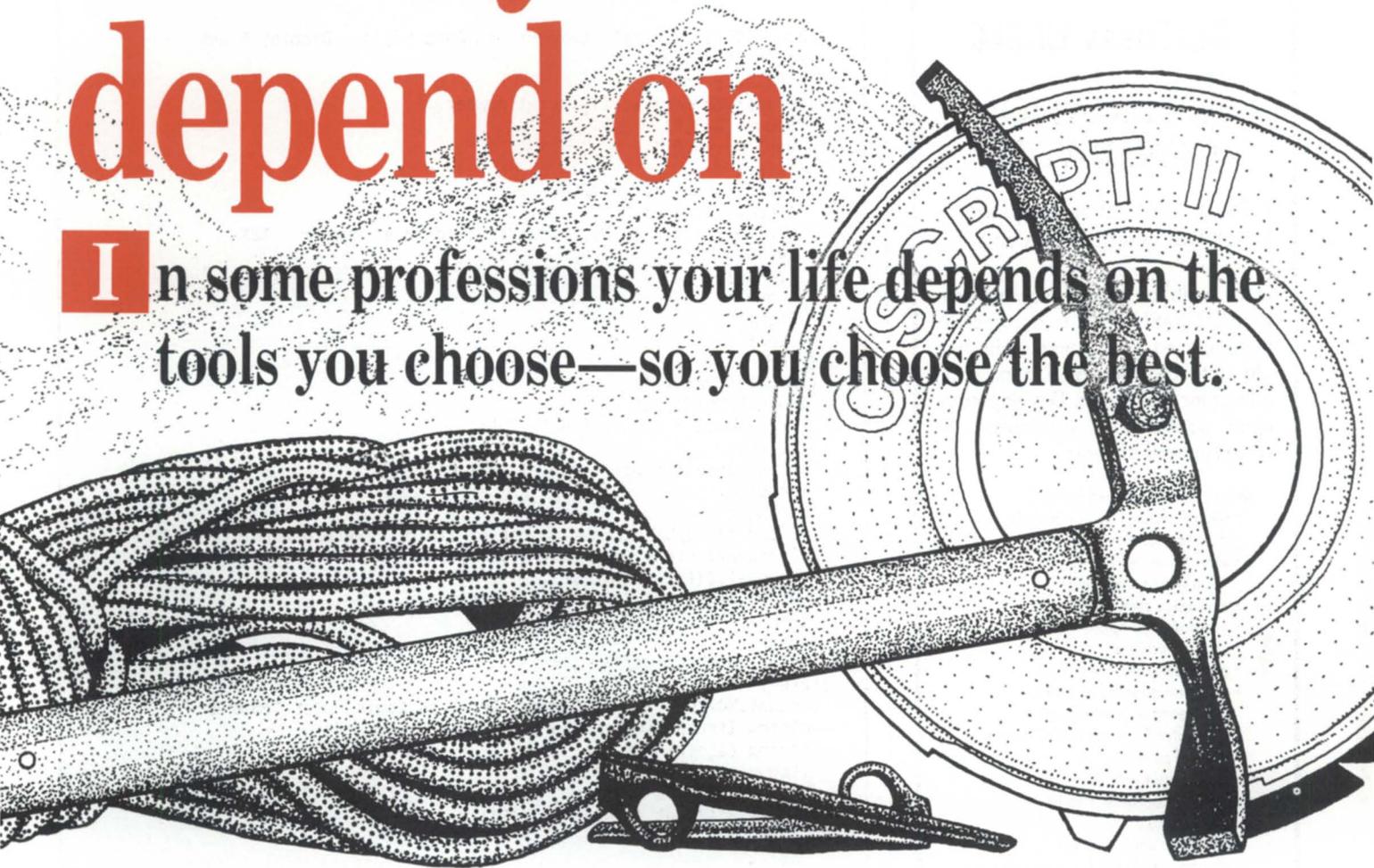
Octal mode and no switches.

```
DBLOCK/T/D :CEO.MAIL:OP:CEO_MESGS
```

```
Decimal mode and text display.     Δ
```

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Figure 1: DBLOCK macro

```
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comm By Richard D Joslin * Date 06-12-87

[!equal,%0/3rd%,/3rd]; Comment 3rd Pass Logic - Display Block
[!equal,%0/d%,/d]
var1 %2%; var0 1
[!else]; Comment verify octal number
[!equal,%2%,0]
var1 0; var0 1
[!else]
var1 0; var1 [!dec %2%]
[!equal,[!var1],0]
write [!asc 212 207]Error: Invalid octal number - %2%
var0 0
[!else]
var0 1
[!end]
[!end]
[!end]
[!equal,[!var0],1]
[!equal,%0/d%,/d]
write Base : [!umu,[!var1],256]
[!else]
write Base : [!oct [!umu,[!var1],256]]
[!end]
string/k
proc/def/ioc/block/name=dblock_of [!pid]/1=warn/2=warn/string &
display/first=[!var1]/last=[!var1]%0\d\2nd\3rd\first\last% %1%
[!nequal,( [!string] ), ( )]
write [!asc 212 207]Error: [!string]
[!end]
[!end]
string %0%%0\3rd%/2nd %1%
[!else]
[!equal,%0/2nd%,/2nd]; Comment 2nd Pass Logic - Get Command
string [!read Block Number? ]
string ( [!string] )
[!equal,[!string],]
string %0% %1%
[!else]; [!equal,( [!string] ), (E)]
pop
str/k
[!else]; [!equal,( [!string] ), (Q)]
pop
str/k
[!else]; [!equal,( [!string] ), (H)]
string %0%%0\2nd% %1%
write
write Display Block Help
write
write DBLOCK displays the contents of a specific Block of a file.
write It takes 2 arguments: 1 - the filename,,2 - the block number.
write The block number is in octal by default.
write
write Switches:,,/D for Decimal input
write,,,,,,,,,All others are passed to Display
write
write,Commands,,,,E - Exit
write,,,,,,,,,F - Change filename
write,,,,,,,,,H - This help screen
write,,,,,,,,,I - Display Information
write,,,,,,,,,Q - Quit
write,,,,,,,,,S - Change switches
write
[!else]; [!equal,( [!string] ), (I)]
string %0%%0\2nd% %1%
[!else]; [!equal,( [!string] ), (f)]
write
pop
```



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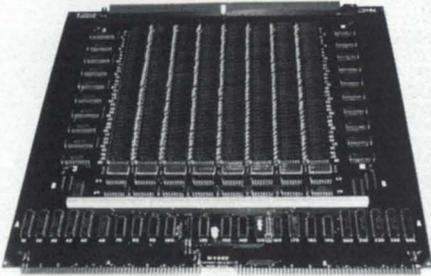
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LETTERS

```
string %0%\%0\2nd%
[!else]; [!equal,(![string]),(S)]
write
string (![read Switches? /])
string %0%\%0\2nd%,(,)/[!string][!end] %1%
[!else]
class(1 2) ignore
[!equal,![string],0]
string %0%\%0\2nd%/3rd %1% [!string]
[!else]
var0 0
var0 [!string]
[!equal,![var0],0]
write [!asc 212 207]Error: Not a valid number - [!string]
string %0% %1%
[!else]
string %0%\%0\2nd%/3rd %1% [!string]
[!end]
[!end]
[!end];[!end];[!end];[!end];[!end];[!end];[!end]
[!else] ; Comment 1st Pass Logic - Find File
push;prompt pop
[!equal,%1%,]
string (![read Filename? ])
[!equal,(![string]),(,)]
pop
string %0%
[!else];[!equal,(![edir [!str]]),(,UPD)]
Write ACCESS DENIED!
pop
string %0%
[!else];[!equal,(![string]),(E)]
pop
string/k
[!else];[!equal,(![string]),(Q)]
pop
string/k
[!else]
string %0% [!string]
[!end];[!end];[!end];[!end]
[!else]
string [!path %1%]
[!equal,(![string]),(,)]
write Filename does not exists: %1%[!asc 207]
string %0%
[!else]
write
write File Pathname : [!string]
write Display Switches : %0\first\last\2nd\3rd\d%
[!equal,%0/d%,/d]
write Request Mode : Decimal
write File Byte Size : [!size [!string]]
write Maximum Block Size : [!udiv,[!size [!string]],512]
[!else]
write Request Mode : Octal
write File Byte Size : [!loct [!size [!string]]]
write Maximum Block Size : [!loct [!udiv,[!size [!string]],512]]
[!end]
write
[!equal,%2%,]
string %0%/2nd [!string]
[!else]
string %0%/3rd [!string] %2%
[!end]
[!end]
[!end]
[!end]
[!end]
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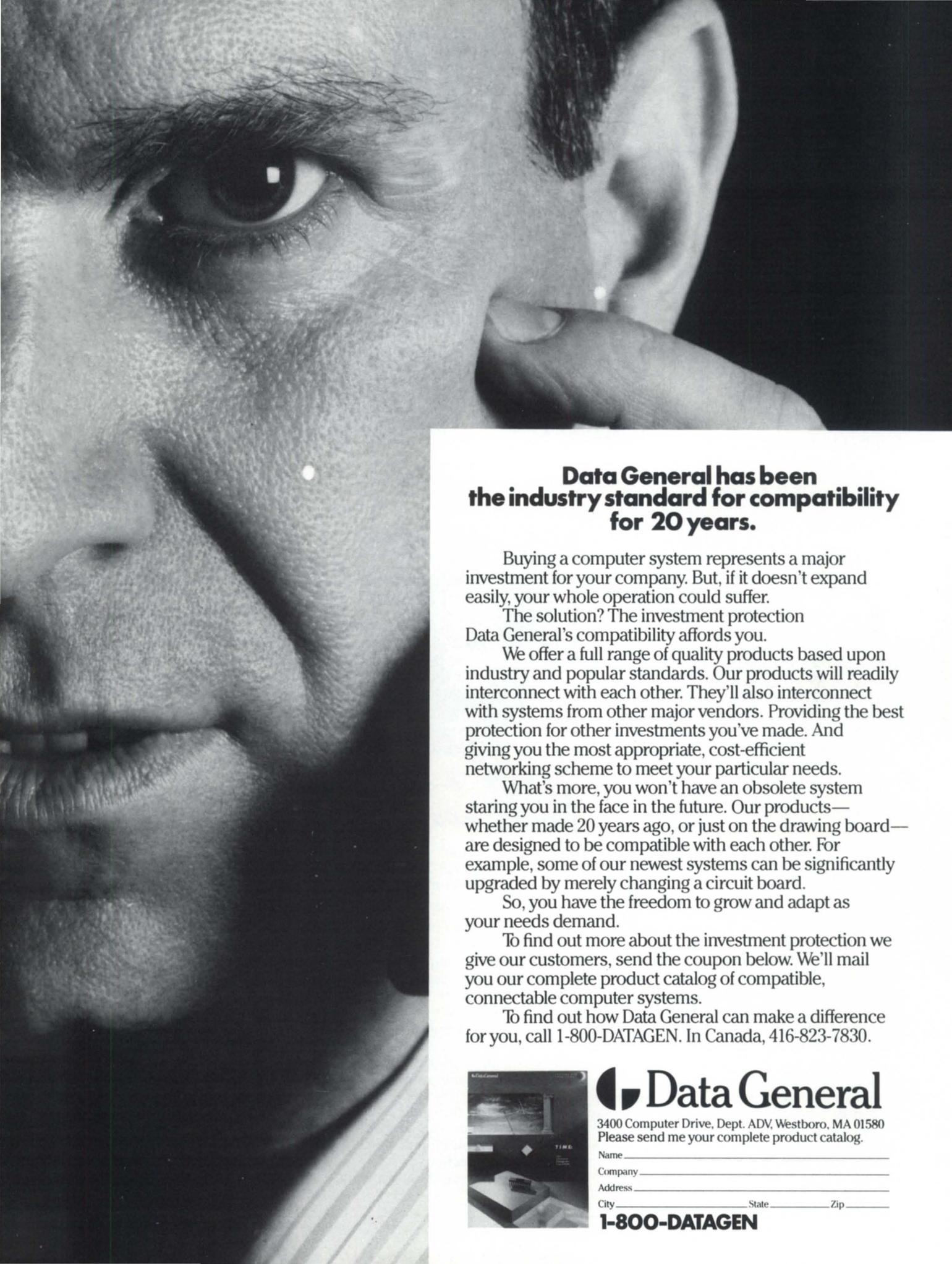
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CIM

TAKES OFF IN AEROSPACE INDUSTRY

Manufacturing system helps a subcontractor's production fly

by Frank Widder
Special to Focus

David Wickey, data processing manager for California Hydroforming, the largest southern California subcontractor for custom hydroformed metal parts for aerospace contractors, says that the job of tracking accounting and production information without a workable computer system would be like "finding a bad noodle in a bowl of spaghetti."

Fortunately for Wickey, the 30-year-old, California-based company no longer uses its old manual system for controlling job cost, payroll/accounting, and inventory. To keep up with increasing business, California Hydroforming implemented an automated system to maintain labor costs, track outside processes from vendors, handle accounting/payroll functions, monitor inventory, and streamline purchasing. The new system is sophisticated enough to handle the requirements of clients such as Hughes, Boeing, McDonnell Douglas, Rocketdyne, and Lockheed.

The software package, called Dynamic, is designed for multiuser, MRP II-based manufacturing environments. Created by Compusource of Torrance, California, Dynamic operates on Data General minicomputers and allows companies to choose related function modules that can immediately integrate with the modules already in a system. The company recently upgraded from a Data General Nova 4 system that was working at capacity to an MV/2000—with 2 MB of memory and 120 MB of hard disk.

California Hydroforming's upgraded system and software has meant an increase in the work that existing personnel can handle. "We attribute a 30 to 40



David Wickey, data processing manager at California Hydroforming, utilizes the Dynamic manufacturing software. The system is based on a Data General MV/2000.



Operators input work status for each job completed at California Hydroforming's plant.

percent increase in throughput and efficiency versus the previous Nova system," Wickey said.

"It's been a real savings in terms of personnel, since we probably would need two or three more people just to keep track of the jobs," said company president Charles Heimlich. "Because we can track jobs more easily, it gives us more credibility with customers."

Before the company came on line with the Data General system, it relied on a service bureau to handle accounting functions and on manual methods to control manufacturing and purchasing management functions.

"When we were recording manually,

we kept a job card for each man on the shop floor with the job number, the number of pieces, and operations performed," said Heimlich. "Not only was this more work for each employee, but another person had to manually sort and enter the information onto a ledger, so we could analyze the job cost. Depending on the job, we'd be one or two months behind."

Tracking jobs through the shop is a critical function. Considering the cost of some of the exotic sheet stock, such as cobalt, titanium, and platinum, it's no wonder that this is one of the most important functions of the system for California Hydroforming.

Most routing procedures employ 15 to 20 steps, including rough shearing, hydroform preparation, hydroforming (a process that uses rubber backed by high pressure oil, and a moving punch to shape the material to specifications), finishing (sometimes sending out the finishing to subcontractors), and quality control approvals.

On the average, California Hydroforming handles 200 to 300 separate jobs per month—each varying widely in complexity and processing time. This makes Dynamic's Extended Work Order Status (WOS) module particularly valuable to track and analyze work orders as they move through the shop.

As a basic function, WOS can create a new work order, release it for processing, and assign exact materials for the job. In addition, WOS allows California Hydroforming to calculate feasible due dates based on estimates and historical data related to job tasks. The program then tracks each work order as it moves from each processing station—provid-

ing ongoing work order history and reports on work load and productivity by department, station, or individual employee.

Those in charge of production control can call up information on screen and answer questions by phone. Previously, they would have had to run to the shop and find the information manually.

"Getting the status of a job is a lot faster," Heimlich said. "At every workstation, each employee punches in the work data after completion, and the information goes in several different directions. It goes into a program to establish at what step you are in the job, links to job costing to establish whether the job is a money-winner or loser, and tracks each employee.

"We get an efficiency report on the shop and individuals, and the computer shows exactly whether an employee is working efficiently," Heimlich said. "The first time a job goes through, we change our estimates a little bit. I believe in having yardsticks of what the employees are accomplishing. We no longer argue about how long a job should run, because we have a history of every type of operation.

"Customers like the fact that we can punch up the information on their orders and give them immediate answers," Heimlich said. "In the past, we would have to search around the shop, find the right folder, and see where the job was. This is an advantage because of the number of small, custom job shops that compete with us."

The employees' reactions to the system have been excellent, according to Heimlich. "Once we got them used to punching in information, they liked the system a lot better, because it was faster and easier."

California Hydroforming's current system employs 10 full-time administrative users and two in-shop terminals. One benefit of the new system is its capacity to allow more users to access the data base easily. Executives such as vice president Jim Irvine and purchasing manager Steve Lorincz, who never used the Nova 4 system, are now using the MV/2000.

"Our purchasing programs allow us to be neater, faster, and more efficient," Lorincz said. "We used to use a seven-column book that we entered information into by hand. Now, the program ties into receiving and accounting, which saves time. We also keep

monthly printouts to verify delivery and costs."

Inside the administrative offices, bookkeeper Sue Reading believes the system performs the work of at least two other accounting people. "The system does just about everything. Once it's understood, it's very easy and very traceable, which is important in dealing with 300-plus vendors and 200 invoices

per month. Occasionally, we'll come across one or two adjustments needed for a particular client, but nothing that we haven't been able to work out within half an hour." Δ

Frank Widder can be reached at Dateline Communications, 1255 Lincoln Blvd., Suite 300, Santa Monica, CA 90401; 213/393-9494.



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MANUFACTURING A STRATEGY

Multiple partnerships keep Data General active in CIM

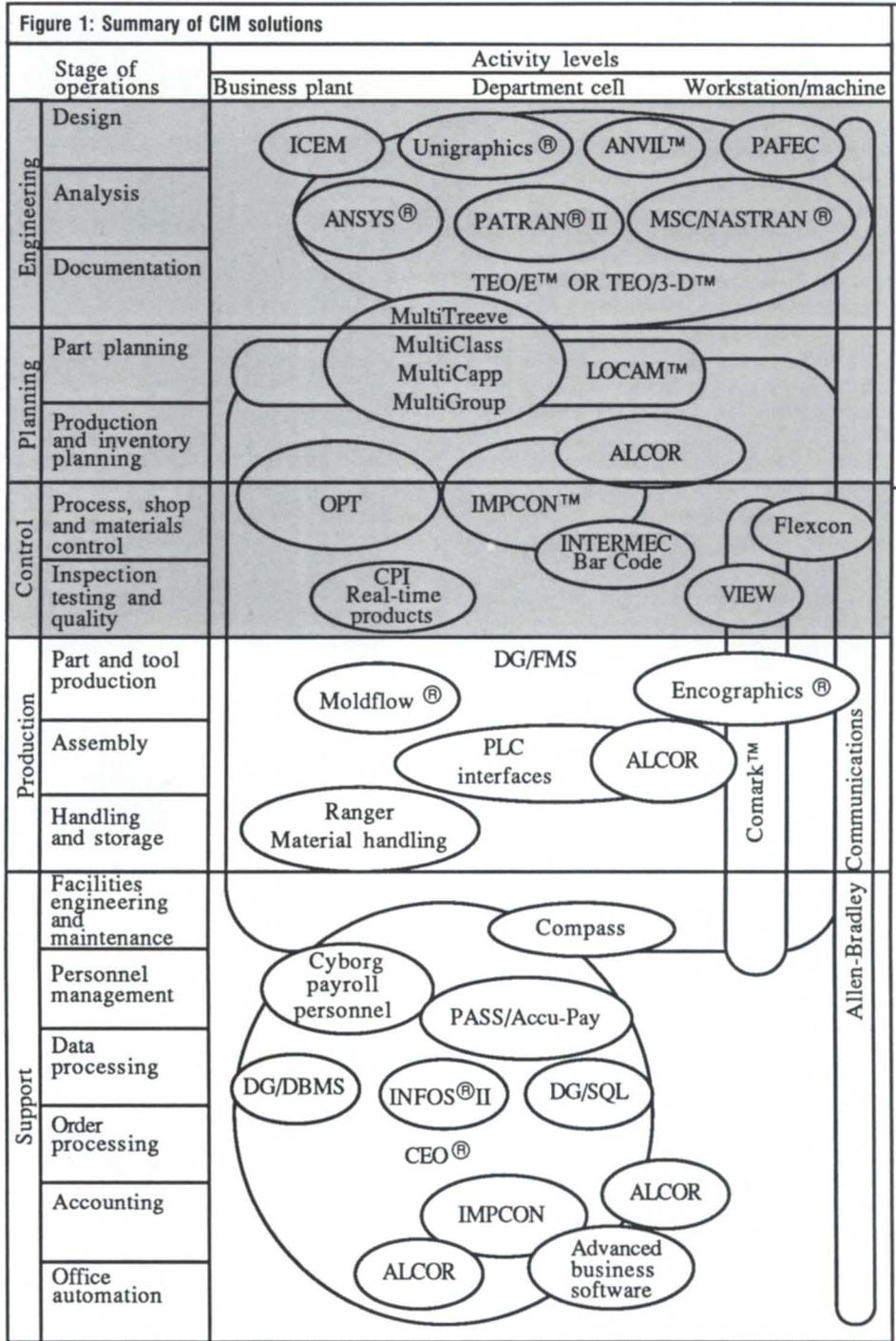
by Geri Farman
Focus staff

Stock market crash, ailing U.S. industries, foreign competition—despite worldwide economic conditions, spirits are high at Data General. “We are very upbeat about the prospects for U.S. manufacturing and our ability to affect the competitive edge of our industries,” said Terry Bennett, director of Data General’s Manufacturing Industries Marketing. “Current events are changing the competitive issues—what people are interested in doing for their company by putting computers in their manufacturing operations.

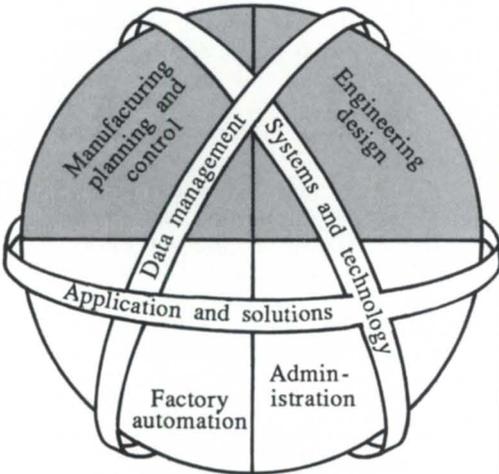
“Our philosophy toward CIM (computer-integrated manufacturing) differs from some other views. We believe that people ought to view each acquisition first and foremost as a way to solve business problems and second with an eye to a longer range strategy of obtaining a more integrated environment.” Bennett emphasized that each project should pay for itself and be open in terms of communications, data access, and adherence to standards, so it can be integrated with other systems downstream.

“The very large Fortune 500 [companies] can say they are going to save the north wall and replace the rest of the plant,” Bennett said. “The rest of the manufacturing world has tighter capital constraints and has to be able to grow their system in increments—finally arriving at the kind of integrated environment they want. We think we’re absolutely superior in being able to supply those types of needs, and we have some strong partners working with us to do the kinds of custom integration that are a requirement to grow their factories.”

Data General’s CIM environment and the solutions they can offer through various partners are summarized in Figure 1. “Our strategy,” said Bennett,



"has been to sign up the 'best of breed' in each functional area. In sharp contrast with DEC, we don't sign up every vendor in the world. Instead, we make sure we have the right functional software available for our customers and can offer more value to the software



vendors. They have a de facto exclusive relationship with us." Slightly less than half of DG's business in manufacturing is done through these OEMs or VARs.

As an example of the cooperative solutions approach DG pursues with their VARs, DG worked with several other vendors to install an MRP (manufacturing resource planning) system at the Kaiser Aluminum factory in Erie, Pennsylvania. MRP software takes the order stream, bill of materials, available equipment, and processes and time required to make each part of a product and determines what the manufacturing schedule should be in order to meet delivery dates. "In a very changing manufacturing environment with custom or made-to-order work," Bennett said, "it's an absolutely essential piece of software."

Empire International, Concord Data Systems, and DG worked with a team of engineers at Kaiser Aluminum to install MRP and interface it with their corporate IBM system and to interface all of that to a MAP (manufacturing automation protocol) network to connect to the shop floor and an energy management system—and so on. "Energy savings alone paid out in a very short period," Bennett said, "and saves them about \$60,000 a month."

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Focusing on shop-floor solutions, Bennett highlighted DG's joint marketing and development relationship with GE's Turbine Business Group. "It's a very strong indication of our commitment and stature in these markets that we are able to attract companies like GE to these cooperative relationships."

DG has taken over maintenance and enhancement of the Factory Manage-

ment System developed by GE. Now called DG/FMS, the software runs GE's large steam turbine plant in Schenectady, New York, on a large number of MV systems. DG/FMS consists of four components: shop-floor control, factory communication, direct numerical control, and maintenance logging. The system is modular so that people can grow into it. "In our market research," said

Bennett, "it is absolutely unique for the span of functionality it brings into a single integrated system—and it absolutely pays for itself. GE is reporting a better than 35 percent return on investment."

Data General works with GE consulting services to market and install the DG/FMS system. The system has to be customized to match a company's own choice of MRP software, process planning software, part nomenclature, and work center nomenclature. It takes input from the MRP master schedule, routings, process plans, and numerical control programs and produces packages of information for terminals on the shop floor under a short-term scheduler.

One of the most important product developments supporting DG's manufacturing strategy is the set of MAP products. A fundamental component of CIM, MAP is a set of communication standards spearheaded by General Motors and up to 300 other user companies. The objective of MAP is to integrate multivendor environments and communicate between a variety of different devices.

Data General has made a commitment to MAP 3.0 and is in beta site with MAP 2.1. The complete specifications for MAP 3.0 will probably not be available on the scheduled date of June 1988. Promulgation of these specifications is in the hands of the MAP Specification Committee and the Corporation for Open Systems. A major problem is that MAP 2.1 won't be able to connect with 3.0. According to Bennett, the committees are taking time to make sure this time that there will be upward compatibility.

Given the delays and changes in the MAP protocols, Data General's strategy is to use MAP 2.1 as a training ground. "We intend to work with companies such as Allen-Bradley and MRP vendors," said Bennett, "to make sure that when we have a beta product available for 3.0, real applications will be available."

Their work with Allen-Bradley is seen as one of Data General's most important approaches to MAP development. "We recognized our place in the spectrum of control systems and automation systems at the factory and sought a good partner for the active control element," he said. As an IHV (independent hardware vendor) for DG, Allen-Bradley supplies several different

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components needed to build a MAP network, such as remodulators.

Data General also worked with Allen-Bradley to jointly develop a software driver and modem interface to Allen-Bradley's proprietary Data Highway—a predecessor to MAP. With this approach, the large installed base of Data Highway customers will continue to benefit from their existing investment. Data General is in turn an OEM for Allen-Bradley for their modem chip set—installing the chip sets on DG's modem board that interfaces DG's product line with the MAP network.

"Possibly the most important thing is that we are going to subcontract cabling services for our customers to Allen-Bradley," said Bennett. Since Allen-Bradley has probably installed more miles of cabling in shop-floor environments than anyone else, their capabilities are seen as a strong plus for Data General customers.

Other companies such as DEC and IBM try to do a great number of these system components themselves. Base-way is DEC's competitor to Data Highway, and they attempt to do a great deal of the shop-floor hardware themselves. IBM competes with Allen-Bradley and Gould. "We don't," said Bennett, "and that makes our relationship with Allen-Bradley even more comfortable."

The new agreement with NTT is synergistic with Data General's overall CIM strategy. Large companies often need to distribute information on a real-time basis. A wide area network capability can be an effective way to knit together operations. "Basically," said Bennett, "the NTT work is a good fit with the corporate view of connectivity."

In fiscal 1988, the thrust of activity will be to continue to develop the strong relationships with partners that have characterized recent CIM strategy. In particular, Data General will be cultivating its partnerships with system integrators. "Every company you look at," said Bennett, "has a different set of business and technical problems with a resulting need for a custom-crafted system." Companies need to study their own business problems and then work with the system integrator or hardware or control specialists to help solve those problems.

At the same time, Data General will emphasize its approach to CIM with end-user companies. "End-user companies are hoping some consultant will

come in and tell them what to do. But they really have to stay involved—studying their own problems and identifying the root causes. We can help with the analysis, but the company has to help identify the most important problems and determine what technology they can afford for now—and later."

Since each company has a different

history, they need to look at a sequence of technology-oriented projects. Throughout the process, the key is to keep from being stuck in a box. "Data General's emphasis on open systems architecture, standards, open data structure, a wide range of expertise, and contractual flexibility allows companies to grow into a fully integrated system." Δ

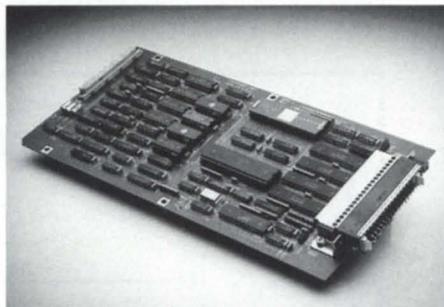
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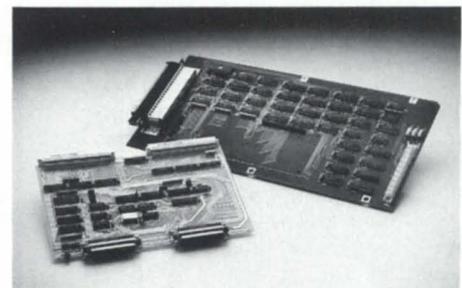
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CAN YOU MANAGE CIM?

How do you define your needs and maximize the benefits?

by Kevin O'Hara
Special to Focus

Most periodicals in the past few years have talked about the "factory of the future" and how automation will save the U.S. manufacturing base. We are bombarded with advertisements on all the technology available to automate our factories. Data General has a complete line of tools to fully automate and integrate any factory.

With so much CIM (computer-integrated manufacturing) activity, why do we hear of so few successes? The CIM situation is similar to the rush to install MRP (manufacturing resource planning) during the past 15 years. Many firms tried, but few reaped the benefits. The inability to implement these new technologies raises serious questions. Are we incapable of implementing these improvements, or are we approaching the solutions incorrectly? Perhaps we are approaching these solutions without the complete facts about our firms' needs and our ability to absorb these new technologies.

Why do American manufacturers have trouble implementing automated systems? Clearly, we never knew how information in our manual or semi-automated system was processed, so how could we expect the new automated system to cure information processing problems we hadn't addressed? We expect new technology to solve our problems; however, for it to be effective, we must know (1) how we currently operate as a company, (2) how we would like our company to operate in the future, (3) how long we anticipate it will take to reach our goal, and (4) the resources required to move from the present methods to our vision of the future.

To get a project of this magnitude off the ground, we first need to set goals. These goals can be adjusted during the

process of the implementation to meet changing conditions. This flexibility is not only prudent, it's usually unavoidable. (I wonder how many project goals changed after the stock market's "Black Monday.") However, we still need a peg in the ground, so we can measure and monitor the project.

You use a simple information flow chart to determine how information flows in your present operation and how the information will flow in the future. This technique is as useful today as ever before. If your firm is ready to move into a CIM environment, you should be able to answer the following questions in order to assemble all the essential information required to move into a more automated operation.

- Have you produced a detailed outline of how all information flows in your firm?

- Within department(s), have you calculated how much data there is and detailed the expected and actual turn-

around time for that data?

- What are the primary jobs of a department(s) versus the paperwork processed in the department on an ongoing basis?

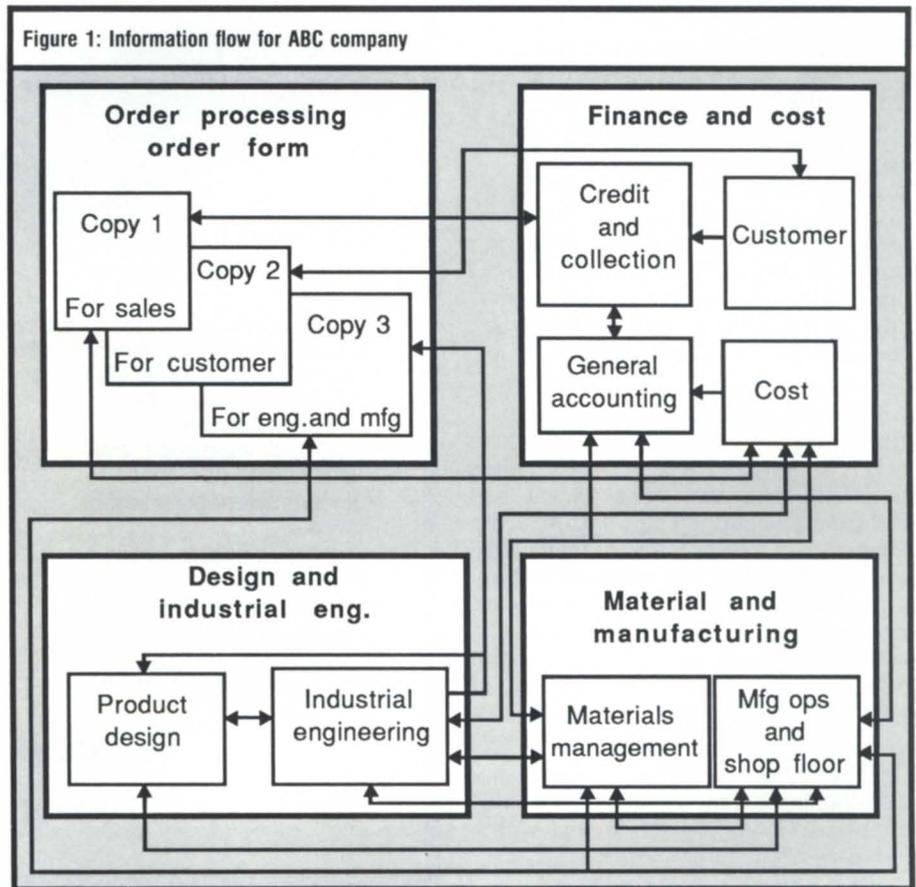
- How critical is the department(s) information output to the success of shipping the product to the customer on time?

- Does the department(s) act as a funnel, controlling the flow of information from one department to the next?

- Has a resource needs profile been developed for all departments outlining what type of information will be processed and who will process that information?

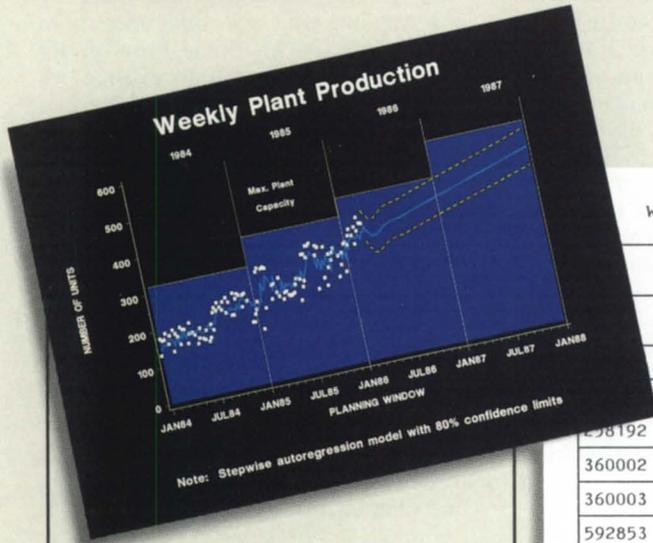
- Does management understand and concur that, in a more automated factory, changes to the schedule must be reviewed and analyzed prior to execution?

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FOCUS ON: CIM

money to have reviews performed on their operations. These reviews spell out the manufacturing volumes and processes, and culminate with a document that the firm can use as an RFP (request for proposal). Unfortunately, many of these RFPs never address the problems the company will face as they are implementing and executing their new systems. These documents tend to be clinical. Rarely do they discuss the impact on the flow of information within each of the affected departments. Simply performing a survey in each department won't reveal *how* data is handled, but only *what* data is handled. Unless your RFP is based on knowledge of the flow and timing of your data, you might become one more firm to install a functionally perfect, but not company-compatible, system.

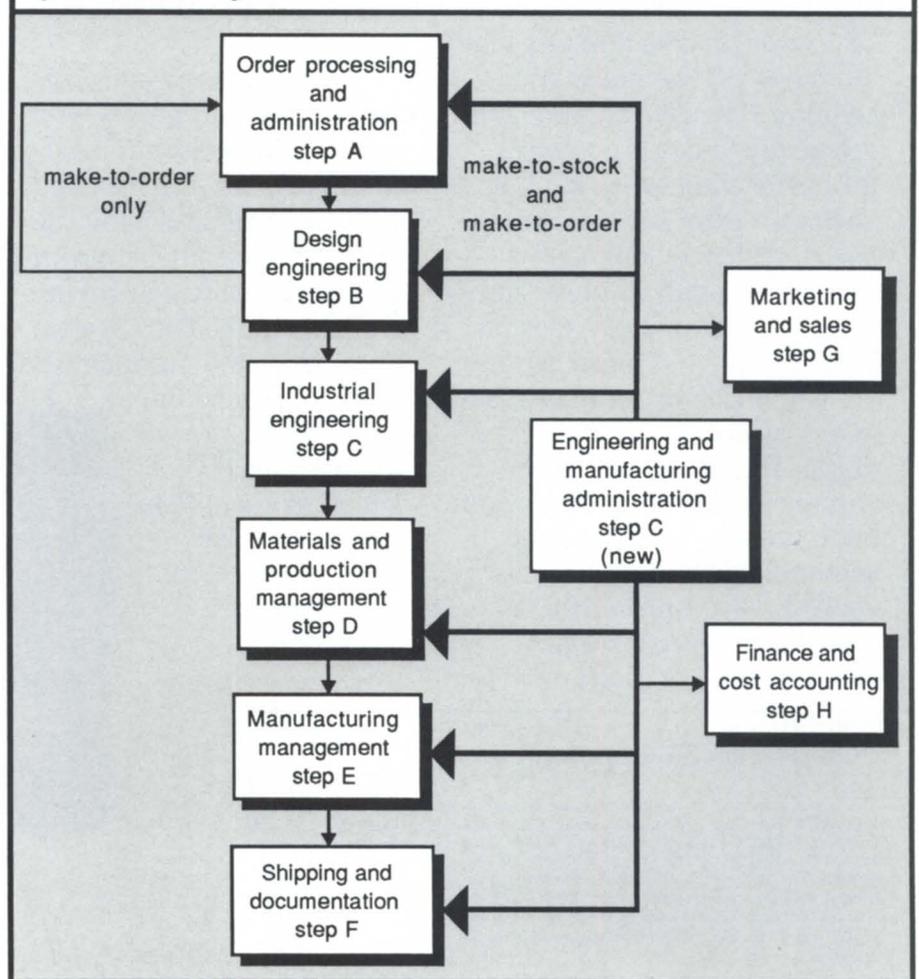
Understanding the processing and handling of information is a significant undertaking for your firm prior to im-

plementing a new system. To help sort out the various documents and their interaction, you must create an information flow profile (IFP). A simple but effective method to create an IFP is the "brown bag method." You start by covering one wall of a conference room with brown paper. Some firms prefer this method for several reasons: it's easier for people to visualize the entire company's information flow at one time, and it's easier for management to monitor the progress of the project. (See Figure 1.)

In the example using company ABC, I depicted how ABC's documentation flow now operates. To keep the illustration meaningful, I used only one document, the order entry form, as an example.

ABC's order form has three parts. Part one remains in order administration, part two goes to the customer, and part three is used internally by engineering and manufacturing. As you trace down

Figure 2: Committee organization





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all the departments this one document flows into, you see that materials and manufacturing have the greatest degree of interaction with all the affected departments. To start and define the IFP for each department, you must quantify and qualify the following information.

- Who receives this document?
- What is the turnaround time for this document?
- How long will it take the receiving person to perform a task?
- Who is the receiving person's backup, and how much time exceeding normal duties does the backup person have to contribute to this activity?
- Will the new system require less or more information to be analyzed by the receiving department?

In this example, I am reviewing the work load for only one document. You would ask these five questions for all documents that flow into a department. You are looking for the cumulative impact of document processing time versus the department's available clock time. Experience tells me that certain departments, normally engineering and materials, have more information to process than there is time available.

Many firms might say it is this information logjam that requires factory automation, thereby improving product deliveries, reducing costs, and allowing the firm to be more competitive. However, speeding the flow of information doesn't mean you will receive those benefits. More than likely, those departments are acting as a buffer for the factory. They are releasing only those bits of information that are required to meet the schedule. If information flows faster through these departments and goes directly to the shop floor, what mechanism will the shop floor have to separate fact from fiction? Remember, engineering can make design changes faster than materials management can purchase new material and manufacturing can change over a machine. Just increasing the flow of information won't help improve your firm's productivity.

Once you have reviewed all the documents that reach a department and determined available versus loaded time, you now can review how your new system will move information. After you have completed the IFP analysis of the new system, you overlay the new IFP for the company on the present IFP. Now comes the hard part: management must decide how to address the

differences in the two profiles. If you don't address the *differences*, and you only use the profiles as a reference, your CIM project could be off to a rocky start. You may find parts of your project have to be delayed. Pushing out the implementation of one or more sections of your CIM project is better than spending time and money and not getting any payback.

Your analysis may show that you

have all the staff you need to make the project work, but personnel may have to be moved to new departments and retrained to meet the changing information flow. You may conclude that no matter how you adjust the staff, the realities of your firm's environment preclude an implementation of your idea of a total CIM solution. In most firms, you can implement parts of a total CIM solution and receive a good return for

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THE 100 PERCENT SOLUTION

Data General's systems engineers are some of the unsung heroes of the DG community. Their goal: helping customers get maximum productivity from their Data General system. Their methods: anything and everything imaginable. A look behind the scenes gives a better picture of who these people are and why they have earned their reputation.

Tom Hopkins, director of Data General's North American Systems Engineering, said that as part of the Data General sales team, the mission of the systems engineers (SEs) is to focus on technical pre-sales requirements. "In this capacity," said Hopkins, "the SE is involved with the customer during the entire process, from conceptualization to implementation." Their job is to understand the customer's specific needs, evaluate possible solutions, develop prototype applications, determine the most effective solution, and ensure a smooth implementation process. Along the way, the SEs may have to use all their training and creativity to provide the right solution.

Systems engineers are trained to solve multifaceted problems and handle complex configuration requirements. For example, a federal agency in Canada uses its Data General computer system for Oracle, CFO (Comprehensive Financial Operations), and CEO software applications in offices throughout Canada. The configuration includes 30 Eclipse MV/2000 computer systems controlled by an MV/10000. The customer plans to upgrade the MV/10000 and add another 45 MV/2000s. The customer is also converting from an IBM mainframe to a Data General system. This customer has purchased a wide range of Data General products—from processors to software, such as CEO Drawing Board, Wordview, and the DG/One computer for road shows.

The SE organization was given the task of making the machines work together. This project has involved a full-



FOCUS ON: SYSTEMS ENGINEERING

Systems Engineering finds the answers

by Paula Jacobs
Special to Focus

an existing IBM SNA network, it was necessary to base the CEO mail facility on an IBM SNA communications foundation.

The systems engineers investigated a number of solutions that would work in this multiple IBM 3275 environment: IBM's NPSI in conjunction with DG XDLC; DG SNA/backbone; IBM's NRE; and DG SNA LU 6.2. However, none of these solutions provided the specific capabilities required.

During the investigation process, it became clear that the customer's primary communications vehicle for exchanging documents between IBM systems would be IBM's Distributed Office Support System (DISOSS). Data General worked with the customer to define the capabilities for a product Data General was considering building to connect DG's CEO software and IBM's DISOSS. Systems Engineering coordinated the efforts of Data General Product Marketing and Development and worked with the customer's staff to define these capabilities. The proposed solution, now known as CEO/DXA, is based on SNA and can mail documents and messages. The customer became a beta test site for the product, and they later decided to implement it.

Data General's Product Marketing and Systems Development divisions look to Systems Engineering as a valuable source for customer product requirements. Systems Engineering is also depended on to strengthen the Data General product line.

In working with customers to find the right solution, Systems Engineering has access to full Data General resources. "While working on your consulting project," said Hopkins, "the SEs will put you in touch with the appropriate Data General group to help meet your needs, whether it is SPSD for custom code, SEPAC for performance analysis, or Educational Services for formal training."

Customers can easily take advantage

time SE on the premises for several months. Network planning is a major part of the work, because the network will eventually contain 75 machines, as well as PCs connected to the host via CEO Connection software. The CFO conversion from IBM required writing special utilities.

Systems engineers often provide service beyond the customer's original request or expectation. In one case, an SE was hired to help a travel agency with their own customized operating system. While the SE worked on a specific application problem, he also investigated the company's response time problems on his own, made necessary modifications to the code, and offered suggestions for performance improvements. The customer was so impressed with the level of commitment displayed that a dinner was held in the SE's honor.

In some instances, Systems Engineering solutions for a specific customer may later become standard Data General products. Consider the development of Data General's CEO DXA software, which provides an interface to IBM's Document Interchange Architecture (DIA) and Document Content Architecture (DCA).

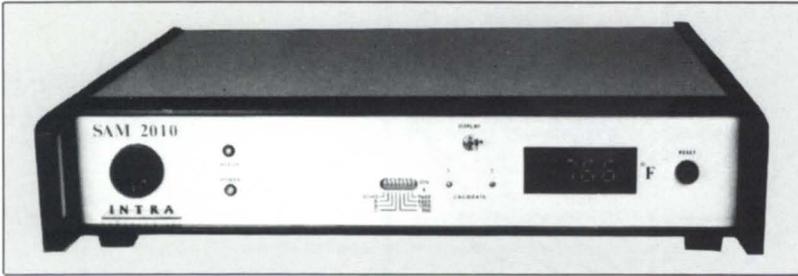
A Data General customer required a communications facility that would allow remote Eclipse MV systems to send critical plant information to an MV system at the department headquarters. Information from the headquarters would also have to be sent to the remote sites, but only documents and messages needed to be sent. (The customer didn't foresee transmitting large, bulk files.) These systems would be running CEO. Since the customer had

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of Systems Engineering services. SES are located in offices throughout the United States and Canada, and are backed by regional and area specialists. A multilevel management team is used to provide prompt attention to customer needs. Project teams are also available to perform an entire installation for a customer throughout the country and for extended time periods. In some cases, SES have provided customized training and implementation for up to two years.

To make sure that the SES can provide the broad range of solutions required by various customers, Data General emphasizes individual technical excellence. "Our objective," said Hopkins, "is for the Data General systems engineers to be the best technical consultants in the industry today." Each system engineer participates in a personal development plan to enhance professional skills and to keep abreast of the latest technology and trends. An internship program in other support/development organizations allows SES to broaden their product knowledge and skill set.

Customers can call on Systems Engineering to:

- perform needs analysis studies (given appropriate customer requirements and materials)
- work with a customer to identify solutions to best meet that customer's needs, including Data General hardware and software, as well as third-party hardware and software solutions (given appropriate customer materials and specifications)
- help review the viability of proposed solutions
- review system configurations for correctness and adequacy
- recommend comprehensive services to ensure successful implementation.

NADGUG's RIG/SIG groups can take advantage of other Systems Engineering services, such as speakers, demonstrations, and presentations. Area technical support groups are specifically chartered to communicate "leading edge" product information to customers, prospects, and employees.

For additional information or assistance with specific Systems Engineering projects, contact your local Data General Systems Engineering office. Δ

Paula Jacobs is senior marketing communications specialist within Data General's Software Products and Services division.

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A DISPLAY OF WARES

A checklist of CRT features may help you select a terminal

A lot of users these days would say that terminal emulation software and personal computers have made video display terminals obsolete. While it's true that thousands of PCs are moonlighting as terminals on DG systems, the old-fashioned CRT doesn't seem to be in immediate danger of losing its job completely.

In fact, there may be more choices than ever for people who are shopping for terminals to attach to DG systems. In addition to all the tubes DG offers, a number of companies market DG-emulating terminals. And as DG extends operating system support for other standard terminal types, there will be literally scores of brands to choose from.

For the time being, however, perhaps it's enough to list the features of terminals designed specifically to work with DG systems. Of course, DG's own tubes are the standard, but *Focus* set out to survey the market to see what else is available. After all, if you spend most of each day looking at a terminal, you ought to like what you see.

Data General

Model name/number: D461

Contact: local DG sales representative.
DG terminals emulated: D450, D460.

Display characteristics

Tilt and/or swivel: tilt.

Screen size: 12 inches.

Lines and columns displayed: 24 × 81, 24 × 135.

Screen phosphor: amber, green.

Screen refresh rate: 60 Hz.

Character sets provided: DG international (256); 13 languages supported.

Smooth scrolling: yes (two speeds).

Controls for cursor characteristics and screen brightness: single brightness/contrast control; user-selectable cursor.
Screen saver: yes.

Character attributes supported: blink, bold, dim, protect, underscore.

Character font(s): single font.

Other: 810 × 288 resolution.

Keyboard features

Dimensions and layout: 20½ inches × 7½ inches; 107 keys.

Function keys: 19 plus 5 special function keys.

Numeric keypad: yes.

Controls for bell tone and keyclick: no.

Function indicators: yes.

Other: high-gravity, tactile-feel keyswitches; height adjust.

Communication features

Interface types: RS-232/422, current loop.

Baud rates: 50–19,200 bps.

Data format: 7, 8 bit.

Auxiliary ports: one bi-directional port.

Self test: upon power up.

Other

Price: \$1,395.

Discounts available: standard DG terms and conditions.

Service available: worldwide DG service.

Other outstanding features: local editing, windowing, graphics.

Model name/number: D220

DG terminals emulated: D200, D210.

Display characteristics

Tilt and/or swivel: tilt.

Screen size: 12 inches.

Lines and columns displayed: 24 × 80.

Screen phosphor: eight colors; FG and BG = 64 combinations.

Screen refresh rate: 60 Hz.

Character sets provided: DG international (256); 11 languages supported.

Smooth scrolling: no.

Controls for cursor characteristics and screen brightness: single brightness/contrast control.

Screen saver: no.

Character attributes supported: blink, invisible, underscore.

Character font(s): single font.

Other: 560 × 240 resolution.

Keyboard features

Dimensions and layout: 20½ inches × 7½ inches.

Function keys: 19 plus local print.

Numeric keypad: yes.

Controls for bell tone and keyclick: no.

Function indicators: yes.

Other: high-gravity, tactile-feel keyswitches; height adjust.

Communication features

Interface types: RS-232/422, current loop.

Baud rates: 50–19,200 bps.

Data format: 7, 8 bit.

Auxiliary ports: printer port, local print support.

Self test: upon power up.

Other

Price: \$2,275.

Discounts available: standard DG terms and conditions.

Service available: worldwide DG service.

Model name/number: D214

DG terminals emulated: D200, D210.

Display characteristics

Tilt and/or swivel: tilt.

Screen size: 12 inches.

Lines and columns displayed: 24 × 80.

Screen phosphor: amber, green.

Screen refresh rate: 60 Hz.

Character sets provided: U.S. only 128 ASCII characters.

Smooth scrolling: no.

Controls for cursor characteristics and screen brightness: single brightness/contrast control.

Screen saver: yes.

Character attributes supported: blink, bold, dim, underscore.

Character font(s): single font.

Other: 800 × 288 resolution; soft setup.

Keyboard features

Dimensions and layout: 20½ inches × 7½ inches; 107 keys.

Function keys: 19.
Numeric keypad: yes.
Controls for bell tone and keyclick: no.
Function indicators: yes.
Other: high-gravity, tactile-feedback keyswitch; height adjust.

Communication features
Interface types: RS-232.
Baud rates: 50-19,200 bps.
Data format: 7 bit.
Auxiliary ports: no.
Self test: upon power up.

Other
Price: \$795.
Discounts available: standard DG terms and conditions.
Service available: worldwide DG service.

Model name/number: D215
DG terminals emulated: D200, D211.

Display characteristics
Tilt and/or swivel: tilt.
Screen size: 12 inches.
Lines and columns displayed: 24 × 80.
Screen phosphor: amber, green.
Screen refresh rate: 60 Hz.

Character sets provided: DG international set (256); 13 languages supported.
Smooth scrolling: no.
Controls for cursor characteristics and screen brightness: single brightness/contrast control.
Screen saver: yes.
Character attributes supported: blink, bold, dim, underscore.
Character font(s): single font.
Other: 800 × 288 resolution; soft setup.

Keyboard features
Dimensions and layout: 20½ inches × 7½ inches; 107 keys.
Function keys: 19.
Numeric keypad: yes.
Controls for bell tone and keyclick: no.
Function indicators: yes.
Other: high-gravity, tactile-feedback keyswitch; height adjust.

Communication features
Interface types: RS-232/422, current loop.
Baud rates: 50-19,200 bps.
Data format: 7, 8 bit.
Auxiliary ports: one printer port with

print pass-through supported.
Self test: on power up.

Other
Price: \$895.
Discounts available: standard DG terms and conditions.
Service available: worldwide DG service.

Model name/number: D411
DG terminals emulated: D400, D410.

Display characteristics
Tilt and/or swivel: tilt.
Screen size: 12 inches.
Lines and columns displayed: 24 × 81, 24 × 135.
Screen phosphor: amber, green.
Screen refresh rate: 60 Hz.
Character sets provided: DG international set (256); 13 languages supported.
Smooth scrolling: yes (two speeds).
Controls for cursor characteristics and screen brightness: single brightness/contrast control; user-selectable cursor.
Screen saver: yes.
Character attributes supported: blink, bold, dim, protect, underscore.

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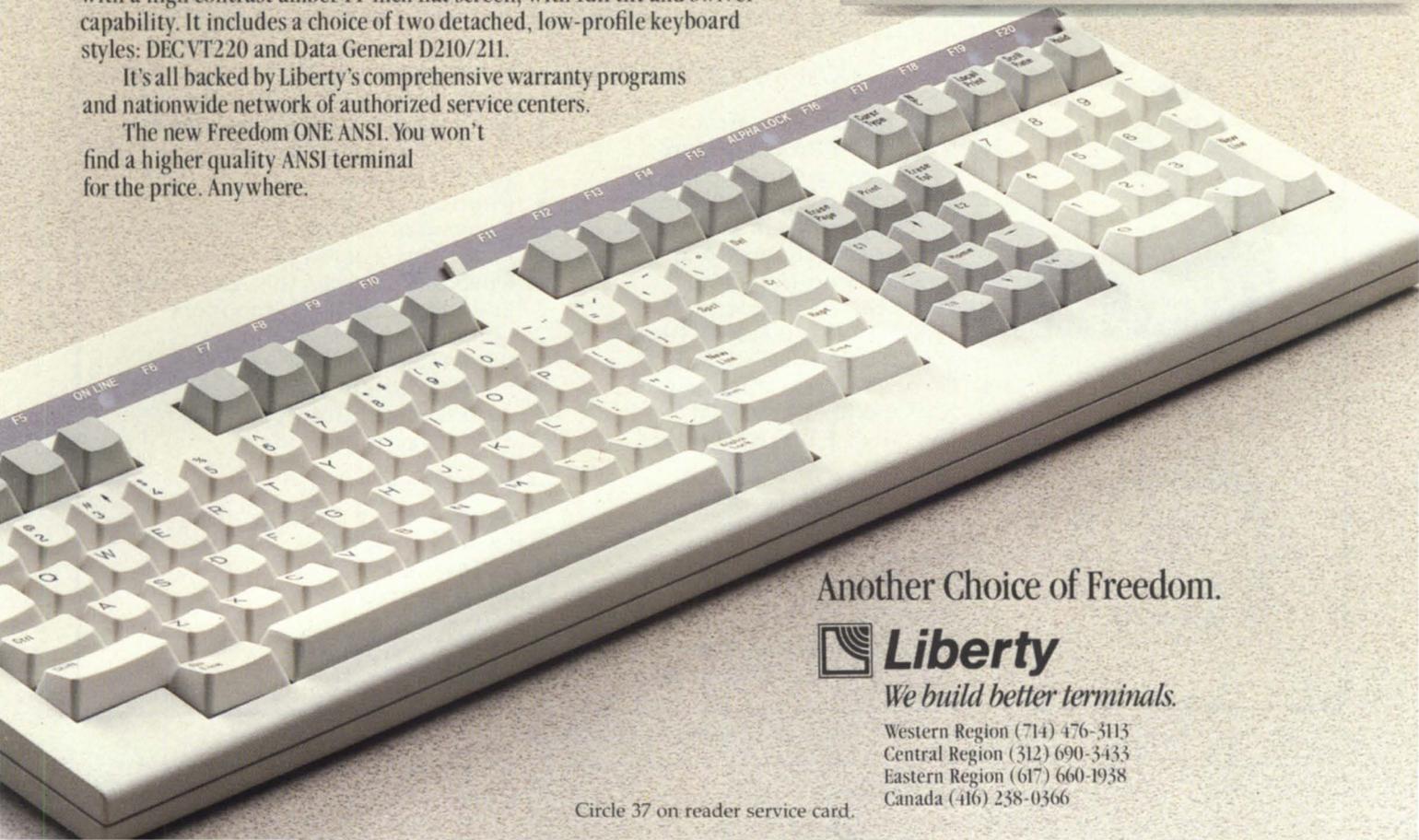
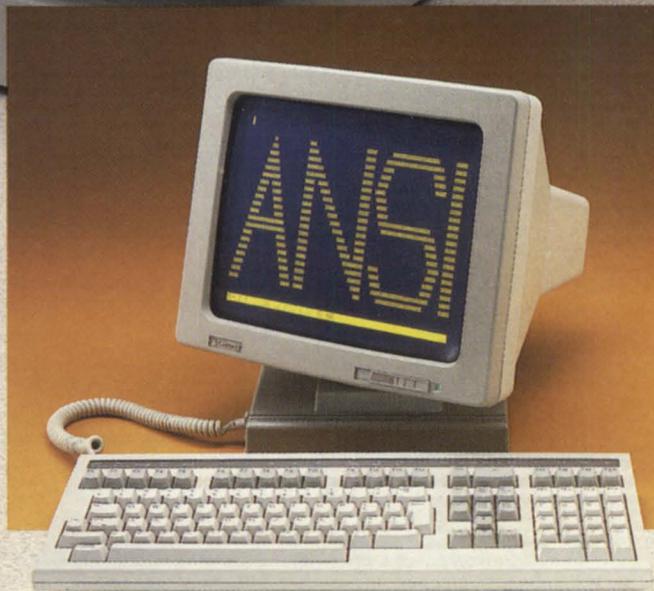
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FOCUS ON: TERMINALS

Character font(s): single font.
Other: 810 × 288 resolution.

Keyboard features

Dimensions and layout: 20½ inches × 7½ inches.

Function keys: 19 plus 5 special function keys.

Numeric keypad: yes.

Controls for bell tone and keyclick: no.

Function indicators: yes.

Other: high-gravity, tactile-feel key-switch; height adjust.

Communication features

Interface types: RS-232/422, current loop.

Baud rates: 50–19,200 bps.

Data format: 7, 8 bit.

Auxiliary ports: one printer port; print pass-through supported.

Self test: upon power up.

Other

Price: \$1,195.

Discounts available: standard DG terms and conditions.

Service available: worldwide DG service.

Other outstanding features: local editing, windowing.

Model name/number: D470 C
DG terminals emulated: D460.

Display characteristics

Tilt and/or swivel: tilt.

Screen size: 12 inches.

Lines and columns displayed: 24 × 81.

Screen phosphor: 16 colors; 256 combinations.

Screen refresh rate: 60 Hz.

Character sets provided: DG international set (256); 13 languages supported.

Smooth scrolling: yes (two speeds).

Controls for cursor characteristics and screen brightness: single brightness/contrast control.

Screen saver: no.

Character attributes supported: blink, invisible, underscore.

Character font(s): single font.

Other: 648 × 240 resolution.

Keyboard features

Dimensions and layout: 20½ inches × 7½ inches; 107 keys.

Function keys: 19 plus 5 special function keys.

Numeric keypad: yes.

Controls for bell tone and keyclick: no.

Function indicators: yes.

Other: high-gravity, tactile-feel key-switch; height adjust.

Communication features

Interface types: RS-232/422, current loop.

Baud rates: 50–19,200 bps.

Data format: 7, 8 bit.

Auxiliary ports: one bi-directional port.

Self test: upon power up.

Other

Price: \$3,175.

Discounts available: standard DG terms and conditions.

Service available: worldwide DG service.

Other outstanding features: editing, graphics, windowing. Δ

Esprit Systems

Model name/number: ESP 6210

Contact: Sal Lanito; 100 Marcus Drive, Melville, New York 11747; 516/293-5600.

DG terminals emulated: D200, D210.

Display characteristics

Tilt and/or swivel: tilt, swivel.

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5365 Baron Drive
San Jose, CA 95124
(408) 356-6105

Note: PereLine works great on the new IBM PS/2 Systems ...
(3 1/2 inch format diskettes available)



Screen size: 14 inches.
Lines and columns displayed: 80 × 25.
Screen phosphor: green.
Screen refresh rate: 50, 60 Hz.
Character sets provided: ASCII.
Smooth scrolling: yes.
Controls for cursor characteristics and screen brightness: yes.
Screen saver: yes.
Character attributes supported: blank, blink, high/low intensity, reverse, underline.

Keyboard features
Dimensions and layout: 17.8 inches × 7.6 inches × 1.7 inches, typewriter layout.
Function keys: 11 keys, 22 programmable functions.
Numeric keypad: yes.
Controls for bell tone and keyclick: yes.
Function indicators: caps lock LED.

Communication features
Interface types: EIA, RS-232 STD, RS-422, 20 mA current loop OPT.
Baud rates: 50–19,200 bps.
Data format: 7, 8 bit; odd, even, space, mark, or no parity; one or two stop bits.

Auxiliary ports: RS-232 printer port.
Self test: yes.

Other outstanding features: includes D400-compatible editing and protected field capabilities. Emulates Hazeltine 1500, Televideo 925, ADM 3A. Δ

Liberty Electronics

Model name/number: FONE ANSI

Contact: Donna Russell; 332 Harbor Way, San Francisco, California 94080; 415/742-7040.

DG terminals emulated: D210, 211.

Display characteristics
Tilt and/or swivel: both, full.
Screen size: 14 inches.
Lines and columns displayed: 80 and 132 columns; 24 lines.
Screen phosphor: amber.
Screen refresh rate: 60 Hz.
Smooth scrolling: yes (four rates).
Controls for cursor characteristics and screen brightness: yes.
Screen saver: yes, selectable delays of 5, 10, and 15 minutes.
Character attributes supported: blink,

bold, hidden, normal, reverse, underline (and combinations).

Character font(s): Spanish, Swedish, Swiss (French), Swiss (German), U.K.
Other: Canadian French, Danish, Dutch, Finnish, Flemish, French/Belgian, German, Italian, Norwegian.

Keyboard features

Dimensions and layout: D210/211—44 mm × 519 mm × 196 mm. VT220—32 mm × 476 mm × 178 mm.

Function keys: 20.

Numeric keypad: yes.

Controls for bell tone and keyclick: yes.

Function indicators: caps lock.

Communication features

Interface types: RS-232/422/423, 20 mA current loop optional.

Baud rates: 50–38,400 bps.

Data format: 7, 8 bits; parity, odd, even, none, mark, space.

Auxiliary ports: one serial.

Self test: three (keyboard, logic, visual).

Other

Price: \$499.

Discounts available: distributor, OEM, volume. Δ

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Circle 45 on reader service card.

Perfect Terminal

Model name/number: P210

Contact: Ken Betuel; 42307 Osgood Road, Fremont, California 94538; 415/656-8383.

DG terminals emulated: D210, 211, 214, 215.

Display characteristics

Tilt and/or swivel: yes.

Screen size: 14 inches.

Lines and columns displayed: 25 × 80, 25 × 132.

Screen phosphor: amber, green.

Screen refresh rate: 50, 60 Hz.

Character sets provided: graphic character set standard 128 displayable ASCII upper/lowercase descenders.

Smooth scrolling: yes.

Controls for cursor characteristics and screen brightness: software or keyboard.

Screen saver: yes.

Character attributes supported: blank, blink, reverse video, underline (and combinations).

Character font(s): 7 × 13 dot matrix, 10 × 14 field.

Keyboard features

Dimensions and layout: 194 mm, 473 mm; 7¼, 18½.

Function keys: 15 shiftable to 38, all programmable.

Numeric keypad: yes.

Controls for bell tone and keyclick: software or keyboard.

Function indicators: on screen.

Communication features

Interface types: EIA, 20 mA, RS-232.

Baud rates: 50–38,400 bps.

Data format: 7, 8 bit.

Auxiliary ports: printer port standard or two host ports.

Self test: yes.

Other

Price: \$649.

Discounts available: depending on quantity.

Service available: two-year warranty on parts and labor.

Other outstanding features: The P210 emulates both Data General 215, DEC VT100, and Hazeltine 1500. Terminal comes standard with two-year warranty.

Model name/number: P411

DG terminals emulated: D410, 411.

Display characteristics

Tilt and/or swivel: yes.

Screen size: 14 inches.

Lines and columns displayed: 25 × 80;

25, 132, 208 columns.

Screen phosphor: amber, green.

Screen refresh rate: 50, 60 Hz.

Character sets provided: Graphic character set 128 displayable ASCII upper/lowercase descender.

Smooth scrolling: yes.

Controls for cursor characteristics

and screen brightness: software or keyboard.

Screen saver: yes.

Character attributes supported: blank, blink, reverse, underline (and combinations).

Character font(s): 7 × 13 dot matrix, 10 × 14 field.

GEN DATABASE MAN

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The deadline is fast approaching for your application to speak or exhibit at NADGUG's 1988 annual conference. Our theme in 1988 is "Where Great Ideas Begin", taking its initiative from Philadelphia, the birthplace of great ideas like independence, electricity, and the Stars'n Stripes. "Where Great Ideas Begin" is your chance to share information or display products to the largest gathering of Data General users in the world.

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If you've got great ideas, information or practical knowledge to share with others, plan to present a paper. We're calling for papers targeted for Technical, Management, and End-User audiences. Be sure to send in your completed application by the deadline date.

Exhibitors!

Conference '88 is your chance to demonstrate your company's products or services. Exhibit space is limited, so please get your completed information in as soon as possible.

Application forms were mailed out in December. In case you misplaced yours, call the NADGUG staff at 617/898-4067.

Philadelphia
Wyndham Franklin Plaza Hotel

August 29 - September 1, 1988



Keyboard features

Dimensions and layout: 194 mm, 473 mm; 7¼, 18½.

Function keys: 15 shiftable to 38, all programmable.

Numeric keypad: yes.

Controls for bell tone and keyclick: software or keyboard.

Function indicators: on screen.

Communication features

Interface types: EIA, 20 mA, RS-422.

Baud rates: 50–38,400 bps.

Data format: 7, 8 bit.

Auxiliary ports: printer port standard or two host ports.

Self test: yes.

Other

Price: \$795.

Discounts available: depending on quantity.

Service available: two-year warranty.

Other outstanding features: The P411 emulates Data General 410/411, DEC VT100, and Hazeltine 1500. Terminal can be connected to both your DG and DEC computers simultaneously. Terminal comes standard with two-year warranty.

Model name/number: P461

DG terminals emulated: D461.

Display characteristics

Tilt and/or swivel: yes.

Screen size: 14 inches.

Lines and columns displayed: 25 × 80, 25 × 132; 208 columns.

Screen phosphor: amber, green.

Screen refresh rate: 50, 60 Hz.

Character sets provided: graphic character set.

Smooth scrolling: yes.

Controls for cursor characteristics and screen brightness: software or keyboard.

Character attributes supported: blank, blink, reverse, underline (and combinations).

Character font(s): 7 × 13 dot matrix, 10 × 14 field.

Keyboard features

Dimensions and layout: 194 mm, 473 mm; 7¼, 18½.

Function keys: 15 shiftable to 38, all programmable.

Numeric keypad: yes.

Controls for bell tone and keyclick: software or keyboard.

Function indicators: on screen.

Communication features

Interface types: EIA, 20 mA, RS-422.

Baud rates: 50–38,400 bps.

Data format: 7, 8 bit.

Auxiliary ports: printer port standard or two host ports.

Self test: yes.

Other

Price: \$1,195.

Discounts available: depending on quantity.

Service available: two-year warranty on parts and labor.

Other outstanding features: The P461 emulates Data General 461, DEC VT220, and Hazeltine 1500. Terminal can be connected to host computers simultaneously. Terminal has full two-year warranty. Δ

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THE DATA BASE CHALLENGE

Comparing the features of three more products

Note: Three vendors of software tools for data base management were not included in the "Data Base Challenge" feature summary that appeared in the November 1987 issue. This month, Focus is updating the list to include products marketed by Datalynx, Maxon Computer Systems, and Williams Automated Management Services. As with the products listed in November, the information supplied here was summarized from responses supplied by the vendors to a questionnaire developed with help from a number of specialists in data base management.

INFO-LYNX

Datalynx, Inc., 6659 Convoy Court, San Diego, California 92111; 619/560-8112. Contact: Peter Walsall.

Data base management

INFO-LYNX is a replacement product for Data General's INFOS II. It features improved throughput, enhanced data integrity, and a number of new functions that make it a powerful general-purpose data base system.

INFO-LYNX is a data base manager that can function as the core of a complete fourth-generation language system. There exist a number of 4GL products that use INFOS II as the core to the system. These products can all use INFO-LYNX without any other modifications necessary.

Physical data structures. Multilevel DBAM using B-trees. Automatic disk space management is provided. Selective data record compression capabilities are provided. Record indexing mechanisms used are linked subindexes and inverted keys.

Logical data structures are hierarchical.

Multivolume data bases are supported.

Data base reorganization is not necessary.

Distributed data base capabilities use DG remote INFOS agent.

Integrity and error processing. Global server monitors all open files and fixes them on abnormal terminations.

Backup and restore procedures.

Backup/restore on entire file, transaction roll forward from transaction log file. The data base must be closed while backing up.

Transaction processing recovery process used is transaction grouping, log to file, recover from log file.

Host language interfaces. C, COBOL, DG/L, MUMPS, PL/1, Fortran IV, Fortran 77.

Data import and export facilities. Provides for ASCII/EBCDIC conversion. Interfaces to Present, Sort, CEO, TPMS.

Data base access control. Access controlled into subindexes. Separate controls for read, write, rewrite, delete.

Report generator

General features. Uses Data General INFOS report writer.

System considerations

Memory recommendation. The minimum memory recommended is 4 MB. The code for each module is shared.

Central system overhead required for supporting processes is 100 KB per user minimum.

Independent application benchmarks are available.

Price. Class B—\$2,200; class C—\$3,000, class D—\$4,000, class E—\$6,000, class F—\$9,300, class G—\$12,900. Consulting services cost \$60 per hour. Cost of documentation is included with license. Ongoing, yearly maintenance costs: class B—\$350, class C—\$400, class D—\$475, class E—\$550, class F—\$800, class G—\$950. Educational, government, and quantity discounts available. Δ

Forth Writer

Maxon Computer Systems Inc., 575 Madison Avenue, Suite 1006, New York, New York 10022; 212/227-1922. Contact: Frank Strickland.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, produces reference lists or "where used" listings, and provides the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money.

File/record restrictions. No restric-

tions on maximum number of files, maximum records per file, or maximum fields per record. Maximum number of files open simultaneously is 13.

Physical data structures supported. Hashing, inverted list, imbedded/external pointers, indexed sequential, and B-tree are all valid Business BASIC file structures. Disk space management is accomplished with all AOS/VIS utilities. Data compression capabilities allow strings to be crammed by 50 percent.

Simultaneous read/write access is provided at the record locking level.

Multivolume data bases are supported.

Data base reorganization is not required.

Distributed data base capabilities. Files through Xodiac can be accessed subject to Xodiac restrictions.

Backup and restore procedures are standard DG utilities. The data base must be closed while backing up data.

Transaction processing recovery process. None.

Host language interfaces. Business BASIC.

Data import and export facilities. Provides for ASCII/EBCDIC conversion. Interfaces to WordPerfect, 20/20, Lotus 1-2-3, dBase.

Data base access control. Field-level access can be selectively granted and denied.

4GL programming capabilities

General features. Execute, functions (internal and external). Forth Writer is non-procedural.

Character and string handling. Concatenate, substring, trim, upper/lower-case, string functions for parsing.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Numeric functions include ABS, SAN, INT, SQR, AND, OR, MIN, MAX, and, SHFT.

Code produced. Optimized P-code.

Interactive debugging capabilities provided.

Spawn to subprocess is supported.

Interactive query facilities. Full screen edit, fill-in-the-blanks operation.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, change with prompts.

FOCUS ON: DATA BASE MANAGEMENT

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities. Supports VT100, HP, and other ASCII table-driven terminal file.

Maximum size field that can be displayed is 60 characters.

Standard screen generated with default prompts and validation criteria supplied from the data dictionary.

Report generator

General features. Page headings, automatic subtotals, default column positioning, default headings from data dictionary.

Standard form letter and mailing label reports are available. Reports can be designed with a "paint" interface.

Additional development tools. Data communications facilities, system and

data base design tools.

System considerations

Memory recommendations. Minimum memory recommendation is 16 shared pages plus 16 unshared pages per user. The code is shared, optimized P-code for each module.

Price. Runtime license is \$6,000. Training is \$500 per day. Consulting services are \$90 per hour. Cost of documentation is included. Ongoing, yearly maintenance is 1 percent per month. Δ

Data Management and Control System

Williams Automated Management Services, Inc. (WAMS), 13570 Larwin Circle, Sante Fe Springs, California 90230; 213/921-3334 or 714/994-2811. Contact: Alan Corcoran.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, and produces reference lists or "where used" listings. It includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money, Boolean, repeating, text, calculation, other DB reference.

File/record restrictions. Maximum number of files is 255. Maximum number of records per file is 100 million. Maximum number of fields per record is 256—64 data, 128 relational or pseudo-fields, 64 constant fields. Maximum number of files open simultaneously is 16.

Physical data structures. Supports B-tree. Disk space management tools provided include index element size, variable-length records, and variable-length indexes. Data compression capabilities include index compression and data base structure compression. Record indexing mechanisms are a modified B-tree that includes record count function.

Simultaneous read/write access is provided with automatic locking at the record level.

Data base reorganization. Indexed field changes type from date to character. Rebuild command automatically rebuilds data base in batch stream.

Distributed data base capabilities.

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January 27, 1987

Mr. Milton Larson
Eagle Software
169 E. Cloud Street
Salina, Kansas 67402-0016

Dear Milton,

I have finally found the time in my hectic schedule to express my appreciation for the value of your VS Toolbox package. I have been using it for quite some time now, so I can safely say that it is a fully debugged, working set of programs.

My first interest in VS Toolbox was aroused by the Rebuilder and the other INPOS-related programs, and they are still the programs which I use most often. I have been regularly rebuilding all our INPOS files ever since, and have had some dramatic improvements. In one benchmark taken, a particular report program reduced its CPU time from two hours to twenty minutes.

Our INPOS files are complex, using up to six levels, linked subindexes, inversions, and (in one case) partial records. Our application programs are written so that they use an optimal subindex node size which we calculated in advance (since in many cases there is no way in our applications to know in proven to be much more efficient than simply taking the default 2042. Despite this, a rebuild of the files using your REBUILDER program with the /OPTIMIZE switch reduced the size of the indices substantially - up to 50%. Of course this means that the rebuilt files are not only more efficient, but also consume less disk space.

I would like also to thank you for your helpfulness and responsiveness in the three cases in which we experienced problems with your software. I can only add that I wish all our software suppliers were as knowledgeable and cooperative as your company has proven to be.

Sincerely,
BOBST GROUP INC.
Gary Pittleson
Gary Pittleson
Manager of Data Processing

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EAGLE Software, Inc.

P.O. Box 16 / 169 E. Cloud
Salina, Kansas 67402-0016

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Circle 23 on reader service card.

Export and import facility for data transfer.

Logical data structures are relational with inner and outer join.

Integrity and error processing. File check command checks for file integrity.

Backup and restore procedures. AOS/VS backup, data base SAVE command creates flat file of data. Data base must be closed while backing up.

Transaction processing recovery process. Transaction logging (before and after image).

Host language interfaces. Fortran 77, PL1.

Data import and export facilities. Universal export and import with single file structure. Can import both fixed- and variable-length data.

Data base access control. Access to menu, field level, file, and field value can be selectively granted and denied.

4GL programming capabilities

General features. If, then, else with nesting.

Character and string handling. Concatenate, substring, upper/lowercase.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; divide, average, minimum, maximum, absolute value, count, sum.

Spawn to subprocess is supported.

Interactive query facilities. Supports query by example, multi-set query with and/or capability, pre-analysis of query available.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports D210, D214, D411, D460, DEC VT52, and dumb terminal mode.

Multiple records displayed. Maximum size field that can be displayed is 1,000 characters.

Screen "painter" included. Default prompts and validation criteria supplied from the data dictionary. Code is available for customization.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning, default headings from data dictionary.

Standard mailing label reports available.

Automatic setting for page numbers, etc. can be suppressed or overridden.

Additional development tools. Appli-

cations generator, system and data base design tools, preprogrammed applications.

System considerations

Memory recommendation. The minimum memory recommended for running on a Data General system under AOS/VS is 2 MB. Code for each module is shared.

Central system overhead. Central file

server process must be running.

Price. MV/2000—\$15,000, MV/7800—\$30,000, MV/15000—\$50,000, MV/20000—\$60,000. Training is \$600 per day. Documentation is included, with additional copies for \$250. Ongoing, yearly maintenance is 1 percent per month. Lease rates and quantity discounts are available. Discounts available for government or educational institutions. Δ



Your boss counts on you for timely, accurate, concise financial information. How can you make sure you don't let him down?

There are lots of accounting packages out there, and it's not easy to decide which is best for your organization.

We think you ought to spend as much time evaluating the vendor as you do the software. Think of it this way. You'll be using the software for years to come, and it will soon become a part of your organization's procedures. You need to be sure your accounting software can grow and change along with your organization. And you need to know you can count on the vendor for professional support when you need it.

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HUMOR ME!

Swap meets and wish lists provide productive recreation

I started this column one Sunday a few weeks before Christmas after spending part of the afternoon at a motorcycle swap meet. You should be reading this sometime in late January or early February—long after the magic of Christmas has been driven from your heart by the shrieking kids on Christmas morning, the well-deserved hangover on New Year's day, or the freshly arrived credit card bills showing December's excesses. Bear with me; the reality of it all hasn't set in on me yet.

The ostensible objective of going to the swap meet was to buy some presents, but all I got were a bunch of doodads for myself and some friends. What I really wanted was a new scarf (mine got left behind in some bar last winter) and a shiny new Harley-Davidson belt buckle to replace the old one that failed from excessive strain. Instead, I ended up with a nifty Coca-Cola belt buckle; a colorful "California" belt buckle for a biker friend who's freezing his bippy off back in Perry, Ohio, while trying to get an operating license for some nuke power plant; and a bunch of bumper stickers that say simply "Like my driving? Call 1-800-EAT-S***." This is the first time I can remember that I've put a bumper sticker on my car. Who says you can't teach an old dog new tricks?

Anyway, after the drudgery of Christmas shopping, I thought I'd get a head start on next year's letter to Santa Claus. I saw a similar column last week in *Data Base Monthly's* December issue, but I figure that by now you've all forgotten it. And my Christmas wish list is more interesting anyway

:WISH.1

The top item on my Christmas list is fairly simple: I'd like AOS[VS] to measure system call time rather than estimate it. Not a very flashy request. I covered this problem in more detail in my May 1986 column, but the gist of it is that both AOS and AOS/VS use some pretty stale and non-CPU-speed-

**I wish that
disk file types
and record formats
would either disappear
or get used properly**

dependent values to charge users for system calls. As a result, certain processes that are CPU hogs due to a high level of system call activity don't get their priority lowered the way they should, and in the process, they become disruptive to other (presumably more well behaved) interactive processes. To add insult to injury, this problem also plays havoc with charge-back products like DMS's Resource Accounting System. Users who spend most of their time doing computational work get overcharged compared to users who spend most of their time doing system calls.

If you want to see this problem in action, try running this simple assembly program:

```
TEST:          .TITLE          DISRUPT
               .NREL          1
               ?MEM
               JMP
               JMP          TEST
               .END          TEST
```

and link it as follows:

```
AOS:           XEQ MASM TEST
               XEQ LINK TEST
AOS/VS:        XEQ MASM16 TEST
               XEQ LINK/SYS=VS16 TEST
```

Now run the program at one terminal (XEQ TEST) while running PED at another terminal. TEST.PR is eating the entire CPU, but AOS[VS] is charging

the process substantially less than 100 percent.

:WISH.2

Those of us who spend more time trying to do performance analysis and capacity planning than we spend producing resource usage invoices from the SYSLOG file would sure appreciate some help. Specifically, I'd give my new Coke belt buckle for a ?RSTAT (Resource STATistics) system call to provide the following information:

- CPU time consumed, by ring (3 to 7)
- CPU time consumed performing system calls
- average unique shared page-secs
- average unshared page-secs
- calls to the AGENT, by ring (4 to 7)
- calls to ring 0, by ring (3 to 7)
- character I/O read requests
- character I/O characters read
- character I/O write requests
- character I/O characters written
- character I/O control requests
- network requests and counts
- read accesses per disk and tape unit
- write accesses per disk and tape unit
- blocks read per disk and tape unit
- blocks written per disk and tape unit
- physical page faults
- logical page faults
- physical shared page I/O reads by disk unit
- logical shared page I/O reads
- system cache misses by disk unit
- system cache hits

Of course, I'd also need the capability of including this information in

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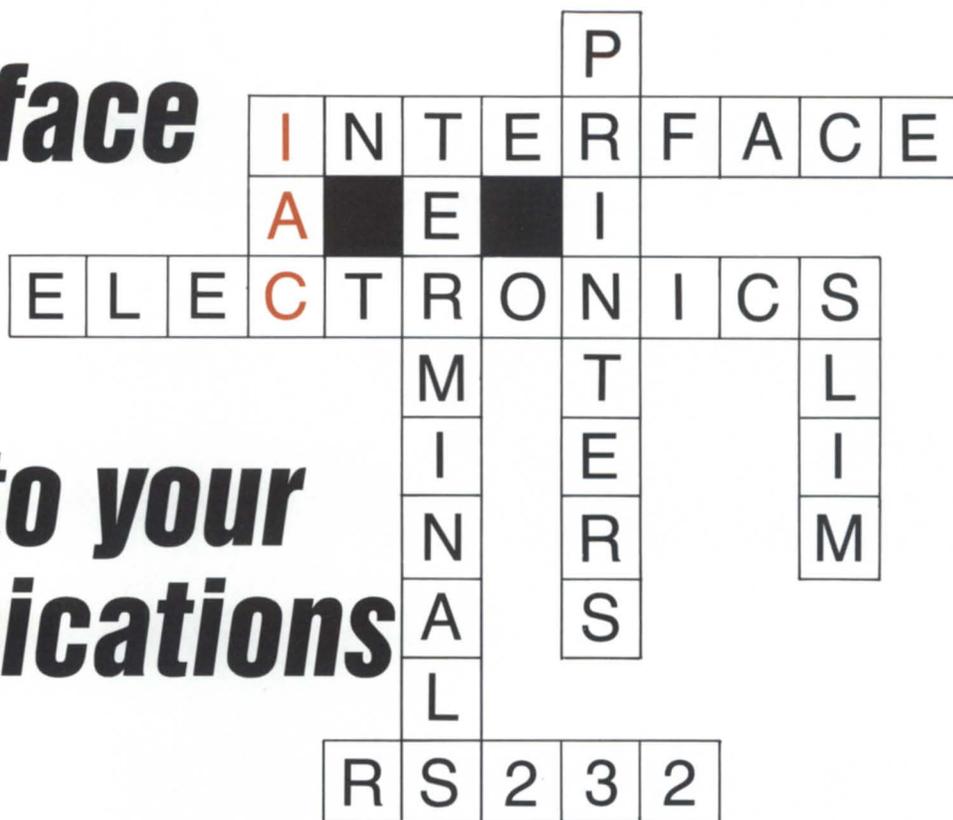
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SYSLOG (with a switch per category to be enabled, instead of en masse!). I don't picture logging this information all the time, but it sure would be useful on performance investigation days.

The real objective is to obtain the resource cost of a process. Without this information, estimating the impact of additional users or hardware upgrades is almost impossible. The only way this information can be obtained now is by testing single programs in controlled environments (i.e., idle systems) and then attempting to adjust for the effects of the real world (i.e., 10:45 a.m. on the last day of the month).

:WISH3

For reasons I can't figure, AOS[VS] supports the same number of internal stacks (which govern the maximum number of parallel system calls) and the same maximum number of cache buffers, regardless of processor speed. This is in spite of the fact that the published maximum number of users for each system covers a wide range. Nobody in their right mind would doubt that each additional user must consume some average fraction of these fixed resources.

Am I asking for more SYSGEN/VSGEN questions? Definitely not! In fact, there are a few too many questions already. No, what I'd like is for SYSGEN/VSGEN to select (in the case of stacks) or allow (in the case of cache size) a larger number of cache buffers.

:WISH4

I wish AOS[VS] software producers would ship their software to me in a more usable form. My two main gripes are the poor ACLs and the lack of directory structure.

Seems like everybody who ships software sets the ACLs to +,RE instead of +,RE for DIRS and CPDs, +,E for .PR files, and +,R for everything else. Then I don't have to worry about people dialing into my system and making off with copies of my compilers and utilities.

Also, who doesn't load a new rev of the COBOL compiler into :COBOL.3.20 or :UTIL:COBOL.3.20 or :COMPILERS:COBOL.3.20 or some such? Why isn't the compiler shipped to me as a dump of COBOL.3.20:# to save me the trouble? One of the down sides of having all the compiler people assume that their products can live in :UTIL is that :UTIL quickly gets overcrowded (read slow), and copies of obsolete files accumulate with each new revision.

**Do not
depend on
the help
files as
substitutes
for the
manuals**

:WISH5

I wish that disk file types and record formats would either disappear or get used properly (preferably the latter). I'm tired of commands like CREATE and QBATCH/QOUT= and WRITE/L= and MOVE 1 TO LAST ONTO FOO in SED creating UDF files with a record format that is DYN.

:WISH6

I wish that the path through the AGENT for buffered disk I/O would get sped up substantially.

Originally, the intention was to have the AGENT buffer disk I/O, because the user program couldn't be depended on to do it. Ostensibly, this would save system calls and precious system CPU time, and avoid unnecessary disk activity—which in turn would yield system-wide benefits by making the system more immune to poorly written user programs. However, this scheme only works if the CPU cost of AGENT buffering is somewhere in the same ballpark as if the user did it. Well, it's nowhere near that right now. On an MV/4000, it costs a minimum of 1.2 ms per call to do buffered I/O (that's for a one-byte write). Assuming an average of 1 microsecond per instruction (pessimistically), that amounts to at least 1,200 instructions to store a single byte in a buffer located according to a channel number. A user program might conceivably be able to do the same thing in fewer than 100 instructions, or about 12 times faster. So what are the other 1,100 instructions doing?

The average COBOL program that produces a print file as output would be significantly affected by speeding up the AGENT I/O path. COBOL is quite fond of doing WRITE statements as two I/Os: the data item and then a (CR/LF) separately.

:WISH7

When I was a kid, I always added one "ringer" to my letter to Santa Claus—something that I didn't have a snowball's chance in hell of getting, but you never know . . .

This year's ringer is my wish that DG would reconsider its decision to become a total high-level language shop.

I have no quarrel with writing the bulk of the system software in a high-level language, but I have a hard time accepting the fact that core routines, which are executed more times than there are grains of sand at the seashore, can be written in anything but assembly language. I keep remembering Hewlett-Packard's ill-fated foray into implementing the MPE/3000 operating system using their SPL (system programming language). For those of you who weren't around at the time (early 1970s), the initial release was so slow that HP had to replace all the 3000s they had shipped with earlier model 2100s until they could recode the operating system in assembly. It took more than a year.

But what about Unix? Isn't it coded in a high-level language? Well, yes it is, except for critical core routines. Also, the people who originally implemented it had the advantage that C is nothing more than a thinly veiled macro assembler for the PDP-11. Implementations on other CPUs have suffered somewhat due to this fact, some worse than others (e.g., DG's suffers from the lack of lots of registers and post/pre-increment/decrement facilities, Motorola 68XXX implementations fare better).

Even coding core routines in assembly with the rest of the system in a high-level language can have its problems if special care is not taken. High-level languages tend to hide the cost of a particular syntax from the coder, and often, the source code implementation that is most straightforward or easiest to maintain has the poorest performance. Take some of the most common C subroutines as examples. There is a fairly standard family of character categorization routines used by most C programmers. They have names like ISASCII, ISCNTRL, ISALPHA, ISDIGIT, and

ISSPACE. Let's use ISDIGIT as an example:

```
/*
** return 'true' if c is a decimal digit
*/
isdigit(c) int c; {
return (c<='9' && c>='0');
}
```

This routine returns either 0 or 1 depending on whether the argument character was a digit or not. The DG C compiler produced the following code for this routine:

Words	isdigit:	
2	WSAVR	0
2	XWLDA	0,-14,3
2	WSLEI	71,0
1	WBR	+.11
2	XWLDA	0,-14,3
2	WSGTI	57,0
1	WBR	+.4
2	NLDAI	1,1
1	WBR	+.2
1	WSUB	1,1
2	XWSTA	1,-10,3
1	WRTN	

19 words

The code generated in the calling program looks like this:

Words		
2	XWLDA	0,-14,3
1	WLDB	0,0
1	WPSH	0,0
4	LCALL	isdigit,0,1
1	WSNE	0,0
1	WBR	notadigit

10 words

The most common code used by an assembly programmer to accomplish the same function would be in-line code (no function call!) that looks like this:

Words		
2	XWLDA	0,C,3
1	WLDB	0,0
1	CLM	0,0
1	.WORD	60
1	.WORD	71
1	WBR	notadigit

7 words

A timing test of these two code segments on an MV/4000 showed CPU times of 4.7 v 25.5 microseconds, or almost 5.5 times faster.

Now, you might say that it's unfair to compare in-line code against a function call, but every book I've ever read on

the C language promotes the use of small functions to make the mainline code more readable. You might say that it's unfair to compare hand-coded assembly against unoptimized, compiler-generated code. But, that's exactly my point. Compiler writers can rarely generate code as small or fast as assembler programmers, because they have to deal with worst-case or general-case conditions. And few programmers specify /OPTIMIZE=FULL because of the STR history associated with optimization.

The LCALL instruction generated by the compiler is a good example of general-case code generation: it allows the target routine to be anywhere in the 4 GB address space, when in fact the target routine is often only a fraction of a megabyte away. When coding in assembler, many of the small supporting routines are in the same source module and shorter, faster XCALL or XJSR instructions are typically used.

Another bad side effect of coding critical regions in a high-level language is that histogramming of the program often doesn't show any unusual peaks that would help to identify what areas would benefit from recoding in assembler. That's because a lot of the overhead is involved in lengthier code sections and expensive overhead instructions like LCALL and WRTN that are scattered throughout the program's address space.

Lastly, one of the most common reasons given for coding in high-level languages is that C (or PL/I or what have you) programmers cost less and are easier to find. Yeah, and BBASIC programmers are even cheaper and more plentiful, but I wouldn't hire one.

:NEW_YEARS.RESOLUTION

So much for Santa Claus. Let me tell you about my favorite perennial New Year's resolution.

Several times a year when I'm about to endure YAILBAR (yet another incredibly long, boring airplane ride), I throw a DG manual in my briefcase, and I read it cover to cover with a pencil in my hand and STR forms at the ready.

This accomplishes two things: it generates some badly needed mail for the folks in the Technical Publications Group in the form of Documentation Remarks Forms, and it refreshes my memory about various options and features (some new, some old) on commands that I've used for years.

Let me give you a couple of ex-

amples: I got a call from a :PERFMGR customer who said he really appreciated the advice in my documentation about the /BUFFERSIZE= switch on the CLI MOVE command. It sped up his nightly backup MOVES considerably. He called his local SE to tell him the good news and discovered that the SE didn't know about the switch either.

Now, the only way this could happen is if the last time you looked up the MOVE command in the CLI manual was during your first few days of exposure to AOS/V5 when you were more interested in simple functionality and less interested in cryptic switch options whose meaning and effect you didn't understand at that point anyway. A re-read of the CLI manual after you're more comfortable with the commands would have yielded this valuable nugget pretty quickly.

Second example: I was working on a user's system and typed the following command:

```
) SORT/O INTO FOO FROM FOO
```

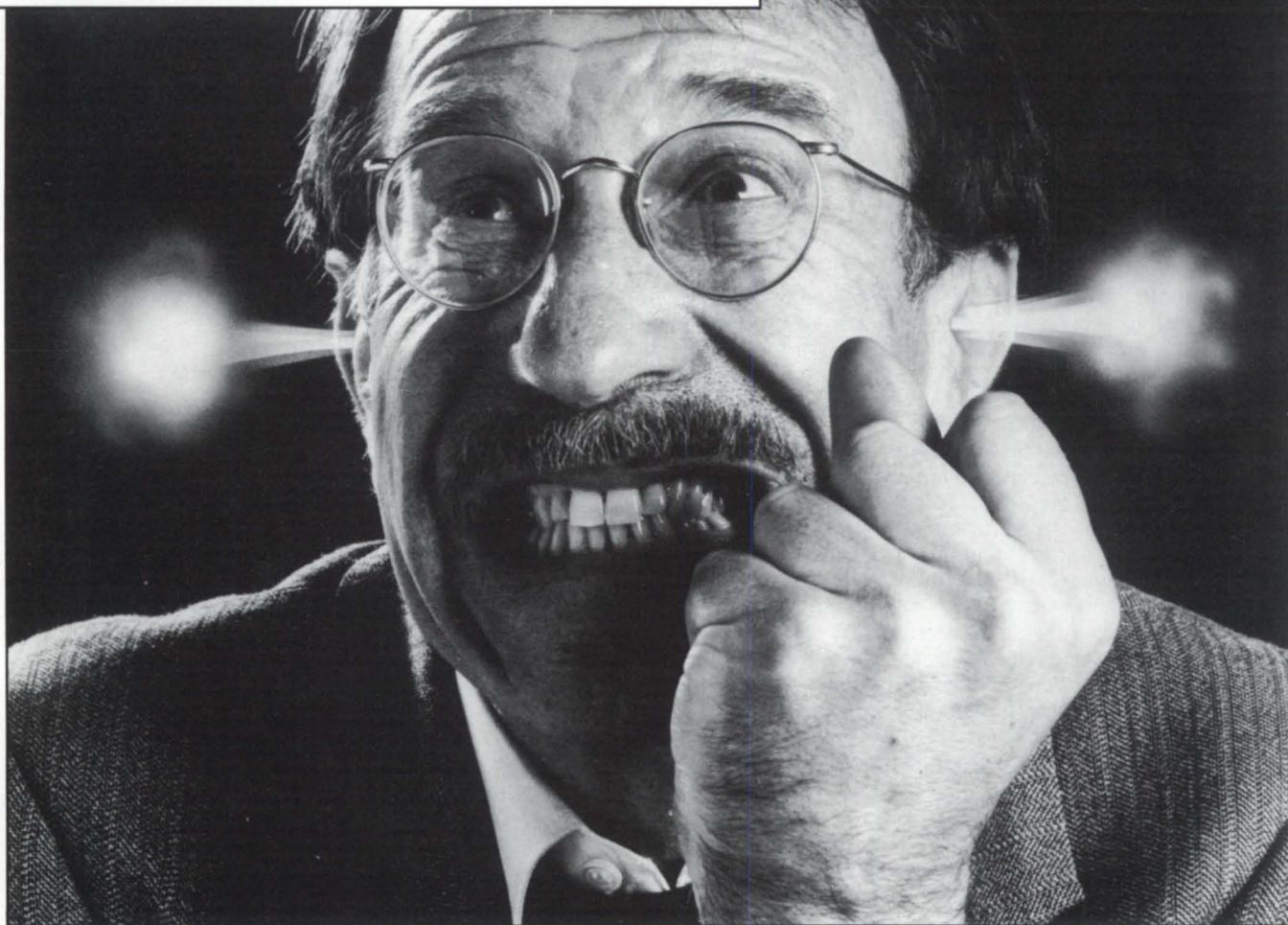
The client looking over my shoulder said, "Hey! What was that?" Well, that was the simplest form of the SORT command line that I know of. If the file type is TXT and the record format is D-S, then SORT will deduce that this must be a text file and sort it using a default key (1/LAST). How many times have you instead typed the following, because you didn't know the command line syntax?

```
) SORT/C/O
*INPUT FILE IS "FOO".
* RECS ARE DATASENS UPTO 136 CHARS.
*OUTPUT FILE IS "FOO".
*KEY 1/LAST.
*SORT.
*END.
```

A last note on this subject: Do not depend on the help files as substitutes for the manuals. Help files are notoriously misleading or incomplete. Too bad DG didn't spend as much time making them accurate, useful, and complete instead of making them pretty (e.g., dim and bright). Δ

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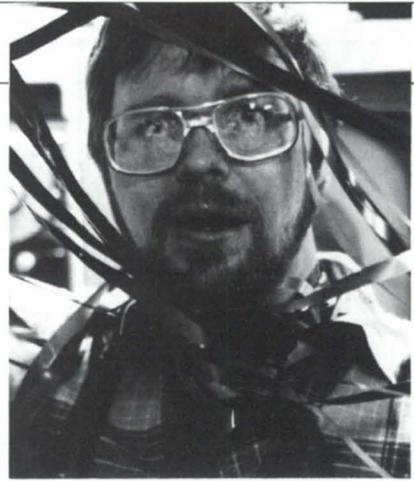
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LONG, WIDE LOAD

Assembly language for the beginner. Part II of V

Last month, I described the primary memory partitions used in AOS[VS] programs and presented a skeleton assembly language program. This month, I will talk about the basic MV instruction set, comparing a few Fortran statements with their assembly language equivalents.

Manipulating variables and constants

Data General's Eclipse and MV architecture provides four integer accumulators (registers) and four floating-point accumulators. Writing a program is really quite simple. All you need to do is (1) retrieve items from memory and put them in the accumulators, (2) do something with them, and (3) put the result(s) back in memory.

The MV instruction set is quite complex, but many of the instructions or instruction modes are specialized and can be ignored. For the purpose of this discussion, I will ignore all floating-point operations. Note that the remainder of this discussion refers only to AOS/VS, since it uses 32-bit instructions.

An accumulator is loaded from memory with:

```
LNLDA A,memadd ;16-bit from memory
LWLDA A,memadd ;32-bit from memory
```

and an accumulator is copied back to memory with:

```
LNSTA A,memadd ;16-bit to memory
LWSTA A,memadd ;32-bit to memory
```

"A" is the accumulator number (0, 1, 2, or 3), and "memadd" is the memory location. In the LDA/STA (LoaD/SToRe Accumulator) instructions, the "L" prefix (LONG) means "a LONG way away," i.e., anywhere in the virtual address space. There are other instructions (with "X" and "E" prefixes) that can be used if the data is not far away, but this way you're sure, and it keeps the discussion simple. The "N" is for NARROW and means put/get only 16 bits of data to/from the memory location (i.e., variables declared with .BLK 1 or constants declared with .WORD). Similarly, "W" means WIDE and refers to 32-bit values (.BLK 2 or .DWORD).

The "memadd" argument can either be a memory location number (i.e., 123456) or a symbolic name that you assign to that memory location. If you use a symbol, MASM and LINK work together to figure out the actual memory location for you. The following LWLDA instructions are equivalent:

```
ABC: .DWORD 162.
      LWLDA 0,ABC
      LWLDA 0,12345
```

(assuming that the memory address of ABC is 12345). In either case, accumulator 0 will contain 162 when finished. In the following examples, I will use ABC to represent a variable or constant; when you reference it with an instruction, MASM will substitute the actual memory address. I will use [ABC] to represent the value of the variable, in this case 162. The statement:

```
ABC: .DWORD 162.
```

is similar to the following Fortran statements:

```
INTEGER*4 ABC
ABC=162
```

Since character constants and variables can't fit into accumulators (unless they are one to four characters in length), they are manipulated indirectly by their byte address, i.e., many of the character operations require that the accumulator(s) be loaded with the byte address of the string:

```
LLEFB A,ABC*2 ;byte address of ABC
```

and sometimes you may need to use the word address:

```
LLEF A,ABC ;word address of ABC
```

Assuming that accumulator "A" contains the byte address of a character in memory, you can retrieve that character into accumulator "B" with:

```
WLDB A,B ; get byte and put in B
```

and put it back with:

```
WSTB A,B ;put byte in B in memory
```

Here are the basic numeric manipulations (A and B are accumulators 0, 1, 2, or 3):

```
WINC A,B ;increment A and put in B
WMOV A,B ;copy A to B
WNEG A,B ;negate A and put in B

WSUB A,B ;B-A and put in B
WADD A,B ;A+B and put in B
WMUL A,B ;A*B and put in B
WDIV A,B ;B/A and put in B

WIOR A,B ;A OR B and put in B
WAND A,B ;A AND B and put in B
```

The instructions above assume that the operands are both in accumulators, but instead of storing a constant in memory and loading it into an accumulator first, some instructions

allow you to use constants directly:

```
WADDI i,A ;A+i and put in A
WSBI i,A ;A-i and put in A
WIORI i,A ;A OR i and put in A
WANDI i,A ;A AND i and put in A
```

and some allow you to perform operations directly between an accumulator and a memory location:

```
LWADD A,ABC ;A+ [ABC] and put in A
LWSUB A,ABC ;A- [ABC] and put in A
LWMUL A,ABC ;A* [ABC] and put in A
LWDIV A,ABC ;A/ [ABC] and put in A
```

and some even allow you to bypass the accumulators entirely:

```
LWADI i,ABC ;[ABC]+i and put in ABC
LWSBI i,ABC ;[ABC]-i and put in ABC
```

Examples

Here are some examples using the constants and variables previously defined:

```
(a) FORTRAN
    I=ISTART (16-bit)

    MASM
    LNLDA 0,ISTART ;16-bit ISTART in ac0
    LNSTA 0,I ; and put it in I
```

```
(b) FORTRAN
    NPT=N (32-bit)

    MASM
    LWLDA 1,N ;32-bit N in ac1
    LWSTA 1,NPT ; and put in NPT
```

A little more work is required to copy a string from one location in memory to another:

```
(c) FORTRAN
    NAME="@CONSOLE"

    MASM
    LNLDA 0,LCON ;put 16-bit length in ac0
    WMOV 0,1 ;make ac1 the same as ac0
    LLEFB 2,NAME*2 ;ac2=byte address of destination
    LLEFB 3,CON*2 ;ac3=byte address of source
    WCMV ;move '@CONSOLE' to 'NAME'
```

To get the seventh character of a string:

```
(d) FORTRAN
    C=NAME(7:7)

    MASM
    LLEFB 0,NAME*2 ;get byte address of NAME
    WADDI 6,0 ;add offset (6, not 7)
    WLDB 0,1 ;get 7th byte of NAME into ac1
    ...
```

Program flow

Program flow is altered by the equivalent of GOTO statements:

```
WBR XXX ;if XXX isn't too far away
LJMP XXX ;if XXX is a long way away
```

Conditional execution requires a bit more thought on the part of the programmer, because the logic is usually the inverse of high-level languages, using skip rather than GOTO.

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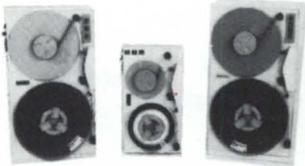
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AOS[VS] TRICKS

```
WSEQ A,B ;skip next instruction if A = B
WSNE A,B ;skip next instruction if A < B
WSLT A,B ;skip next instruction if A < B
WSLE A,B ;skip next instruction if A <= B
WSGT A,B ;skip next instruction if A > B
WSGE A,B ;skip next instruction if A >= B
```

The "gotcha" here is that MV instructions do not have the same length: they may be one, two, three, or four 16-bit words in length. The six test and skip instructions above can only skip the next instruction if it is one word in length. WBR is a one-word instruction, and LJMP is a three-word instruction. The following code fragment is OK:

```
WSEQ 0,1 ;ac0=ac1?
WBR DIFF ;nope
SAME:WSUB 0,0 ;ac0=0
WBR GO ;carry on
DIFF: WADC 0,0 ;ac0=-1
GO: etc
```

If the instruction following a skip instruction is not one word, MASM will complain ("possible skip into instruction"):

```
WSEQ 0,1 ;ac0=ac1?
LJMP DIFF ;no—go a long way away
SAME:WSUB 0,0 ;ac0=0
... (a lot of code)
```

DIFF:

and you will have to invert the logic and add a second stage:

```
WSNE 0,1 ;ac0=ac1?
WBR SAME ;yes
LJMP DIFF ;no—go a long way away
SAME:WSUB 0,0 ;ac0=0
```

DIFF:

Most of the remainder of the MV instruction set is outside the range of this discussion. There are several distinct groups that I have not discussed:

1. subroutine call and return
2. stack (push and pop)
3. decimal (commercial) instructions
4. floating-point instructions
5. queue instructions
6. device and system control instructions.

As you write your programs or subroutines, you will have a requirement to manipulate some data. That is the time to learn new instructions. Browse through the manuals, read the description of the instruction, and then try it out. I find that the *Instruction Reference Booklet* (14-702) is particularly handy to keep beside my terminal.

Next month in part three of this five part series (I've added one since last month), I will talk about AOS[VS] system calls. In part four, I will present a practical example of a small assembly language program that allows you to use a username (as opposed to the PID or console name) for the CLI SEND command. In the final article, I will talk about writing assembly language subroutines that can be called from high-level languages. Δ

John A. Grant is a geophysicist with the Geological Survey of Canada, where he manages the Exploration Geophysics Subdivision's MV/4000. He may be contacted at 601 Booth St., Room 591, Ottawa, Ontario, K1A 0E8; 613/996-2325.

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A DATE WITH CEO

Calendar facility can organize your time better

Have you ever missed a meeting or been late for an appointment? Have you ever scheduled a meeting with several people but forgot to write it on your own calendar? You're probably better about this than I am, but if not, these suggestions may help you.

Data General's CEO calendar can remind you to go to a meeting, perform a task, or even send a message to your inbox when it's posted. You can access the electronic calendar from the main menu of CEO or on the interrupt key (F5). The menu options allow you to look at your calendar on another date, change calendars, delete, schedule meetings, and insert or change entries.

You can look at someone else's calendar only if that user has set in their personal profile that anyone can view their non-personal information. Likewise, you can change an event on someone else's calendar only if that person has given you the privilege. This capability saves on phone calls or the rescheduling of meetings or appointments.

When inserting information into your calendar, you have the options of setting meetings, appointments, trips, personal entries, or "other." The system prompts you for the date and time of the event, the location, the subject, and a description of the event. (Other users given access to your calendar only see the date, time, and location—not the subject or description.) The system will ask you if it is a recurring event. You can schedule daily, weekly, or monthly events, or at irregular intervals. You will be asked for the number of recurring events.

The next prompt asks if you want to be reminded of this activity. If so, the system prompts you for reminder text and the date and time that you wish to be reminded. You have the option of repeating the reminder. This function

is also available through the interrupt key without the use of the calendar function.

However, scheduling a meeting must be done from the calendar option of the main menu. The system prompts you with several options: schedule, cancel, reschedule, status, and additions. If you indicated in your personal profile that you want to be included on the list of attendees, your name will appear first on the attendee list. You have the option of adding other users for the scheduled meeting. You can also use a mailing list to send to several users at a time.

When specifying the time and date of the meeting, your options are ASAP, a general range, or a specific time. The first two options default with the next day, but that can be changed. You then define the expected length of the meeting (this is where I always mess up). For example, if you want the meeting to last one hour, you must enter "1:" instead of "1" without the colon. A single digit without the colon indicates minutes, not hours. Many times, I've scheduled one minute meetings instead of one hour meetings!

Next, the system prompts you for a conference room. If the CEO manager includes conference rooms among the resources that can be scheduled, they should be listed with information such as capacity, location, and room name. You enter the number of that conference room and enter the information. If the conference room is available for that date and time, you are automatically allowed to proceed. (This resource is only valid if you keep *all* conference room schedules in the CEO calendar.) You can then execute the menu, and the system will prompt you with the time and place your meeting is scheduled. After confirming with OK, proceed with a scheduling supplement for the subject and description of the meeting.

CEO asks if you would like confirmations from the attendees, if it is a recurring meeting, and if you would like to be reminded of the meeting. When the

entry is completed, a message is sent to the attendees' inboxes, and an entry is automatically inserted on their calendars. The attendee has the option to confirm or decline the meeting. If declining, the attendee may reply with the reason.

To check the status of the meeting, you choose status from the scheduling menu and see who has confirmed or declined. You can print this information on your CEO printer.

Changing the display of your calendar gives you the opportunity to view the calendar at a glance by day, week, or month. The daily calendar shows the events planned including the subject, location, time, reminders, and recurrences of the event. The weekly calendar lists the time and type of event for Sunday through Saturday of a specified week. The monthly calendar gives more limited information: character symbols for meetings, vacations, etc. are inserted on a particular day next to a dot that represents an hour of the day. This gives you a quick idea of the kind of month ahead of you.

Unfortunately, the calendar facility is unable to view calendars across systems. I have talked with Data General's development staff to see if this feature will be included in the future. If the calendar is to be used to its fullest extent, users must be able to view across systems and schedule conference rooms using one resource calendar to eliminate double scheduling of resources.

The reminder facility can also maintain a things-to-do list. When creating such a list, a text entry is made of the item, then a priority level is assigned. If you want that item to be a number one priority, and no other item is to have that priority, the system lets you make that entry unique. While at that prompt, you can display the entire list by pressing the index key (S-F2). If no priority is assigned, the item will be added to the bottom of the list. This list can also be printed at your CEO printer.

Access to the reminder facility is
(continued on page 60)

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MASTERING YOUR CONSOLE

Your console is as versatile as you are

A couple months back, I did a column on how to secure the all-powerful master console (April 1987). Today, I'm going to tell you how to turn your master console into a log-on console on a standard non-SMI system. I have been told a number of times this is impossible, but I have done it and it works. It isn't as tricky as it sounds, but if you're not careful, you can get yourself in a little bit of trouble.

To implement this technique, you need to add three lines to your UP macro. In the beginning, add CHAR/ON/SHR before you start EXEC. Once EXEC is up and running, you then add CONTROL @EXEC ENABLE @CON0. At the end of the UP macro, add BLOCK 2. That's it. When you get to the ENABLE statement, your master console screen will be cleared, and you'll get a log-on message. Since the UP macro is still running, any output from it will still be displayed on the screen, so unless you want to be interrupted, don't actually log on until the UP macro finishes. You might add WRITE UP MACRO COMPLETE before you BLOCK PID 2. You now have the master console available for logon under EXEC.

What's the catch? Just that you need to be a little careful getting to the PID 2 CLI when it's needed, and if the UP macro terminates before you BLOCK PID 2, it can be very confusing.

Let's take a look at the normal situation first. There will be times when you need to get to PID 2. You might need to change a baud rate or terminate a hung process or even bring the system down. (Some people shut down their system intentionally on occasion.) How do you do that? First, you log on to the master console with a username that has super-process. Turn superprocess on and enter WHO to find out what PID you have logged on under. Then enter the single command line UNBLOCK 2; BLOCK x, where x is your PID number. You should now have the CLI prompt for PID 2. Type WHO at least twice to make sure (I'll explain why later). Now you can do whatever it is you need to do with PID 2. When you're done, enter UNBLOCK x; BLOCK 2, and you will be back at your log-on PID CLI prompt. Sound easy? Well, it is.

Here comes the hard part: you'll find yourself in a difficult situation if the UP macro doesn't finish or if something goes wrong in the blocking and unblocking needed to switch back and forth to PID 2. You will end up with both CLI processes running on the same console. Since the CLI processing cycle is (1) issue a prompt, (2) read a line, (3) process the line, and (4) go back to step one, you get both cycles interleaved with each other. However, the operating system won't let one process issue a prompt until the other reads the command line, nor will it let one read a command line while the other is reading or prompting. So you get this cycle: (1) write PID 2's prompt, (2) give command line to PID 2 and write PID x prompt, (3) give command line to PID x and write PID 2's prompt, and (4) repeat steps two and three until someone breaks the loop with a BYE, TERMINATE, BLOCK, or some other command. This can be very confusing.

If you suspect you are in this trap, keep entering WHO at the prompt. Once, just for the heck of it, I started several CLIs at the same terminal. Then I brought in an unsuspecting friend and entered WHO again and again. It really blew my

friends mind when we got six different PID numbers from WHO. It was an interesting, but nearly useless, exercise.

So how hard is it to get out of this vicious cycle? Simple. Just start entering BLOCK 2 at the prompt. If you get an error, the wrong CLI tried to do it. Enter it again until you don't get a message. Now if you enter WHO repeatedly, you should get only one PID number.

The only other complication is when the UP macro blows up. At this point, instead of two CLIs fighting it out, you have PID 2 CLI and the EXEC log-on procedure. Thus, every other entry will be going to EXEC for a username or password. If you synchronize your entries, you can log on to the system under EXEC and have two CLIs, or you can disable @CON0, so only PID 2 has the console. If you disable @CON0, make sure that you do not block PID 2. Otherwise, nobody will have the terminal. Of course, as long as another console is available, you can log onto it and either unblock PID 2 or enable @CON0.

If another console isn't available, you've got a problem. Turn to the system manager's guide and force a shutdown of the system, because that is your only way out. So here comes the Macro Doc's warning: Don't block PID 2 if no consoles are enabled on the system.

Too many unhappy returns . . .

I've seen a number of macros display something on the screen in an unusual way. Instead of TYPEing a text file, they use COPY @CONSOLE <filename>. I always believed the two commands were identical, but after chasing down another problem, I discovered they weren't. I was trying to figure out why I had a whole bunch of extra carriage returns inserted when I TYPED source program files. This occurred in the batch stream, as well as on my own screen, and made the listings difficult to read. Furthermore, X DISPLAY showed that there were no extra carriage returns or line feeds in the file. In addition, it occurred on most of the files that our old, old version of CSCRIPT generated, but not on all of them. It also occurred on some programs that were not generated by CSCRIPT.

It wasn't until I tried a COPY @CONSOLE on one of the strange files that I found the answer. The COPY worked! But when I TYPED it—too many returns. The answer was that CSCRIPT created those files as fixed-length record files of 84 bytes. However, after using SED on the file, the trailing blanks on a line were stripped. The TYPE command converted the file from fixed-length records to data sensitive by adding a line feed every 80 bytes (CHAR/CPL setting), and that was the problem. It was further aggravated by our practice of never writing a program from scratch, but instead using COPY to give us a start from an older program. COPY retained the file type and record-length settings. SCAN.ELEM (January 1988 column) also retains the file type, and it was confusing me also. After all, I had used SED, SCAN.ELEM, COPY, MOVE, and CRTEDIT on all of these files, and none of them fixed it. But if I started a new file and appended or inserted it with an editor, everything was fine.

The moral of the story is that TYPE <filename> and COPY @CONSOLE <filename> are not the same. COPY will move the data as is, but TYPE will sometimes add carriage returns, depending on the input file type. To fix a file with many extra returns, just use the following sequence of CLI commands:

```
CREATE/TYPE=TXT (newfile)
COPY/A (newfile) (filename)
RENAME (filename) (oldfile)
RENAME (newfile) (filename)
```

Now for a visit to the mailbag . . .

A couple months ago, I reviewed some shareware and tried to emphasize the fact that it's *your* responsibility to make sure that what you get won't kill your system. I also commented that this is true to some extent with commercially supplied packages. Unfortunately, this was exemplified by a user who sent in the following.

Dear Macro Doc,

This macro (see Figure 1) came with a piece of software I bought commercially. Being the trusting sort, I ran it late one afternoon and found it had an interesting side effect. Somebody in accounting was apparently using the file at the time, and the REORG bombed. That wasn't so bad, but the renamed file was deleted, leaving me with nothing but my backup. Fortunately, it was good. My questions:

1. Should I have suspected foul play?
2. How could I spot a problem like this before I commit hari-kari?
3. Would you fix the macro?

Dear Anonymous,

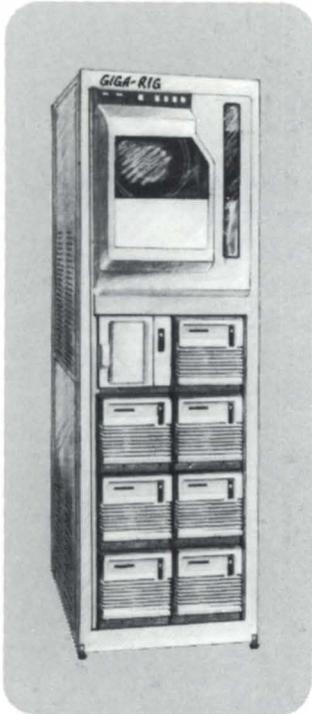
Before I tackle your questions, let me say you did good by picking a file with a current and complete backup. Without

Figure 1: Commercially supplied reorg macro

```
push ; prompt
defacl op,oware -,ware
write Beginning REORG of %1%
pause 1
delete/2=ignore %1%.RAF
rename/2=error %1%.nx old_%1%.nx
rename/2=error %1%.xd old_%1%.xd
reorg/a=%1%.RAF old_%1% %1%
copy @console %1%.RAF
write
delete/2=warning old_%1%.(nx xd)
write
write REORG of %1% complete
pop
```

meaning to sound as critical as it will, you probably should have picked a better file for the test run. One good way to test unproven software is to make a copy of some file in a separate test directory, strip everything possible off your searchlist, and try it out. Ideally, you would have a null searchlist, but in the case of your test, you might have only the ICOBOL directory on it. I will admit, though, that the macro seems straightforward and simple, and that probably gave you a false sense of security as a result. Under slightly different circumstances, you would have had no problem, assumed it was good, and possibly gotten bit weeks or months later when you weren't so careful. You might consider yourself lucky that it erased your live (but backed up) data file.

for Nova, Eclipse, and MV Users



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To answer your questions:

1. No, I don't see any reason to suspect foul play. Perhaps a little carelessness on the part of the macro writer, but it is more probable that it was just an assumption that the end-user would know what they were doing if they understood the macro code.

2. Always be concerned about delete commands. This is the fastest way to destroy something. Remember that when you rename or delete a file on AOS[VS], anyone who has that file open will continue to use the original copy until it's closed. That is when the delete will actually remove the file from disk. However, no other user will be able to open it after the delete command. A macro makes a basic assumption about its operating environment, and the user must be aware of all factors in that environment. Since it includes a multi-user operating system, you must consider what other users could be doing.

3. There are many ways to improve the macro—that's what makes writing a good macro as much an art as a science. A well-written macro can be reasonably safe, but no matter how well it is constructed, I have never seen a macro system that was foolproof, because fools are so ingenious. Anyway, here are some techniques that will make it less likely to destroy:

1. Change the first line to "push ; prompt pop."

2. Encircle the complete macro as shown in Figure 2. This will prevent the macro from blowing up if no argument is supplied or if the file doesn't exist in the current directory for renames.

Figure 2: First level of protection

```
[!equal,%1%,.]
  write *** ERROR *** No filename supplied
[!else]
[!equal,[!file =%1%.].]
  write *** ERROR *** %1% not in current directory
[!else]
  . . . rest of macro . . .
[!end] ; Comment end of file exists check
[!end] ; Comment end of argument 1 check
```

3. Change or remove the delete command. The simplest protection would be to add /C to the critical delete command. I did this to a BUILD macro I got from an unknown source after accidentally leaving off the first argument. I had meant to enter "BUILD ALLPROGS +.COB" and ended up deleting all of my source code for an entire subsystem. (See Brian Johnson's August 1987 column for a safer version of BUILD and his September 1987 column for a detailed narrative on how to idiot-proof it.) A similar version of the REORG macro on my system QPRINTS the audit file (instead of COPY @CONSOLE, which can usually be replaced by TYPE, otherwise, don't QPRINT, use COPY @LPT (filename)). The hard copy on the printer makes me check the outcome and reduces the possibility that I might miss a problem.

4. Since the cause of the disaster was that the file was in use, you might want to see if there is a chance of this and warn the macro operator about it. Add this right after what is shown in Figure 3.

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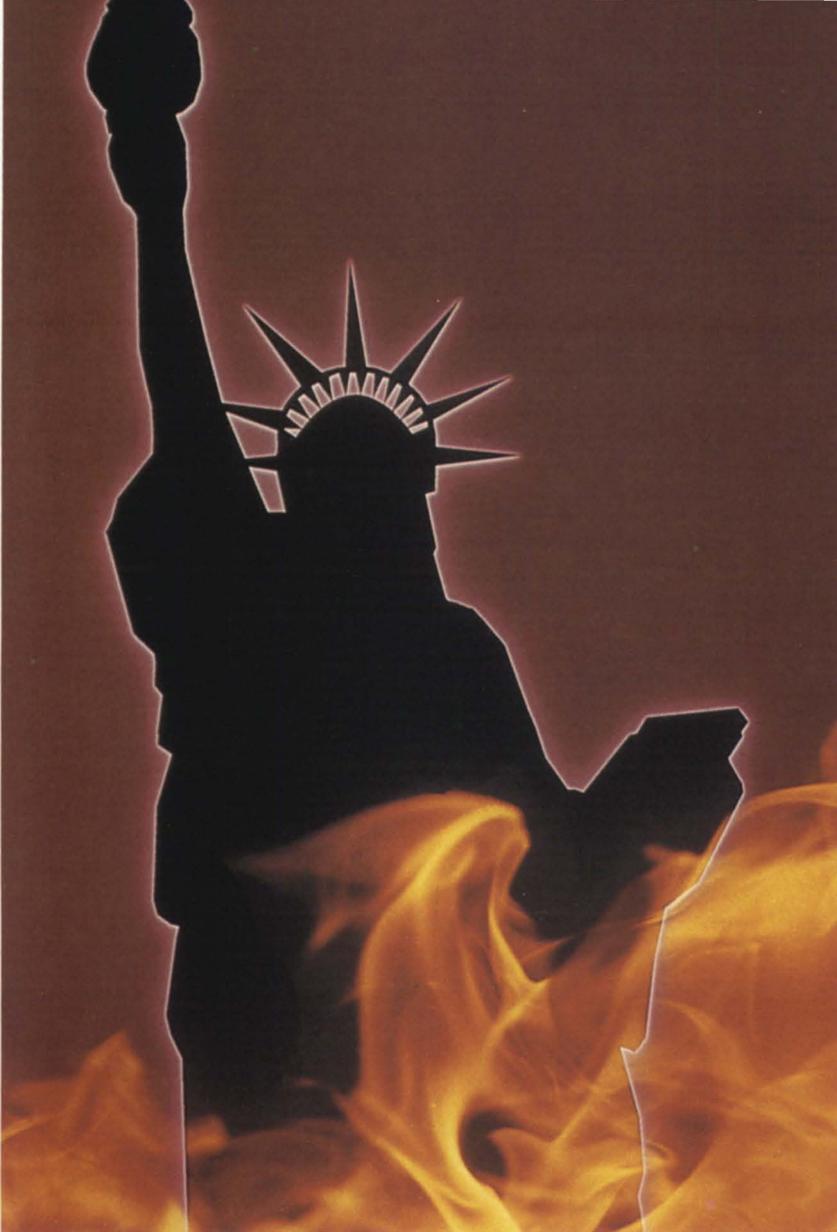
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Figure 3: Warning that file is in use

```
"PUSH;PROMPT POP".
Delete/2=ignore ?check.[!pid].tmp
create ?check.[!pid].tmp
who/l=?check.[!pid].tmp op:mIs32
[!une,[!size ?check.[!pid].tmp],0]
write
write WARNING—MINISAM SERVER RUNNING
write FILE %1% MIGHT BE IN USE.
write TYPE ^C^A TO ABORT. PAUSING 5 SECONDS.
write
pause 5
[!end]
delete/2=ignore ?check.[!pid].tmp
```

Another approach would be to take hold of that file by changing the ACL on it. This would change the middle of the macro to look like Figure 4.

Figure 4: A different approach

```
delete/2=ignore ?acl_%1%.tmp
acl/l=?acl_%1%.tmp %1%.xd
acl/2=error old_%1%.xd [!user] r
acl/2=error old_%1%.nx [!user] r
reorg/a=%1%.RAF OLD_%1%.XD/D %1%/l [%1%.KEYFILE]
acl/2=error %1%.(nx xd) [?acl_%1%.tmp]
delete/2=ignore ?acl_%1%.tmp
```

Before that change can be used, you must also add a .KEYFILE for each index file you have. This lists the primary and alternate keys for the file in reorg format. For example, if your ARMASTER.(NX XD) had an 8-byte primary key and a 12-byte alternate key at the beginning of the record, ARMASTER.KEYFILE would contain "1:8/K 9:12/A." This of course assumes that the system manager set up these parameter files during the system installation and kept them up to date.

Once the ACL was changed on the old file, any user that had it open would be locked out of updating it. You, as [!user], would still be able to read it. The user would get an error at the console if any further update of the file was attempted, but you would be assured of having the latest copy of the file. Furthermore, since changing the ACL of a potentially open file is dangerous in itself, I used the rebuild version of the REORG as shown in Figure 4.

As much as I hate to say it, when acquiring software from any source, be suspicious of any unproven or unfamiliar software. Most commercially supplied software works fine under most conditions, but nobody can test every line of code for everything. Therefore, when installing "proven" software, be careful. When installing any software, caveat emptor. Δ

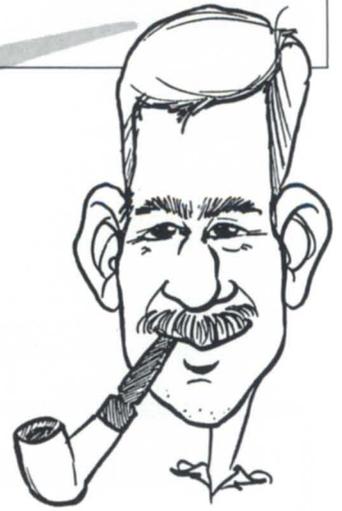
Jim Siegman is a contributing editor to Focus, chairman of the NADGUG audit committee, and treasurer of the Chicago Area Data General Users Group. Send comments or questions to Datamark Corp., 3700 W. Devon, Suite E, Lincolnwood, IL 60659; 312/673-1700.

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Glamour and gleanings from Las Vegas

I made it back from Las Vegas in one piece and not too much poorer. The convention was, as usual, excellent. There were more educational sessions than ever, and the exhibit area was huge. All in all, an excellent investment in time and money. For me, the most interesting exhibit was the demonstration of ICMS-DOS 1.40. This is the multi-terminal version of ICOBOL, running on a Dasher/286.

For those of you who haven't heard by now, ICOBOL on the PC has gone multiterminal. Up to six dumb terminals can be hooked up to the PC for a total of seven users. Included in the package are many of the normal ICOBOL utilities, such as REORG, PASS, ANALYZE, and IVERIFY. I haven't seen any benchmarks, but the machine looked fast to me. I'm sure it could run rings around my old CS/40—and that was on a 10 MHz Dasher/286. I wonder what it would do on a 20 MHz, 386-based machine? The MS-DOS version of ICOBOL can support larger programs than the RDOS version. RDOS can handle a maximum program size of 33 KB, while ICMS-DOS will support programs of up to 55 KB. How's that for a twist? Move from your Eclipse to a PC, and you can write larger programs.

What does this mean for us? For me, it means I may never have to hear the words "PC network" again. With the vast numbers of cheap PCs and their inexpensive disks, it should be possible

to set up a seven-user system for around \$10,000. This does not bode well for the Desktop Generation machines. Heck of an upgrade path. When you get too large for the system, buy an MV, throw a terminal emulator on your AT, and BLAST the object code over to the new machine.

Of course, there's a catch. Data General hasn't completely lost their marbles. Like single-user ICMS-DOS, there's no way to compile programs on the PC. You develop the programs on a DG machine and transfer the object code to the PC. At the conference, however, I found a way to get around this minor limitation. Strobe Data from Bellevue, Washington, had an exhibit to show off their Falcon co-processor. This board slips into a PC and runs the Nova instruction set so that anything that will run on a Nova—be it RDOS, ICOBOL, DISCOS, Fortran IV, or whatever—will run on your machine. There is also an Eclipse instruction set emulator included, so your ICOBOL 1.30 code will compile.

Although I'm sure that Strobe Data will be the first to admit that the emulator is quite slow, they've got Ira Ellenbogen working on that project, so don't be surprised if he has it outrunning an MV/20000 soon.

But I've never really been concerned with compile speed. It's running speed that impresses me. I normally do all of my compiles at night in the batch stream anyway. With the Falcon co-processor, you have a DG in a PC. Couple that with ICMS-DOS 1.40, and you can compile the programs under RDOS, transfer them to MS-DOS, and run multiterminal ICOBOL—all on the same

80286-based machine! ICMS-DOS will run you \$1,400.

The requirements for the PC system are simple. You'll need a 286-based machine with 640 KB of memory and 20 MB of hard disk. The AT's serial ports can support up to three users (the master, plus one each on COM1 and COM2), and an AST mux card will support four more.

Other conference news

Gerry Manning gave another excellent lecture on ICOBOL. This year's subject was about using what you've got. The gist was that we've been asking DG for numerous features through the years, such as more speed, new commands, better utilities, and so on. Now that we've got them, what are we going to do with them?

I won't go into any detail, because he's got his own column to write. (I wish he'd start them up again. I miss them greatly.) But I'd like to pass on a piece of advice. Just because you can write these humongous ICOBOL programs under AOS/VS doesn't mean you should. When I switched from ICOS to ICOBOL, I rewrote our cash entry and order entry programs to cut them down from two programs to one. This decreased entry time by about 2 seconds per transaction and made the things nearly impossible to debug (especially since the program became too large for the ICOBOL debugger to handle, which is an article in itself).

In AOS/VS, you have the capability of taking your whole order entry, editing, billing, and inventory control systems and combining them into one program. Go ahead and do so, but don't expect

anyone to be able to maintain them!

In RDOS news

It's been a couple of years since I wrote my last "RDOS is dead" article. RDOS may not be dead, but it is very, very sick. The last revision of normal RDOS, 7.60, should be out in summer of 1988. The product is going to be cate-

gory C for all except the big machines. RDOS 7.60 will contain some STR fixes and a few minor enhancements from DG/RDOS, but I think we're about to see the last of an old and faithful friend.

DG/RDOS, on the other hand, seems to be surviving all right. Rev 2.10 came out in the fall, and it supports the MV/1400. In addition, 2.10 supports reel-

to-reel tape on the MV/2000 and MV/1400, RAM disk with normal system memory, and a CLI screen edit. Rev 2.20 is due in spring of 1988 with unannounced enhancements.

Now, let me tell you about the IRDOS SIG meeting. We were set up in this huge room with seating for about 200. The microphone and podium were up front, and the slide projector was ready. Then, the five of us who attended sat and bsd for a half an hour. The DG/RDOS representative looked a little disappointed, but eventually got into the spirit, and we all had a nice talk.

Apparently, we are never going to generate enough RDOS interest at the national conference to justify an IRDOS meeting. I can understand why—the name of the group emphasizes RDOS, and there are just not enough RDOS shops around that can afford to send people to the conference. If you're running a CS system, the travel expenses are probably more than your machine is worth! Therefore, we're changing the name of the group to the ICOBOL special interest group. Don't worry, we're not going to abandon RDOS. But realistically, ICOBOL will generate more interest than RDOS.

There wasn't much new to come out of the RDOS roundtable. I think that if we had kept the question cards from last year and resubmitted them this year, we could have saved a lot of writing. The two big complaints were, as always, RDOS support for the larger MV machines and the lack of a reliable backup utility for RDOS. Marketing, once again, is going to study RDOS for the large machines. In the meantime, buy NANOS.

On the backup question, we did learn something interesting. IMOVE, the DG/RDOS backup utility, which I understand works quite well, isn't shipped with RDOS, because it requires the character instruction set option. ICOBOL, of course, also requires the CIS. So the natural question was "Why not bundle IMOVE in with the ICOBOL release?" This will be looked into, but in the meantime, if you are desperate for a backup utility that works, IMOVE will.

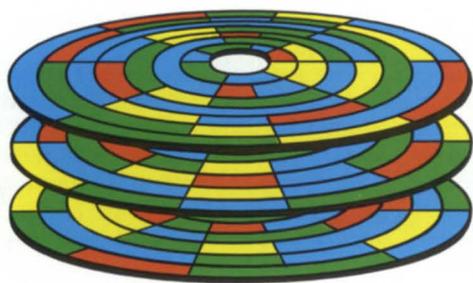
ICOBOL

One reason I went to the conference was to look for a multilevel bill-of-materials program. I knew that Lion's Gate Software was going to be there, and since they have taken over the old

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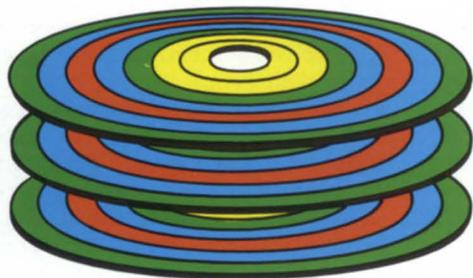
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MCBA software, I thought they would have a BOM package. It turns out that they're ignoring the ICOBOL market and selling everything in 32-bit COBOL. Bad move, guys. I think the market is heading more toward ICOBOL software.

Witness the rumor going around that Cognos is going to release a MINISAM version of Powerhouse.

Fortunately, I found Orbi Inc., which markets an ICOBOL-written MRP-II package that looked pretty slick.

Peregrine Data Systems had a fancy D200/D210/ANSI/VT100/VT52 terminal emulator. It includes customized menus, function key macros, XMODEM/YMODEM/Kermit file transfers, and more. It sells for \$69.95. The hilarious thing is that they were giving out demo disks. Demo disks for a \$70 program?

Rational Data Systems was demonstrating, along with all of their other amazing goodies, a new version of one of my favorite emulators, Popterm. The new version is a D410 emulator, and I've got it on my desk, but I haven't had a chance to play with it yet.

Kudos Department

I'd like to offer a round of appreciation from all of us RDOS users to someone who has been helping us all these years.

Ira Ellenbogen has been mentioned in this column many times, but he still isn't as well known (or as rich) as he ought to be. I've been through two or three of these roundtables with Ira, and sometimes, it hurts to watch him. Someone in the back will stand up and declare that he wants multiground RDOS. While the panel is answering, I know Ira is in his chair muttering, "I've got that. I've had that for seven years now."

Someone else wants to know why DG won't come out with an MV version of RDOS. Ira has had one on the market for two years. Yet, at this roundtable, Ira gave Data General reasons why they should come out with RDOS for the larger machines, even though the release of such a product would probably hurt Ira's version.

Ira is one of the true gentlemen in this business, always trying to share his knowledge with others. We owe him a vote of thanks. Δ

Tim Boyer is EDP manager at Denman Rubber Mfg. Co. He may be reached at P.O. Box 951, Warren, OH 44482; 216/898-2711, or on the NADGUG bulletin board at 415/924-3652.

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Msgs: New 0 Dec 25, 87 2:15PM Doc: CAI Document

>> CAI Integrated File Crypt <<

Please specify document to process (or press CANCEL/EXIT)

Read Your Document

Drawer Name: CAI Drawer

Folder Name: CAI Folder

Document Name: CAI Document

CAI Document will be encrypted

Key:

(Please enter encryption key again for verification)

* Documents and files are encrypted quickly and easily

* Software implementation of DES (Data Encryption Standard), FIPS-PUB 46 (1977)

* Available for CEO, WordPerfect and AOS/VS Files

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Circle 13 on reader service card.

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Circle 54 on reader service card.

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Circle 9 on reader service card.

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Circle 58 on reader service card.

(from page 50)

gained by pressing the interrupt key. When an active reminder is blinking at the top right corner of your screen, you can press F5, and the cursor will move to the appropriate number. Just press newline until the reminder is displayed. You then clear, delete, or reset the reminder.

The electronic calendar is a useful tool, but keep this in mind. When we first obtained CEO, one of our vice presidents kept his entire calendar in CEO. One day the system was down, and he had no idea what his schedule for the day was. So I advise making a hard copy of your schedule the day before, just in case. Δ

Charlene Kirian is PC/OA instructor for the Online Computer Library Center, Inc., 6565 Frantz Rd., Dublin, OH 43017; 617/764-6435. She also serves as president of NADGUG's OASIS (Office Automation Special Interest Group).

PRODUCT SPOTLIGHT

TEO-compatible software released

Marion, OH—Macola, Inc., a software publishing firm for engineering and business applications, has introduced a TEO Applications Group and released the Piping Design System (PDS).

PDS is a fully integrated, interactive system for designing complete piping systems and construction documentation. It enables design engineers to produce complete three-dimensional piping system models.

The software is compatible with Data General's TEO/3-D modeling and data base management product line. PDS runs on the Data General DS series of engineering workstations that provide windowing and 3-D graphics.

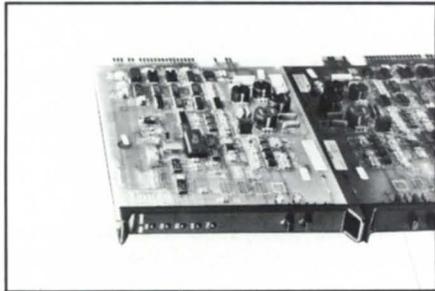
PDS features interactive and menu-driven pipe routing, a comprehensive library of ANSI standard fittings, automatic fitting placement, and model de-

sign verification. These features guide users through the creation of piping system models, allowing modifications and alternative analyses, and producing construction documentation.

Currently under development by the TEO Applications Group are electrical, HVAC, and 3-D equipment builder products. Custom applications are also available. Macola is an independent software vendor (ISV) for Data General.

Macola, Inc., 196 S. Main St., P.O. Box 486, Marion, OH 43302-0485; 614/382-5999. △

Gandalf adds to data-over-voice family



Wheeling, IL—Gandalf Data's new RM 3640 DOV (data-over-voice) rack-mount card provides users with an inexpensive alternative to modems for desktop access to integrated voice and data communications.

It is the latest addition to Gandalf's data-over-voice family, which includes the DOV 640 standalone unit, the DOV 6400 system, and the DOVtrex network switching system.

Designed as an entry-level DOV system, the RM 3640 provides simultaneous voice and data transmission over existing PBX wiring, reducing cable installation costs. Voice signal quality is not affected.

The single-channel, central rack-mount unit operates full duplex at data transmission rates from 2.4 Kbps to 64 Kbps synchronous, and 0 to 19.2 Kbps asynchronous, providing flexibility and high-speed operation for local area network (LAN) applications.

In addition, the RM 3640 DOV rack-mount card operates at distances of up to 2.3 miles at 64 Kbps, or up to 3.4 miles at 32 Kbps in alternate mode.

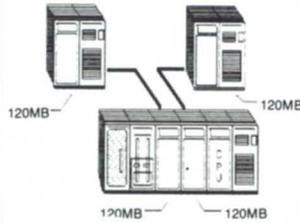
The RM 3640 card fits into Gandalf's



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Circle 21 on reader service card.

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December 25, 1987	Current Inbox	9:16:29
<u>Date</u>	<u>Sender</u>	<u>Summary</u>
1) 15-DEC-87	Sue	Meeting on Thursday
2) 20-DEC-87	John	PIPELINE information
Choose one: (1. Switch to outbox , 2. File Mail, 3. Examine, 4. Delete)		1

- * PIPELINE is an asynchronous mail and file delivery package
- * May be used as an independent mail package, or with CEO Electronic Mail
- * Support for dial up and dedicated lines without requiring Xodiac
- * Dialing and connection procedures are transparent to the user

Concept Automation, Inc.
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Sterling, VA 22170

for further information
contact *Sylvia Michaels*
at (703) 450-6000

Circle 14 on reader service card.

3000 chassis, which can accommodate up to 14 cards without redundancy or 12 cards with redundancy. It's capable of digital multidrop operation, a feature that the 3000 chassis accommodates. This means multiple rack-mount units can share one communication path to a

single CPU port, making optimum use of a limited number of ports.

The rack-mount card is available for immediate delivery. It costs \$295.

Gandalf Data, Inc., 1020 S. Noel Ave., Wheeling, IL 60090; 312/541-6060 or 1-800/PAC-XNET. Δ

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Circle 35 on reader service card.

DMS announces version 3.20 of DBR

Salt Lake City, UT—DMS Systems has announced version 3.20 of their Disk Backup and Recovery System (DBR) utility program. DBR runs on Data General MV minicomputers and overcomes deficiencies found in DUMP_II/LOAD_II utilities.

DBR handles hard tape errors. DBR can read any tape with a hard tape error regardless of whether it was created using DUMP_II or DBRDump. DBR speeds up reloading of specific files from multivolume backups by creating an index and allowing loading to start with any volume of the set. Sequencing through preceding volumes isn't necessary with DBR. Version 3.20 contains the following enhancements.

- DBR now supports labeled tapes in dump and load with standard EXEC tape-mount management, as well as a non-EXEC interface.

- DBR will load files using the DBR index as a one-step process. The index is searched, and the user is prompted to mount the correct volume.

- DBR will dump and load through a network for both labeled and unlabeled tapes.

- DBR allows verification of dumps, comparing data on the tape with that on the disk and reporting any discrepancies.

- DBR allows disks to be reorganized with all the directory information loaded independent of the data. This provides performance improvements for directories with large numbers of files.

DMS Systems, Inc., 1111 Brickyard Rd., Salt Lake City, UT 84106; 801/484-3333. Δ

Office/Publisher now compatible with WordPerfect

Rochester, NY—A new version of Office/Publisher software from Intercon Associates, Inc. offers electronic office publishing with WordPerfect software on Data General computers.

The software offers a transparent add-on to users and conforms to WordPerfect user interfaces. It integrates with the WordPerfect word processing software, running on Data General MV Eclipse minicomputers.

The software is the first of several versions for a wide range of hardware and software platforms expected to follow throughout the next 12 months, according to Intercon.

Intercon Associates, Inc., 1580 Emerson St., Rochester, NY 14606; 716/458-0860. Δ

Interscience introduces new band printers

Agoura Hills, CA—Interscience Computer Services, Inc., a supplier of peripheral subsystems, has announced a new family of band printers, 1,500 and 2,000 LPM, fully plug-compatible with DG systems.

The printers are manufactured by Dataproducts and use a data channel, DMA/DCH line-printer controller.

A swing-open gate facilitates paper, ribbon, and steel print band changing. The paper routing system, with four tractors and a paper puller, allows unattended operation.

A touch-sensitive control panel includes a built-in self-test unit with switch-selectable, 80- or 132-column multiple pattern program. A built-in self-diagnostic display monitors all electronics and system interlocks.

The 1,500 and 2,000 LPM printers have list prices of \$19,995 and \$25,500, respectively. Prices include installation and 90-day warranty on parts and labor. Quantity and dealer discounts available.

Interscience Computer Services, Inc., 5171 Claretton Dr., Agoura Hills, CA 91301; 818/707-2000, telex 183628. Δ

Concept Automation offers Pipeline, MenuOP, and MATE

Sterling, VA—Concept Automation, Inc., a DG VAR primarily for the federal government, is now focusing more on commercial sales. Some of their software offerings include Pipeline, an asynchronous mail delivery system; MenuOP, a menu system; and MATE, a multiple asynchronous terminal emulator.

Pipeline can operate on the DG MV series. AOS/V5 file transfers and CEO mail deliveries are handled automatically

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6061 192 MB Disk S/S
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4196-A Tape Drive
6026 Tape Drive S/S
6021 Tape Drive S/S

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Nova 2 Memory

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Circle 50 on reader service card.

SECURE YOUR ENVIRONMENT WITH menuOP

Dec 25, 1987	Main Menu	5:56:29 PM
0)about menuOP (tutorial)		
1) CEO (Data General's CEO)		
2) Library (WordPerfect's Shell)		
3) File Crypt (data encryption)		
4) PIPELINE (async mail delivery)		
		Option Id: 0
(F11 = Exit/Cancel) (SF1 = Help)		

- * Combine macro, program and application execution into an easy access menu structure
- * User access to options under complete control of system manager
- * Ability to create multiple levels of menu managers
- * Ability to create or redefine function keys to meet individual user's needs

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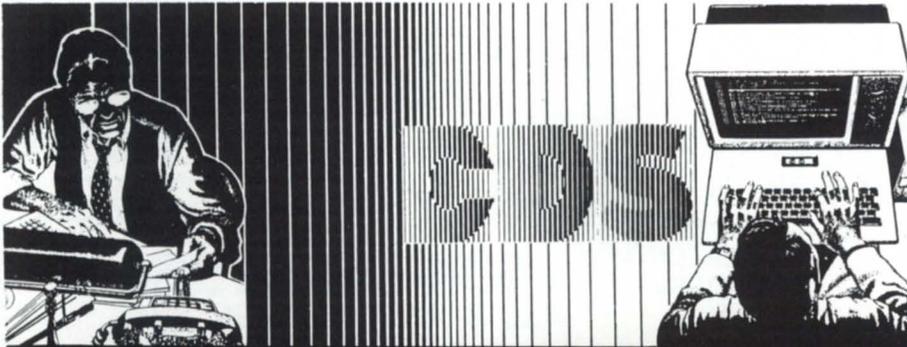
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across dialed or dedicated asynchronous lines. It features:

- system maintenance screens with on-line help
- built-in mail user interface to allow transfers of AOS/VS ASCII text files and binary data files
- delivery of CEO documents to remote

sites through standard dial-up phone lines or dedicated lines

- transparent dialing and connection procedures
- communication speeds of 300, 1200, 2400, 4800, and 9600 baud
- encryption of secure data prior to disk storage.



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Circle 6 on reader service card.

The MenuOP uses a tree-like structure. Each option in a menu executes a function or displays a lower menu. Groups of related functions and menus can be grouped under a higher menu option. Each option can be assigned an access list containing the users or terminals that may access it. Not all users or terminals will have access to every option within a menu. A manager can choose to display all options or maintain a concise screen to display only those options available to the user.

MATE is an asynchronous communication handler for terminal emulation and file transfers. MATE can communicate with a variety of systems using ASCII asynchronous communications. It also functions as a file transfer agent capable of bi-directional transfers of both ASCII text files and binary data files.

Concept Automation, Inc., 1319 Moran Rd., Sterling, VA 22170; 703/450-6000. Δ

Printronix introduces new P6000L series



Irvine, CA—Printronix, Inc., a manufacturer of computer printers, has introduced a series of multifunction printers designed for bar code label printing.

The P6000L series is optimized for industry bar code standards in production environments, including AIAG shipping labels and primary metals labels, LOGMARS, UPC, HIBC, and EAN. Applications include large shipping labels, inventory shelf labels and part number labels, material control, process control, point-of-sale, and accumulating charges to customers' accounts such as hospital charges.

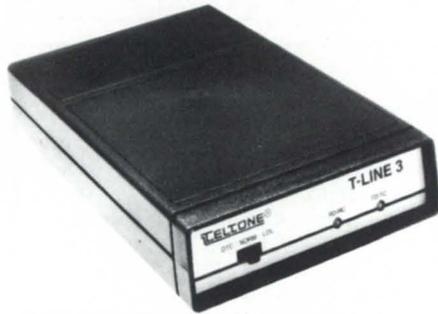
In addition, the P6000L series offers multi-mode printing for text applications. Multiple character pitches are selectable in each mode. Users may choose models with either pedestal-mount or floor cabinet configurations.

A font selection capability allows

printing style and pitch to be inter-mixed on the same print line. Features include boldface, underline, expanded characters, superscripts, and subscripts at all selectable character pitches. Using the Intelligent Graphics Processor (IGP) option, users can generate forms, bar codes, and logos.

Printronic, Inc., 17500 Cartwright Rd., Irvine, CA; 97713; 714/863-1900, telex 910/595-2535. Δ

T-Line-3 transmits asynchronous data



Kirkland, WA—T-Line-3 units link asynchronous data terminals to host computers up to 10,000 cable-feet away. Full-duplex data is transmitted at 19,200 bps on spare pairs in many telephone wiring installations, eliminating the installations of RS-232 cables. Data workstations can be installed and moved as telephone extensions.

T-Line-3 costs approximately \$275 per channel.

Telton Corporation, 10801 120th Ave. NE, Kirkland, WA 98033; 206/827-9626. Δ

UL listing used for UPS

Dublin, OH—Underwriters Laboratories Inc. (UL) has granted Solidstate Controls, Inc. (SCI) approval to use the UL listing mark for sci's 10 kVa, three-phase output uninterruptible power system (UPS). The unit, PB 4100-3, is a power transistor-based design that provides continuous on-line protection from all types of commercial AC power disturbances. It is designed for main-frame computer systems, data communications equipment, and process control systems.

SCI, Inc., Inquiry Handling Dept., P.O. Box 57, Dublin, OH 43017-0057; 614/846-7500, telex 245338. Δ

ETHERNET TCP/IP NOVA/ECLIPSE, RDOS/AOS

For RDOS or AOS systems, Claflin & Clayton offers high speed file transfers or remote logins via Ethernet between systems with TCP/IP support such as VAXs. Software includes FTP (file transfer) and TELNET (virtual terminal) applications.

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Cart. Tape for Desktop (New)	2100.
5-14513 Desktop Converter	Stock
4436 Mouse	Stock
D-214, D-215, D-411, D-461, CRT	Stock
D-211 Amber CRT	550.
C/300	495.
C/150 w/o Memory	795.
Nova 3/12	400.
Nova 4C, 5 Slot Chassis	95.
Cassette I/O w/512473 Cable	295.
Comm. Basic I/O	Stock
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ALM-16	350.
TCB's	Stock
9165 TCU	50.
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INTEL Disk CTL (New)	2500.
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6239 592MB Disk S/S	Stock
6161 147MB Disk S/S	Stock
ERCC for S/140	500.
8537 Expansion Chassis	300.
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Service and Training, Inc. has expanded eastern facilities and branched out to new locations across the country in an effort to meet the need for contract maintenance, repairs, and plug-compatible subsystems for Data General systems. Operating out of headquarters in Gaithersburg, Maryland, new offices have opened in Atlanta; Dallas; and Irvine, California.

Jim Considine has been named director of U.S. Field Engineering Support in Milford. He will oversee administration standards and procedures, policies, programs, and strategies within the division. He has been with DG for 14 years.

Happy birthday, Research Triangle Park. The North Carolina facility recently celebrated its tenth anniversary by honoring 10 employees who have been there since the beginning. They are Dennis Balch, Roger Banks, Joe Dooda, Randy Lambe, Phil Larson, Dan Oldman, Lee Schiller, Tom Sheffield, Dean Throop, and Richard Woods.

Tom West, vice president of the Systems Development division, and Edson de Castro attended the gathering and offered some perspective on the changes at Data General during the past decade. Said de Castro, "We have shipped over 180,000 computer systems. And we have seen a product evolution from the 16-bit Novas to the 32-bit Eclipse MV family of computers. . . . We are not celebrating the anniversary of a building, but achievements of the people of RTP."

Nippon Telegraph and Telephone (NTT) will eliminate approximately 23,000 jobs during a three-year period in a push toward modernization, according to a recent article in *MIS Week*. The article said that most of the work reduction would be from hiring fewer employees than retire each year. They estimate hiring 4,000 annually, compared to a 10,000-a-year attrition rate. Some 2,100 people have also been transferred to NTT subsidiaries.

Educational Services has published a *Customer Education Catalog Schedule Update* that contains complete course schedules for all of Data General's Education Centers. New offerings include a CEO rev 3.0 technical seminar, a CEOwrite lecture course, a disaster recovery workshop, and two computer-

based training courses for computer maintenance technicians.

Those interested in forming a Unix special interest group can join up with the handful of people who met at Conference 87. Acting leader John Huddleston of USDA Soil Conservation Service said they are trying to set up a UUCP network node to transfer files back and forth to each other. The SIG will cover both MV/UX and DG/UX.

Interested people should contact Huddleston at USDA Soil Conservation Service, P.O. Box 4611, Portland, Oregon 97208; 503/221-2843 or 503/245-5791.

More than three years had gone into E.F. Hutton's information system, and it was well on the way to being a PC integration showplace. And the \$40 million plus that Hutton had budgeted for MV systems to link the PCs on every Hutton account exec's desk made the company a major DG customer. That changed rather abruptly when Hutton was taken over by financial giant Shearson Lehman American Express last fall. According to Bernard Weinstein, the Hutton VP responsible for the project, Shearson is likely to take out the whole system. When asked whether he would like to comment on the loss of his project, Mr. Weinstein only laughed and said, "What do you think?"

For lease: value-added resellers' hardware and software through Data General. In response to input from VARs at the recent regional VAR council meeting held in Fort Wayne, Indiana, Data General has implemented a comprehensive leasing program for qualified value-added reseller customers. The plan includes the leasing of both the VAR's hardware and software to the VAR's end-user.

Under the terms of the leasing contract, DG will deal directly with the end-user. Upgrades can also be offered to the customer during the lease period. The length of the lease varies between one and five years.

So far, DG has eight contracts worth a total of approximately \$1.5 million.

Gandalf Technologies Inc. reported a healthy 21 percent increase in revenue from 1986. Fiscal 1987 consolidated revenue totaled more than \$130 million. Net income for fiscal 1987 was

\$6.25 million, up 87 percent from the previous year.

Federal employees may not want their bosses to find out, but beginning last November, Access Technology has been providing government agencies with a free license for a spreadsheet-based Payroll Decision Support System (PDSS) when agencies license their 20/20 spreadsheet program directly from them.

PDSS is a 20/20 spreadsheet application that extracts data from an external payroll data base and brings it into 20/20 for analysis of payroll information. The software allows government agencies to plan personnel payroll more economically. An employee's file can be examined according to government service classification, grade, step, hourly rate of pay, and due dates for pay increases or promotions.

Penta Systems International recently installed a new software package at Waldman Graphics to link Waldman's Penta composition system with a Scitex Response Color System and allow the New Jersey printing and typesetting firm to merge and produce color text and graphics.

This link enables text and composed pages to be transferred on line to the Scitex color system, allowing the creation of fully composed color pages.

Waldman purchased its first Penta system in 1977, upgrading from a 16-bit system to a 32-bit Penta MV system in 1984.

Network Associates of Cedar Rapids, Iowa, has announced a new service, called State-of-the-Art Service, for life, health, and annuity administration. The service keeps clients up-to-date on software, new products, and trends in these industries.

The service includes monthly maintenance releases and enhancements to any software the client has under license with Network Associates, visits to a client's company, upgrades, and unlimited phone consultation.

Data Assurance Corporation (DAC), a hot site recovery center for Data General users, now offers a generic disaster recovery plan free of charge to all DAC customers. The plan will be a licensed product. Also, subscribers will be able to obtain free consulting advice via toll-free telephone services. Δ

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