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1980-1981

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Computing
Services
Office

Off-Line

University of Illinois at Urbana-Champaign

VOL. 8, NO. 3 March 1980

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CSO DIRECTORY - STAFF AND SERVICES

Administrative

Director	George Badger	150	DCL	333-4103
Business Manager	Stanley Rankin	150	DCL	333-6530
Secretary	Joyce Vaughn	150	DCL	333-1637

User Services

User Accounting	Gary Bouck	162	DCL	333-7752
Systems Consulting		138	DCL	333-6133
Statistical Services Consulting		65	Comm West	333-2170
Text Processing Consulting		207	Astronomy	333-7318
Document Printing Reservation		209	Astronomy	333-8150

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Mgr, UNIX Operations	Sandra Moy	177	DCL	333-4703
Documentation	Lynn Bilger	139	Astronomy	333-6236
Distribution Center	Don McCabe	164	DCL	333-6285
Keypunch Services	Darlene Hawkins	1208	W Springfield	333-6184

Hardware/Software Support

Terminal Repair Service		164	DCL	333-0969
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		1200	baud	333-4001

Asst Dir Systems and Operations	Sandra Moy	177	DCL	333-4703
Asst Dir Development	J. M. Randal	120	DCL	333-9772
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Agriculture	M103	Turner Hall	333-8170
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Commerce West	70	Comm West	333-4500
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OFF-LINE is the newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. OFF-LINE is printed monthly. Articles may be reprinted provided that the source of the article is noted. CSO operates an IBM 360 Model 75 with one million bytes of fast core and two million bytes of slow core, under HASP and OS, and a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

POLICY

PLANNED DISK SYSTEM UPGRADES TEMPORARILY POSTPONED

The disk system upgrades planned for December 1979 have been temporarily postponed due to the failure of CDC to honor their delivery commitments. This delayed upgrade affects the two most significant service bottlenecks on the CYBER, disk space and swapping speed. We anticipate problems, particularly with disk space (and migrated files) throughout the remainder of the Spring semester because of this delay. Please cooperate by purging unnecessary files and by leaving files migrated unless actually needed.

The revised delivery schedule, which we expect will be honored, calls for partial delivery in late March and completion of delivery by June.

We regret any inconveniences caused by this delay, and will honor the price reductions which were made in anticipation of adding this equipment.

IBM 360 TO BE REPLACED

At the January Board of Trustees meeting, approval was given for CSO to acquire a new system, the IBM 4341, to replace the 360/75. The new system will not completely replace all components of the 360. CSO will replace the central processing system, the memory and the data channels, but will retain the disk system, tapes and communications equipment, and the unit record equipment associated with the 360.

The 360, which was installed in the late 1960's, has 1 million bytes of main memory, 2 million bytes of a slow Ampex memory, 3 selector channels and 2 multiplexor channels. This is the equipment that will be phased out.

The incoming system, the IBM 4341, will have 4 million bytes of high speed central memory and 6 channels, one of which will be a byte multiplexor. The remaining 5 channels are known as block multiplexors. (The block multiplexor is the successor to the selector channel.)

The two systems are approximately equal in computing power although our tests have shown a fairly wide range of individual performance differences depending on the characteristics of the job involved. Despite this similarity in performance there are enormous differences based on the changes in technology which have occurred since the design of the 360.

The outgoing equipment consists of approximately 25 large cabinets housing the processor, memory and channels. The new system consists of three cabinets housing the entire system. Data channels have gone from being contained in 6-foot-high boxes that are approximately

3 feet square, to being packaged 3 on a large card. The power consumption and air-conditioning requirements have dropped by approximately 80% despite the slight increase in the number of channels and the amount of memory. Most attractive, however, is that the monthly maintenance cost will drop from about \$7,000 to about \$600 and that this difference over a three-year period will pay for the purchase of the system.

The system is currently scheduled to arrive in August. However, we have requested that delivery be made earlier so we can install the system at a more convenient time during the summer. One advantage of the new system is the compact size which will allow us to install and test it before any steps are taken to dismantle the 360. In any event the installation, for service purposes, will not occur until removal of the Library Circulation system scheduled for July 1, 1980.

With the installation of the 4341 we are continuing our commitment, made at the time of the CYBER selection, to provide IBM compatible service over the life of the CYBER. The 4341 will meet this objective quite adequately and will allow us to continue our IBM services, including the driving of the RJE network.

Of interest to the user community is the fact that the OS/MVT operating system, with HASP, as it is currently in operation will continue on the new machine, although additional services are being planned. It is our anticipation that all jobs which currently run on the 360/75 should run without modification on the new system. As more definite delivery schedules are known and as other plans are developed we will continue to inform the user community in future issues of *OFF-LINE*.

SYSTEM NOTES

RELIABILITY REPORT

During January, the approximate mean time between failures for the CYBER was 24 hours and the mean time to repair was about 23 minutes. 2550's, disk and environmental problems were the major causes of CYBER downtime.

For the IBM 360, the approximate mean time between failures was 26 hours and the mean time to repair was about 44 minutes. Memory failures and disk problems were the reasons for 360 downtime.

STATISTICAL SERVICES

MULTIVARIANCE VI INSTALLED ON CYBER AND IBM

Version VI of the MULTIVARIANCE statistical program has been installed on the IBM 360/75 and the CDC CYBER 175. MULTIVARIANCE performs a generalized univariate and multivariate analysis of variance, covariance, and regression. It is intended to replace the MULTIVARIANCE Version V package presently available on both machines. Both Version VI and Version V will be maintained until the end of this semester. Then Version V will be removed from both systems.

The new manual, *MULTIVARIANCE - Version VI*, National Educational Resources, Chicago, Illinois, 1978, may be purchased at the CSO Distribution Center (Room 164 DCL).

To access the program on the CYBER you should issue the following commands from the BATCH subsystem in time-sharing or from cards:

```
GRAB,MULTV.  
MULTV,file1,file2.
```

where:

- | | |
|--------------|--|
| <i>file1</i> | Specifies the local file which contains the specifications of the problem and data. If <i>file1</i> is not specified, the information is assumed to be in the system file INPUT. |
| <i>file2</i> | Specifies the local file to which the results are written. If <i>file2</i> is not specified, the results are written to system file OUTPUT by default. |

To access the program on the IBM you should request approximately 160K on the ID card and issue the following commands from cards:

```
//PROCLIB DD DSN=SYS4.PROCLIB,DISP=SHR  
// EXEC MULTV
```

Any questions or problems with this program should be directed to the CSO Statistical Services Consultants in Room 65 Commerce West (333-2170).

SOUPAC ON THE CYBER

CYBER SOUPAC now takes data with record lengths longer than 150. However, the default record length limit will continue to be 150. If your record length is shorter than 150, the default limit will suffice. If you need a higher limit, you must specify the limit with an internal file statement. This file statement should appear early in the SOUPAC program, preferably prior to any program statements and should have this form:

```
#FILE(S-unit no.)(mrl)(mbl)"rt""bt".
```

where:

<i>S-unit no.</i>	Is the sequential number for this file in usual SOUPAC syntax, e.g. S16 corresponds to TAPE16 data file
<i>mrl</i>	Maximum record length, default = 150
<i>mbl</i>	Maximum block length, default = <i>mrl</i> = 150
<i>rt</i>	Record type, default = Z
<i>bt</i>	Block type, default = C

For example (using default parameters):

```
#FILE(S16)(150)(150)"Z""C".
```

As is usually the case with SOUPAC parameters, any parameter which is to take other than its default value should be specified, all others may be skipped or omitted. The file statement is not needed if all parameters take default values.

Although record lengths may be quite long, limitations on sizes of formats and numbers of variables still hold as before. Also the old external file statement is obsolete in SOUPAC. Users should not reuse S-Units designated on #FILE statements for other purposes in the same SOUPAC run, or for reading in subsequent SOUPAC runs unless the file statement is given there.

File statements only apply to foreign files bringing data into SOUPAC and files written for export to other packages, etc. Of course these files may be read or written with default values without file statements (when they apply). SOUPAC internal scratch files never require file statements.

The above description of #FILE can be found in the revised document, *SOUPAC on the CYBER*, available in Room 65 Commerce West. See other CYBER manuals for appropriate file statements suitable for your data.

MATHEMATICAL SERVICES

TELL, MATH SOFTWARE

Users with numerical problems or questions are invited to use the new mailbox facility to leave messages. You may do this by first entering:

TELL,MATH SOFTWARE

(the space between MATH and SOFTWARE *is* required), and then entering your message when you are prompted with a question mark.

MISCELLANEOUS

RESEARCH BOARD DEADLINE FOR DEPARTMENTAL ALLOCATION REQUESTS

The Research Board has established an April 7, 1980 deadline for the submission of departmental requests for research computer allocations. This deadline affects allocations for the period July 1, 1980 through December 31, 1980.

Research Board allocations are expected to support faculty research, and thesis and dissertation research. Departmental requests and the allocations they subsequently receive are based on individual user requests. Those persons who will need research computer time for this allocation period should be sure to submit their requests to their department via the Research Board Form A. These forms and further instructions are available from the University departments.

COMPUTER RELATED DISCOUNTS AVAILABLE

The Lier Siegler Terminal has been added to the list of CRT's available for Research and Instructional Computing. It also has been made a component of the LSI II Project, since it can be upgraded to a graphics terminal by the insertion of a "card" manufactured by Digital Engineering.

Model of the CRT terminal is:

Lier Siegler ADM 3A (with upper/lower case)	\$750
EIA Cable	\$25

Model of the "card" for upgrading to a graphics terminal is:

Digital Engr. RG512

\$965

A demonstration of the CRT and the graphics upgrade is available in the CSO Systems Consulting Office (Room 138 DCL).

NOTICE OF A FOUNDING MEETING OF AN APPLE COMPUTER USERS GROUP

Time: 8:00 - 10:00 PM
Date: Tuesday, March 18, 1980
Place: Room 28 Education Building

The initial objectives of the group will be:

- to share knowledge about Apple Computer hardware and Software
- to share experiences concerning use of the Apple Computer
- to exchange expertise in solving problems encountered with the Apple Computer
- to discuss applications and software packages of interest to campus users of Apple Computers
- to discuss interfacing and use of various peripherals with the Apple Computer
- to deal with other concerns regarding Apple Computer systems

We invite all faculty, staff and students who are current or potential users of Apple Computers to attend this founding meeting. An inventory of campus Apple applications and users will be one of the first benefits of this group.

For further information, contact Jim Carter or Dave Pontius at 333-2757.

USED QUME CARTRIDGES AVAILABLE

The Center for the Study of Reading has approximately 100 used, cloth and film ribbon qume cartridges available. They would be pleased to give these to anyone willing to recycle the cartridges. If you are interested, please contact either Mike Nivens (333-6660) or Steve Antos (333-7624).

***OFF-LINE's* Mailing List**

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

Check one: ☐ New subscriber
 ☐ Removal request
 ☐ Address correction

Name: _____

Address: _____

CAMPUS or Zip Code _____

(If address correction, give old address and zip code below.)

Comments:

RETURN TO:

OFF-LINE
164 Digital Computer Laboratory
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

PRISCILLA YU
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CAMPUS

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164 Digital Computer Lab.
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THE UNIVERSITY OF THE
MAY 12 1980
CHAMPAIGN, ILLINOIS

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Social Science	202	Lincoln Hall	333-0309

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POLICY

SERVICE KEYPUNCHING AT CSO

Due to the declining use of service keypunching, CSO is planning to contract all keypunch work to a commercial keypunch service. Users will see little change in the service and will continue to deal only with CSO when submitting or retrieving keypunch jobs. CSO itself will provide all interfacing with the contracting agency.

Over the past 18 months, use of service keypunching has been at a level too low to justify the cost of in-house processing. This has held true even though charges for the service have been held at a level below the usual commercial costs. At the same time, it is impractical to simply reduce the size of the operation since it is now at the minimum level to accommodate large jobs with reasonable turnaround times.

The target date for conversion of the service is July 1, 1980. The exact date will be governed by how quickly the present data entry staff can be placed in other similar positions on the campus. It is expected that there will be a transition period during which some work will be processed in-house, and the remainder will be processed commercially.

We emphasize that CSO is continuing to offer service keypunching as one of its services. The method of processing submitted jobs is changing, but little else. It is expected that small keypunch jobs (400 cards or less) will experience an additional one or two day delay because of transit times. Larger jobs should be processed more quickly since a larger staff will be available to keyboard the data.

CSO is planning to adjust its method and rate of charging for keypunch service to be consistent with the contracting agency. Users who have received Research Board support for keypunch services will not be affected by the rate change since their allocation is denominated in the number of cards to be punched. Other users will probably incur higher data entry costs.

SYSTEM NOTES

RELIABILITY REPORT

During February, the approximate mean time between failures for the CYBER was 74 hours and the mean time to repair was about 54 minutes. Major problems on the CYBER were related to disk.

For the IBM 360/75, the approximate mean time between failures was 11 hours and the mean time to repair was about 35 minutes. Hardware failures on memory and LCS were the major causes of IBM downtime.

CYBER

TELENET ADDRESS CHANGES

Due to TELENET expansion, the addresses for a number of TELENET hosts have been changed. Please make a note of these changes because you will no longer be able to access these systems using the old addresses!

HOST SYSTEM	OLD ADDRESS	NEW ADDRESS	CHANGE DATE
Carnegie-Mellon	412 CM	412 28	03/01/80
	412 CU	412 29	03/01/80
U. of Delaware	302 UD	302 20	01/19/80
	302 ZD	302 21	01/19/80
	302 ZV	302 22	01/19/80
U. of Illinois - Urbana	217 UI	217 25	03/22/80
U. of Minnesota	612 UM	612 123	03/22/80
	612 MN	612 124	03/22/80
Notre Dame	219 ND	219 65	03/22/80
Rice	713 RU	713 74	03/01/80
Wisconsin - Madison	608 UW	608 25	03/01/80

CATALOG OVERFLOW - SIZE

If you have ever tried to SAVE or REPLACE a file and received the following message:

CATALOG OVERFLOW - SIZE

read this article to learn why you receive such a message, and what to do about it.

If you are trying to SAVE a new permanent file, the message indicates that you have tried to exceed the amount of permanent INDIRECT access disk space you are permitted. To verify this, you can check your disk space limitations by entering the command

LIMITS.

and checking the displayed value for disk space. Then, by entering the command

DIRECT/PROJ/SUM.

you can determine how many PRU's of indirect files you are currently using.

If you are doing a REPLACE to update a permanent file and receive the message, the above discussion may apply. However, there is another possibility. To understand it, we'll have to explore the connection between files, projects, and limits.

When a file is created, the charge,project used at the last signon is stored along with the user's data (file). This charge,project is then billed for the disk space used by the file. The Project Manager can control the amount of disk space funded by the project by setting the various file limits for each person in the project (e.g., the disk space limit we are currently discussing).

The BILL or CHARGE command sets these limits for the user at signon, using the charge,project specified. If a user signs on using one project and REPLACES a file belonging to another project, the limits associated with the current signon are not applicable to that file. The limits which must be enforced are those set by the owning project. Ideally, these limits would be extracted from the same database used at signon by the BILL or CHARGE command. This solution, however, is very difficult and costly, and an alternate solution has been adopted.

The alternate solution is to store, at file creation, not only the owning charge,project, but also the file limits currently in effect. Whenever a REPLACE is done on a file belonging to a project other than the one used at signon, these stored limits are used. Note that the usual limits (those set up at signon and displayed by the LIMITS command) are used whenever the project stored with the file matches that used at signon.

We now come back to the error message we started with. If you receive this message after a REPLACE command, you must first determine which limits are being enforced -- those displayed by the LIMITS command or those stored with the file. If all of your files were created under the charge,project you used at signon, your current project limits are being used. If this is not the case, enter the command:

DIRECT,*file*/PROJ/LIMITS.

This will display both the charge,project which owns the file and the limits stored with the file. You can update this information by entering:

CLAIM,*file*.

This will replace the charge,project stored with the file with the charge,project used on the last BILL or CHARGE command, and also will replace the stored limits information with your current limits information. The output from

DIRECT,*file*/PROJ/LIMITS.

should then reflect the changed information. Using the CLAIM command also will cause all disk space charges for the file to be charged to the charge,project current at the time of the CLAIM.

REFERENCE GUIDES REORGANIZED

CSO has recently completed a reorganization of the Reference Guides. This reorganization involved splitting the Reference Guides into several major categories, reviewing and updating the existing Reference Guides, and writing new Reference Guides for many topics.

The categories which have been established are as follows:

Category 0	General information which applies to both the CYBER and the IBM.
Category 1	CYBER General Information
Category 2	CYBER Language Processors
Category 3	CYBER Statistical Software
Category 4	CYBER Mathematical Software
Category 5	CYBER Plotting and Graphics Software
Category 6	CYBER Miscellaneous Software
Category 7	CYBER Utilities and Procedures
Category 11	IBM General Information
Category 12	IBM Language and Compilers
Category 13	IBM Statistical Software
Category 14	IBM Mathematical Software
Category 15	IBM Plotting and Graphics Software

Category 16 IBM Libraries

Category 17 IBM Utilities and Procedures

Most of these Reference Guides are now available at CSO North, CSO South, and the RJE sites. However, some of the old guides are still undergoing revision, and some of the "new" guides have yet to be written. These will be added as they are finished.

In addition to reorganizing the guides, the manner in which they are stored has been changed. Instead of being placed on shelves (with the attendant problems of adding or deleting guides and misplaced copies) the guides will now be maintained in folders in filing cabinets. This should make it much easier to add or delete guides, and take up less space. We hope the users will find this new system more useful.

Six of the Reference Guides have undergone some rather drastic revision; DIRECT, PLOT, PRINT, PUNCHC, SENDJOB, and TYPE. Since these particular utilities have so many options available on them, CSO has put them into a special manual entitled, *CSO Local Utilities Manual*. The Reference Guides for these utilities now contain only the most frequently used options. The manual, however, contains *all* of the options that are available on these particular utilities. The manual will be available at the CSO Distribution Center, Room 164 DCL (as soon as it is returned from the printer). It is also available on-line, and may be obtained and printed by entering:

```
WRITEUP,UTILITY.  
PRINT,UTILDOC/ASCII/CC.
```

The reorganization of the Reference Guides came about because CSO is preparing to publish a new manual, *An Index to Software on the CYBER*. This index will contain a listing of all software available on the CYBER including software that is on the system, but unsupported by CSO. Each software package or system listed will include the level of support, a brief description, and a list of available documentation. This manual should be available in the near future.

IBM

SAS CHANGES ON THE IBM

The 1979 version of SAS has now been installed and tested on the IBM 360. Due to the installation of the 1979 version, SAS76 and SAS76.6 were both removed from the system on March 31, 1980. The new 1979 version of SAS is available by using the following JCL (you do not need a PROCLIB card):

```
// EXEC SAS79
```

CSO Statistical Services would also like to remove the much older 1972 version of SAS from the system. However, we understand that certain users are still making use of some of the

features from the 1972 version. We encourage any users who feel that they still need to use this older version to contact Ron Woan (333-2172). After March 31, 1980, the 1972 version of SAS will be available only by using the following JCL:

```
//PROCLIB DD DSN=SYS4.PROCLIB,DISP=SHR
// EXEC SAS72
```

If there is not sufficient evidence to support keeping the 1972 version of SAS available, it will be removed from the system at the end of the semester.

MISCELLANEOUS

CDC DOCUMENTATION UPDATES

The CSO Distribution Center (Room 164 DCL) now has updates and/or revised manuals available from CDC for Release 5 of the operating system. In the following list, updates are available to anyone who needs them to update their present manuals. "New" manuals will be given only to those users who bring in their old manuals for trade (otherwise, the manuals must be purchased).

1. NOS Vol 1 Reference Manual (60435400), Rev J	NEW
2. NOS Vol 2 Reference Manual (60445300), Rev J	NEW
3. FORTRAN Reference (60497800), Rev E	UPDATE
4. BASIC Reference (19983900), Rev F	NEW
5. COMPASS Reference (60492600), Rev F	UPDATE
6. COMPASS Instant (60492800), Rev C	UPDATE
7. Time-Sharing Reference (60435500), Rev G	NEW
8. LOADER Reference (60429800), Rev G	UPDATE
9. Interactive Debug Reference (60481400), Rev B	NEW
10. SYMPL Reference (60496400), Rev F	NEW
11. Record Manager BAM Reference (60495700), Rev E	NEW
12. Record Manager AAM Reference (60499300), Rev B	NEW

NOTICE OF MEETING FOR MICROCOMPUTER USERS GROUP

Date: Wednesday, April 9, 1980
 Time: 7:30 PM
 Place: To be determined
 Topic: Microcomputer Communications with the CYBER

The first meeting of the Apple Computer Users Group, held on March 18, was highly successful and well attended. It was then decided that the Apple Computer Users Group

should expand and become a general Microcomputer Users Group.

Please help us get in touch with other microcomputer users in the area who do not receive *OFF-LINE* by telling them of this meeting. All interested faculty, staff, students and off-campus users are invited.

For further information about place and details of the upcoming meeting, contact Jim Carter or Dave Pontius at 333-2757.

HELP WANTED

OPERATOR/PROGRAMMER WANTED

A local Federal agency wants to hire a 32-hour per week computer operator/programmer. Applicants should have FORTRAN or PLI programming experience. Familiarity with IBM and CYBER systems is desirable, but not necessary. If interested, please contact Ms. Helen Larson at 398-5355.

C COMPILER WANTED

I am looking for a "C" compiler for a 6502 CPU. If you have one, or know of anyone who does, please contact Pat Kane, 206 Astronomy, 333-1546.

SPECIAL TEAR-OFF SHEET AND MEETING NOTICE

INFORMAL DEC USERS GROUP MEETING

TIME: 4:00 - 5:30 PM
DATE: Tuesday, April 29, 1980
PLACE: 115 Digital Computer Lab

Persons with DEC computers of any size (DEC 10/20, VAX, PDP-11, PDP-8, etc.) are invited to gather and share common hardware and software interests, problems, and ideas. We will determine at the meeting if there is sufficient interest to form an organization which would continue to meet on a regular basis.

Please help us to get in touch with users of DEC machines in the area by Xeroxing this page for appropriate people (who do not receive *OFF-LINE*). All interested faculty, staff, students, and off-campus users are invited. We intend this particular group to be user oriented. It is not a policy group.

Part of the value of such a group will be knowing who has which machines and what software. The responses to the questionnaire on the following page will be made available to interested members.

The responses to the questions below will be made available to DEC users and other interested persons. Please type or print plainly in **BLACK** ink and bring this form to the meeting, or return it to:

Jerry Wray
Loomis Laboratory of Physics
University of Illinois
Urbana, Illinois 61801

- 1. Department/Company_____
- Address_____
- 2. Principal user or
Person responsible _____ Phone_____
- Second contact _____ Phone_____
- 3. Location of machine(s)_____
- 4. Location of user_____
- 5. System/Processor type(s) - list specific models_____
- _____
- 6. Configuration(s) - Memory size, types of peripherals, special devices, etc._____
- _____
- _____
- 7. Brief description of work (stat analysis, A/D, etc)_____
- _____
- 8. Software used? (Monitor, BASIC, FORTRAN, etc)_____
- _____
- 9. Do you have user-written software you would consider sharing? _____ Yes _____ No
- What?_____
- On what medium?_____
- 10. Should this group continue meeting? _____ Yes _____ No. If yes, how often?_____
- What topics should be considered at meetings?_____
- _____
- _____
- 11. Should we associate formally with DEC/DECUS? _____ Yes _____ No.

OFF-LINE's Mailing List

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

Check one: ☐ New subscriber
☐ Removal request
☐ Address correction

Name: _____

Address: _____

CAMPUS or Zip Code _____

(If address correction, give old address and zip code below.)

Comments:

RETURN TO: **OFF-LINE**
164 Digital Computer Laboratory
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

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OFF-LINE is the newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. OFF-LINE is printed monthly. Articles may be reprinted provided that the source of the article is noted. CSO operates an IBM 360 Model 75 with one million bytes of fast core and two million bytes of slow core, under HASP and OS, and a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

SYSTEM NOTES

MARCH RELIABILITY REPORT

CYBER: 16 interruptions affecting time-sharing only
 6 interruptions affecting the entire system
 2 of these were for more than 15 minutes

Availability: 98.8% of the scheduled time

360/75: 36 interruptions affecting the entire system
 10 of these were for more than 15 minutes

Availability: 97.7% of the scheduled time

For the past several months, we have considered changing the format of the monthly reliability report to make it more meaningful to the user community. The above format is one possible way. "Interruptions affecting time-sharing only" means those interruptions from which a user may normally recover (may continue any work being done at the time of the interruption by doing a RECOVER, tty when the system comes back up). "Interruptions affecting the entire system" means that a major problem has occurred and work being done at the time of the interruption will not be able to be recovered.

We would appreciate any comments (pro or con) and/or suggestions from you, the users, about the new format.

CYBER

SECURITY SAFEGUARDS

Due to some recent incidents with unauthorized users on the CYBER, CSO would like to take this opportunity to remind all users about security safeguards for files and accounting information. It may be legal to look at files which the owner has not taken proper steps to protect. However, it is illegal to pose as another person, through the presentation of identification and passwords, for the purpose of making unauthorized use of their accounts.

Allocations of service supported by campus funds are for specified research and instructional purposes. Their use for harassment of others, for violations of file privacy, or as a means of gaining illegal access to other accounts will result in disciplinary or legal action.

To safeguard your resources from such abuse, please be sure that your files which contain accounting information, especially passwords, are properly protected. Such files should be restricted to private mode. If it is necessary to allow access to a few people, you can permit the files explicitly to their user identifications.

We advise all CYBER users to change their passwords frequently. Users with null passwords should assign passwords to their User Numbers. If someone has been using your resources illegally, however, just changing the password may not provide adequate protection. You should also check the permission privileges for all your files, and change the permission of any public files to private if they should be protected.

The following commands show a number of ways to check and change the permission privileges of files, and to change your password.

DIRECT/CT=PU.	Will list all files in your area which are public, i.e., can be accessed by anyone signed on to the CYBER.
DIRECT/PTOTAL.	Will list all files in your area with the specific IDs permitted to access them.
GET, <i>pfn</i> .	Will get a local copy of the file <i>pfn</i> .
PURGE, <i>pfn</i> .	Will delete the permanent copy of file <i>pfn</i> .
SAVE, <i>pfn</i> .	Will save the file <i>pfn</i> in your permanent directory with no permission privileges assigned to it.
PERMIT, <i>pfn</i> , <i>userid</i> =R.	Permits read-only access to file <i>pfn</i> for the specified <i>userid</i> only.
PASSWOR, <i>oldpas</i> , <i>newpas</i> .	Changes the password <i>oldpas</i> to a new password <i>newpas</i> . This changes the password immediately, and the new password must be used the next time you sign on. An even safer way to change your password is to simply enter the command PASSWOR. The computer will then prompt you for the old and new passwords and the entries you type in will not be echoed on the screen. If your password is presently null, enter a carriage return when prompted for <i>oldpas</i> .

Project Managers should check to ensure that no User Numbers have been illegally added to their project. Also, if they have a null project code word, they should assign a code word to their project immediately. To assign a code word to a project, enter:

```
MANAGE.
P,charge,project
CODE WORD=newcode/PN
E
```


One other word of caution: it has been observed that some users have signed onto public terminals and have not logged off when leaving for a short period of time. Perhaps the reasoning for this is that they believe this "reserves" the terminal for them. However, it is a dangerous practice because it allows *anyone* to then use that signon for whatever purpose -- to access the files, use the person's funds, etc. If you do this type of thing, you must accept the responsibility for what happens. **LOG OFF** when you leave a public terminal - protect your files and your funds!

NCAR GRAPHICS SOFTWARE

CSO has installed the NCAR Graphics Software on the CYBER. This software, obtained from the National Center for Atmospheric Research, contains graphics utility subroutines for drawing

- Contour plots
- 3-D surfaces with hidden lines removed
- World map projections

and other high-level applications. Plots may be produced on a Tektronix graphics terminal or a CalComp plotter.

The NCAR Graphics Software is a library of subroutines called from a FORTRAN program. The NCAR software achieves device independent plotting by writing a local disk file of plotter commands, which is later plotted on a specific device requested by the user. This file of plotter commands is called the meta-code file.

Documentation describing the subroutine usage and parameters is available for inspection in the CSO North Consulting Office (Room 138 DCL). This same information is available on the CYBER via a procedure, NCARDOC. The commands

```
GRAB,NCARDOC.  
NCARDOC.
```

will give a brief summary and directions to obtain additional information and subroutine writeups.

A typical use of the NCAR software involves the following sequence of commands:

GRAB,NCAR.	Attach the NCAR library.
FTN,I= <i>program</i> ,L=0.	Compile the FORTRAN program with calls to NCAR subroutines.
LGO.	Execute the program. This does not generate the plot itself, but rather, the meta-code file of plot instructions.
NCARTRN.	To display the plot on a Tektronix terminal.

NCARTRN,PLOT=CALC.

To display the plot on a CalComp plotter.

PLOT,TAPE99.

This plot statement is necessary to actually send the file to the plotter.

Once the meta-code file has been generated, it may be displayed at will on either Tektronix or CalComp equipment by using the appropriate NCARTRN statement.

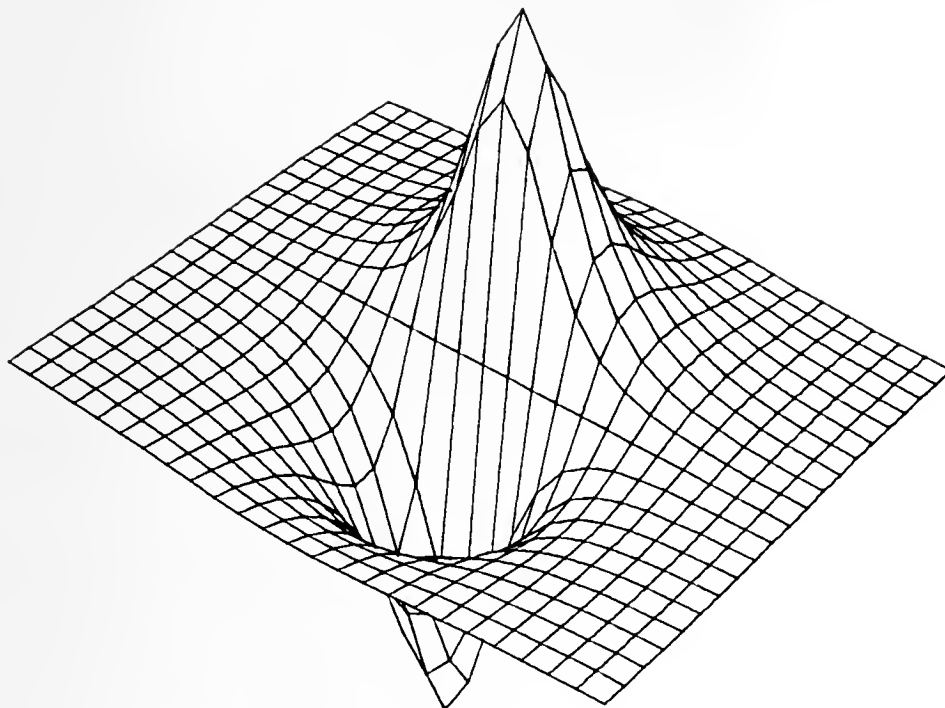
NOTE: The file name NCARMC *must* appear on the program statement of your FORTRAN program. This is the name of the meta-code file written by the NCAR software.

A sample program and plot are shown here:

```

PROGRAM NCARTST(INPUT,OUTPUT,NCARMC)
C
C   THE FUNCTION
C
C        $Z(X,Y) = .25*(X+Y+1./((X-.1)**2+Y**2+.09)$ 
C            $-1./((X+.1)**2+Y**2+.09))$ 
C
C   IS EVALUATED FOR
C
C       X=-1. TO 1. IN INCREMENTS OF .1 AND
C       Y=-1.2 TO 1.2 IN INCREMENTS OF .1.
C
C   XX CONTAINS THE X-DIRECTION COORDINATE VALUES FOR Z(X,Y)
C   YY CONTAINS THE Y-DIRECTION COORDINATE VALUES FOR Z(X,Y)
C   Z  CONTAINS THE FUNCTION VALUE
C   S  CONTAINS VALUES FOR THE LINE OF SIGHT FOR SRFACE.
C   WORK IS A WORK ARRAY
C
C   REAL XX(21), YY(25), Z(21,25), S(6), WORK(1050)
C
C   DATA S(1), S(2), S(3), S(4), S(5), S(6)/
1   -8.0, -6.0, 3.0, 0.0, 0.0, 0.0/
C
C   FILL XX AND YY COORDINATE ARRAYS AND Z FUNCTION VALUE ARRAY
C
C   DO 20 I=1,21
C       X= .1*FLOAT(I-11)
C       XX(I)=X
C       DO 10 J=1,25
C           Y= .1*FLOAT(J-13)
C           YY(J)=Y
C           Z(I,J)=(X+Y+1./((X-.1)**2+Y**2+.09)-
1           1./((X+.1)**2+Y**2+.09))*.25
10  CONTINUE
20  CONTINUE
C
C   CALL SRFACE (XX, YY, Z, WORK, 21, 21, 25, S, 0)
C
C   STOP
C   END

```



RECORD MANAGER BUG - ODD BLOCK SIZES

It has been noted that CYBER RECORD MANAGER, when writing records on an S-format or L-format tape (e.g., a tape to be sent away to be read elsewhere), writes only blocks of even length. If a block is odd in length, RECORD MANAGER adds a character to the block, which may hamper subsequent attempts to read the tape file. This will apply whether you are recording the tape with FORTRAN directly or with TBLOCK.

For example, if you use TBLOCK with RECSIZE=269 (record size) and BF=11 (blocking factor), the size of each tape block is $269 \times 11 = 2959$, which is odd. RECORD MANAGER will then create a block of length 2960 by adding a character to the block. If BF=10, the size of each block is 2690, which is even. However, the *last* block in the file may not have a full 10 records in it; it may only have 9 records. This block then would be $269 \times 9 = 2421$ which is odd, so, RECORD MANAGER would add a character.

For the moment, the only way around this problem is to specify an *even* record size, thus ensuring that in all cases, each block is even in length.

Please note that DEBLOCK will read such an incorrect file with no errors, but if the tape file is read on the IBM 360, an error will result. Or, if the file is read "to end of file" with FORTRAN on the CYBER, RECORD MANAGER error 143 (insufficient data) will result.

STATISTICAL SERVICES

1979 VERSION OF BMD INSTALLED ON THE IBM 360

The 1979 Version of BMDP is now available on the IBM 360/75. It is an improved edition of the 1977 Version. The following JCL should be used to access it:

```
// EXEC BIMED,PROG=desired program
```

NOTE: You no longer need to use BIMEDT to increase the core for larger problems. You may simply specify more core on the "ID" card. If you request more than 400K, you will need to put the region on the "EXEC" JCL card also. You now need the BIMEDT program only when FORTRAN statements are to be used. The following JCL will invoke BIMEDT:

```
// EXEC BIMEDT,PROG=desired program
```

Any questions concerning BMDP should be directed to the CSO Statistical Services Consultants at 65 Commerce West (333-2170).

SAS79 INTERFACE TO BMDP79

You may now call most of the BMDP programs from SAS. For a detailed description of its usage, see the BMDP procedure as described in the *SAS User's Guide - 1979 Edition* (available from the CSO Distribution Center, Room 164 DCL). To utilize this interface, you must use the following JCL:

```
// EXEC SASBMDP
```

If you have any questions concerning its use, please contact the CSO Statistical Services Consultants at 65 Commerce West (333-2170).

CORRECTION IN APRIL'S SAS ARTICLE

In the April issue of *OFF-LINE*, the JCL specified in the SAS article to access the 1979 Version of SAS was in error. The article said to use "EXEC SAS79". The *correct* JCL to use to access the 1979 Version is as follows:

```
// EXEC SAS
```

CSO regrets any inconvenience or confusion this error may have caused.

NUMERICAL SERVICES

SLAM: SIMULATION LANGUAGE FOR ALTERNATIVE MODELING

SLAM, a program for combined continuous, discrete and network simulation, is now available on the CYBER. The program is similar to GASP in its mode of operation: the user may supply a data deck for certain information, but *must* supply FORTRAN routines to define states, events and special output. Currently, CSO has no formal documentation other than the book, *Introduction to Simulation and SLAM*, by A. Alan B. Pritsker, available for inspection in the CSO North Consulting Office (Room 138 DCL).

The program is accessed by the statement:

```
GRAB,SLAM.
```

This places a binary program file, SLAM, in your local file space. It is then run as follows:

```
SLAM,input,output.
```

Where *input* represents a file of input data and *output* is a file where the simulation report should be placed. If you have auxiliary routines as well, the following method should be used:

```
FTN,I=subs,...  
LOAD,LGO.  
SLAM,input,output.
```

Where *subs* represents a file containing your routines.

An assortment of sample SLAM problems is available via the SAMPLES procedure. This is accessed via

```
GRAB,SAMPLES.
```

General help on SAMPLES can then be obtained by entering:

```
-HELP,SAMPLES.
```

A catalog of SLAM sample decks may be obtained by entering:

```
SAMPLES,SLAM.
```

See Stan Kerr (Room 175 DCL, 333-4715) for additional information.

MINI-DYNAMO

A version of the DYNAMO simulation language for system dynamics called Mini-DYNAMO has been installed on the CYBER. It is documented in the *Mini-DYNAMO User's Guide* (has been ordered), and in the works of Jay Forrester, the inventor of systems dynamics.

DYNAMO is accessed by the statement:

```
GRAB,DYNAMO.
```

This places a CCL procedure file called DYNAMO, and a binary program in your local file space. Some help information may then be obtained by entering:

```
-HELP,DYNAMO.
```

To run a model, enter the statement:

```
DYNAMO,model,options.
```

Where *model* represents a file containing your DYNAMO model statements, and *options* represents a series of letters specifying run options. The default options (if you omit *options* from the above statement) cause DYNAMO to analyze and list the model, do one run of it, then request rerun options.

Some sample models for DYNAMO are available via the SAMPLES procedure, which is accessed with the statement:

```
GRAB,SAMPLES.
```

After accessing SAMPLES, general help information on SAMPLES may be obtained by entering:

```
-HELP,SAMPLES.
```

A catalog of available DYNAMO samples may be obtained by entering:

```
SAMPLES,DYNAMO.
```

Other references on system dynamics are *Principles of Systems* by Forrester, and *World Dynamics* by Forrester.

See Stan Kerr (Room 175 DCL, 333-4715) for further information or references on system dynamics.

NEW PROCEDURES: MATH AND SAMPLES

A CCL procedure called MATH is now available which combines the facilities of the MATHDOC, IMSLDOC, MSLDOC, NATSDOC, LINDOC, and MISCDOC procedures (all of which will eventually be phased out) for obtaining source and/or writeups of routines in

various libraries. This procedure is accessed by entering the statement:

```
GRAB,MATH.
```

General help information may then be obtained by entering:

```
--HELP,MATH.
```

MATH is designed to supply information on a specific routine in a specific library, and is generally used as follows:

```
MATH,library,routine.
```

Where *library* represents the name of some library "known" to MATH, and *routine* represents something in the library. MATH places the information (if any) in files SOURCE and/or DOC; file SOURCE will contain FORTRAN source (if available) and file DOC will contain a writeup (if available). SOURCE and DOC are not rewound, so several things can be "stacked" in them by consecutive calls to MATH. If you "stack" things in SOURCE, be sure to PACK the file before saving or compiling it.

For a given library, the statement

```
MATH,library.
```

places a list of available routines from the library in the file DOC. Entering just the statement

```
MATH.
```

or the statement

```
MATH,SUMMARY.
```

causes MATH to display a list of "known" libraries.

Procedure SAMPLES can be used to obtain sample decks for a number of packages on the CYBER, demonstrating their use. It is accessed via

```
GRAB,SAMPLES.
```

You may then obtain more help information by entering

```
---HELP,SAMPLES.
```

SAMPLES is used much like MATH:

```
SAMPLES,package,deck.
```

Where *package* represents the name of some package "known" to SAMPLES, and *deck* represents the name of some sample deck or data for that package. It will produce a file SAMPLE with the requested sample deck in it. In some instances, an extra auxiliary file may

be produced; this is usually called DATA. A message is displayed if this auxiliary file has been produced.

Entering the statement

```
SAMPLES,package.
```

lists a catalog of known sample decks for the given package in file SAMPLE. Entering the statement

```
SAMPLES,SUMMARY.
```

produces a summary of what packages are known to SAMPLES.

Please note that you must know beforehand how to run the package you are interested in. SAMPLES only provides files, not instructions on how to use them.

Following is a list of the libraries currently "known" for MATH:

UOILIB	Locally produced and externally acquired routines
IMSL	Large leased library of math and statistical routines
MSL	CDC's math routine library (no longer supported by CDC)
EISPACK	Routines for eigenanalysis of both standard and generalized eigenvalue problems
FUNPACK	Special function package developed at Argonne Lab
MISC	Miscellaneous unsupported routines, provided only in source with no guarantees of performance
BSPLINE	B-Spline routines from Carl de Boor's book, <i>A practical Guide to Splines</i>
HARWELL	Very small subset of Harwell Library routines which various users have converted for the CYBER
GRG	Generalized reduced-gradient optimization program
NETWORK	Network solving routines and programs

Following is a list of packages "known" to SAMPLES:

APEX	CDC's large-scale linear programming package. Includes parametric and mixed-integer programs.
MPOS	Northwestern U.'s medium-scale linear/integer/quadratic programming package
XMP	Linear programming subroutines library

ALTRAN	Symbolic manipulation language for rational functions
SPICE	Circuit analysis package
MODEL	Continuous network simulation language
ACSL	Continuous simulation language
FORSIM	Simulation package for time-dependent PDE's
DYNAMO	System dynamics simulation language
POST	PDE program from Bell Labs
ELLPDE	Routines for separable elliptic PDE's, published in <i>Transactions on Math Software</i> , Sept/79
PDECOL	Collocation software for time-dependent PDE's, published in <i>Transactions on Math Software</i> , Sept/79
FFT9	A program for fast solution of Helmholtz-type PDE's, published in <i>Transactions on Math Software</i> , Dec/79
SLAM	Continuous/discrete/network simulation language
GASP	Continuous/discrete simulation language
SPURT	Discrete simulation language
GRG	Generalized reduced-gradient non-linear programming
BSPLINE	B-Spline routines from Carl de Boor's book, <i>A Practical Guide to Splines</i>
DBSPLIN	Double precision B-Spline routines
ITPACK	Iterative routines for solution of large sparse symmetric positive definite linear systems, from U. of Texas at Austin

NEW UOILIB ROUTINES

The following routines have recently been installed in UOILIB on the CYBER:

EPISODE	A routine for solution of ordinary differential equations from the Argonne National Laboratory.
DEPSODE	Double precision version of EPISODE.

LSODE	A new code for solution of ordinary differential equations, by Alan Hindmarsh of Lawrence Livermore Laboratory. This contains algorithms for both stiff and non-stiff problems.
DLSODE	Double precision version of LSODE.
STINT	A routine for solution of stiff ordinary differential equations, published in <i>Transactions on Mathematical Software</i> , Volume 4, Number 4, December 1978.
GAM	A routine for evaluation of incomplete gamma functions, published in <i>Transactions on Mathematical Software</i> , Volume 5, Number 4, December 1979.
DGAM	Double precision version of GAM.

The UOILIB library is accessed via

```
GRAB,UOILIB.
```

For source or writeups of UOILIB routines, use the procedure MATH as follows:

```
GRAB,MATH.  
-HELP,MATH.
```

These statements will display information on how to use MATH to then obtain source and writeups for the UOILIB routines.

TEST VERSION OF MINPACK

A library of minimization and optimization codes is being developed at Argonne National Laboratory. We have been asked by the test site representative here to announce it for user testing. Like the previous packages, EISPACK (eigenanalysis), FUNPACK (special functions) and LINPACK (linear systems), MINPACK will be extensively tested and validated at many user sites, on many different computer types. The final result should be a well-integrated and reliable package of routines.

The present version contains several Levenberg-Marquardt routines for minimizing sums of squares (as for curve-fitting); there are versions requiring derivatives to be provided by the user, and derivative-free versions, as well as storage-economizing versions. Also, there are routines for solution of simultaneous nonlinear systems of equations, based on a hybrid method due to Powell; there are derivative-based and derivative-free versions of this. A routine is also provided for checking the consistency of a Jacobian calculation, as a means of testing one's Jacobian calculations before using one of the routines requiring derivatives.

A full description of the current MINPACK routines (78 pages) can be obtained and printed as follows:

```
WRITEUP,MINPACK/FUTURE.  
PRINT,MINDOC/CC.
```

The library can be accessed and used by entering the control statements:

```
GRAB,MINPACK/FUTURE.
```

Following this, simply compile and run your program which calls the MINPACK routines.

Please direct inquiries or responses to Stan Kerr (Room 175 DCL, 333-4715) or to Mary Ann Berg (Room 221 Altgeld, 333-2168) in the Mathematics Department.

MISCELLANEOUS

NEW REVISION PAGES FROM CDC

CSO has now received Rev. D for the COBOL Version 4 Reference Manual. Note that these are just revision pages, not a new manual. Anyone who needs these pages may obtain them from the CSO Distribution Center, Room 164 DCL.

SPECIAL TEAROFF SHEET

INDEX FOR MINI AND MICRO COMPUTER USERS

CSO is planning to publish an *Index to the Use of Mini and Micro Computers by Researchers on Campus*. It will also include the use of specialized computer-related equipment, software packages, or databases not provided by CSO.

The impetus for this document comes from the frequent questions directed to CSO in these areas. A researcher who is facing a problem involving computers often suspects that someone else on campus has already dealt with a similar problem. CSO is a logical place to start trying to contact such a person.

The document will be published informally and updated periodically. Minimal effort will be spent editing the information or data received, and inclusion of an item will not imply further knowledge or support by CSO. We are simply trying to start useful conversations.

We would like to hear from you if

- you are using a minicomputer or microcomputer in your work.
- you have acquired experience using equipment for automated control, measurement, data collection, or data conversion.
- you have acquired or developed software packages or databases which could be of interest to someone else.

If you have information, please fill out the form on the reverse side of this page, and return it to us by June 15, 1980. If you are a CYBER user, you can use the APPEND command to send us the information through a CYBER file, COMPUSE, rather than using the form. To do this, simply put your responses into a local file (named *filex* in the example below) and then enter the following control statement:

```
APPEND,COMPUSE,filex/UN=DOCUMNT.
```

Please fill in this form and return by June 15, 1980 to:

Editor, Documentation
164 Digital Computer Laboratory
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

It may be returned by campus mail to the above also.

Name: _____

Address: _____ Phone: _____

If you are using a minicomputer or microcomputer, please supply the following information:

Type of Computer _____

Peripheral hardware _____

Operating system _____

How are you using the equipment? _____

If you've developed or acquired special purpose equipment which is used in conjunction with a computer, please tell us about it. _____

If you've developed or acquired software packages or databases which could be useful to someone else, please tell us about it. _____

Other comments or information _____

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University of Illinois at Urbana-Champaign

VOL. 8, NO. 6 June 1980

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SYSTEM NOTES

APRIL RELIABILITY REPORT

CYBER: 15 interruptions affecting time-sharing only
 14 interruptions affecting the entire system
 7 of these were for more than 15 minutes

Mean Time Between Failures = 28 hours
 Mean Time to Repair = 63 minutes
 Availability: 95.8% of the scheduled time

360/75: 21 interruptions affecting the entire system
 8 of these were for more than 15 minutes

Mean Time Between Failures = 33 hours
 Mean Time to Repair = 51 minutes
 Availability: 96.7% of the scheduled time

"Interruptions affecting time-sharing only" means those interruptions from which a user may normally recover (may continue work being done at the time of the interruption by doing a RECOVER, tty when the system comes back up). "Interruptions affecting the entire system" means that a major problem has occurred, and work being done at the time of the interruption will not be able to be recovered.

CSO would appreciate any comments (pro or con) or suggestions from you, the users, about the new format of the Reliability Report.

NUMERICAL SERVICES

NEW VERSION OF SPICE

Version 2F.1 of the SPICE circuit analysis program has been received from the Electronics Research Laboratory of the University of California at Berkeley. It is available via

GRAB,SPICE/FUTURE.

or

FUTURE,SPICE.

SPICE is then run as follows:

```
SPICE,input,output.
```

Current users of SPICE should note that a "procedure" will no longer be used with the new version.

The writeup for the new SPICE can be obtained and printed by entering:

```
WRITEUP,SPICE/FUTURE.  
PRINT,SPCDOC/CC.
```

This will print 71 pages.

The new SPICE will become the default on or about July 1, 1980 and then may be accessed by simply entering:

```
GRAB,SPICE.
```

Please take note of this if you are currently using SPICE, as the present method of using it (CALL,SPICE...) will not be correct after that date.

CCL VERSIONS OF SOME PROCEDURES AVAILABLE IN FUTURE

CCL versions of several CSO procedure files are available via GRAB,*procedure*/FUTURE. These include USERLIB, TIDY (formerly TIDYPRC), MIMI (formerly CONVPRC), ACSLCOM, ACSLGO, ALTCOM, ALTGO, DEBLOCK and TBLOCK. In each case, on-line help is available by entering:

```
HELP
```

and then by entering the name of one of the above procedures when prompted with a question mark.

The new procedures are all called in "control-card" form rather than with a dash (-) or BEGIN. For instance, with DEBLOCK you can now enter:

```
DEBLOCK,DISK=xxx,TAPE=yyy.
```

The parameters of all the new versions are the same as the old, with two exceptions: in TIDY and MIMI, the NR parameter has been replaced with a REWIND parameter, which should be coded as

```
REWIND=NO
```

if you wish to suppress the automatic rewinding of the files used by the procedure.

The "positional parameter" feature of CCL can be used to make some of these procedures more convenient. For example, in translating and running an ACSL model interactively, suppose the model definition is in file MODEL. You would enter

```
GRAB,ACSL/F.  
ACSLCOM,MODEL.
```

to translate it, and then enter

```
ACSLGO,PLOT=TEKTRON.
```

to run it at a Tektronix graphics terminal. Each procedure should be consulted to check which parameters can best be given positionally.

These CCL versions will become the "official" default versions on or about September 1, 1980.

SOME PROCEDURE FILES TO BE DISCONTINUED

The procedures MATHDOC, IMSLDOC, MSLDOC, NATSDOC, LINDOC, MISCDOC, ACSLINF, and ALTINF will no longer be available after July 31, 1980. They have been superceded by the CCL procedures MATH and SAMPLES, which were described in the May issue of *OFF-LINE*. New reference guides are also available on these procedures (RF-4.12 MATH and RF-4.13 SAMPLES).

FORTUOI PHASE-OUT

The bulk of the routines in the 360 FORTUOI library are outdated and should not be used when substitutes from IMSL or other libraries are available. Since there may be hidden dependencies on FORTUOI in many programs, the following plan will be used to phase out the outdated material.

- The routines we desire to preserve will all be placed in a data set called SYS1.FORTUOIX. On or about September 1, 1980, this data set and the current SYS1.FORTUOI will be "switched." At this time, programs using old routines will fail unless they explicitly access SYS1.FORTUOIX.
- Source of the outdated routines will be available via the MATHLIST procedure, using T=FORTUOIX.
- SYS1.FORTUOIX will remain on-line until the end of the Fall 1980 semester. It will be destroyed on or about January 1, 1981.
- Source of the deleted routines will remain available until June 1981 at least. Disposition beyond that date has not yet been determined.

The following routines are to be "removed."

BKTRNZ	DGEARZ	EIGENZ	INV3Z	ORT4Z	SCSLEZ
BROMNZ	DGELGZ	EVIITZ	LRCHZ	PLOTEZ	SLEVBZ
BROWNZ	DIFEQZ	FLPOMZ	MDETZ	PLOTZ	SMEIGZ
CEST1Z	DIFSUB	FRANCZ	MINVZ	POL1Z	SPL1Z
CFIT3Z	DOTP	FSER1Z	NOLINZ	POL2Z	TRAUBZ
CHOL1Z	DVDIFZ	GAUSZ	ORT1Z	POLVAZ	WLSQZ
CHOL3Z	ECON1Z	HOUSEZ	ORT2Z	RAMEZ	XINVZ
CHOL4Z	EIGENP	INV1Z	ORT3Z	RSSR	

TEXT PROCESSING

DIABLO RESERVATION SERVICE TO CHANGE

Effective June 2, 1980, users will no longer be able to make reservations to use the Diablo terminal located in Room 209 Astronomy. Instead, CYBER users will be required to queue their RNF output, intended for printing on the Diablo, by executing a CYBER Control Language (CCL) procedure. Users unfamiliar with RNF are referred to the RNF User's Guide or the RNF Reference Manual (available in the Distribution Center, Room 164 DCL).

All RNF source files must contain the .LPT command in the first line of the file, and must be processed by RNF into an output file. All non-RNF source files must have carriage control and begin with a page eject. The RNF output file or the non-RNF source file can then be submitted to the Diablo queue via the CYBER CCL procedure.

The following conventions have been established:

1. The top of the form (page) will be set to one line below the horizontal perforation in the paper.
2. Plain white 20-lb paper, 14 7/8" wide by 11" long, will be used.
3. If the pica font is selected, the printing will be done with 10 characters and 6 lines per inch.
4. If the elite font is selected, the printing will be done with 12 characters and 6 lines per inch.

After you have prepared your file for submission, you should access and execute the DIABLO procedure by issuing the following commands from time-sharing on the CYBER:

```
GRAB,DIABLO.
DIABLO.
```

The procedure then prompts you for your name, telephone number, choice of font (pica or elite), and the name of your RNF output file. The RNF output file may be either a local or a permanent file. If the procedure is unable to find your file, it aborts with a message to that effect. If the procedure finds the specified file, it places it in the Diablo queue.

On-line help is available by entering the command

HELP

and then by entering DIABLO (the name of the procedure) after the question mark prompt.

Turnaround time should be no longer than 24 hours, except in cases of system downtime or hardware malfunctions. The output of jobs received on Fridays or prior to a University holiday will be available the next working day.

Your printouts may be picked up at 203 Astronomy. The cost will continue to be \$0.15 per page, rounded up to the nearest dollar. You may pay for the printing by charging it to a University account number or with a personal check.

Questions regarding this service should be directed to Debbie Weller, 209 Astronomy (333-8150).

MISCELLANEOUS

TELETYPE REPAIR DISCONTINUED

As stated in the February 1979 *OFF-LINE*, and again in the October 1979 *OFF-LINE*, the maintenance and repair service relating specifically to "Teletype" terminals will be discontinued June 30, 1980. This applies only to the service offered on Teletype Models 33 and 35; it does not affect any other offering.

LSI-11 RENTAL SYSTEMS

We have now received the equipment necessary to start our rental program using the DEC LSI-11. We are offering a package system with the components listed at the end of this article. Our initial rental program is going to be fairly simple. We will rent entire systems on a quarterly basis at \$1500 per quarter.

In the event that the customer wishes to purchase the system later, it is available at \$500 over our purchase cost and 50% of the rental, which has been paid, will be credited against the purchase price. By paying the \$500, the system is included in our general LSI-11 support program which was described in a recent issue of *OFF-LINE* (December 1979). The rental price includes maintenance and a reasonable amount of discussion with our support personnel. The system is fully licensed with FORTRAN, BASIC and the operating system.

LSI-11 RENTAL SYSTEM

KD11-HA	LSI-11/2 CPU
KEV11	Arithmetic Instruction Chip for KD11
CI-1103	32K word MOS Memory
DLV11-J	4 Line Serial Interface RS2326
BDV11	Bootstrap/Terminator/Diagnostic
BA11-NE	9 Slot System Box
RXV21-BA	Dual Drive Dual Density Floppy
H984	Cabinet

Options (No charge unless noted)

TU58-BB	Dual DECTAPE II
ADV11	16 Line MUX'D A/D
AAV11	4 Line D/A
KPV11	Power Sequencer/Controller with Console
Lier Siegler ADM 3A with RG512 Graphics (extra \$250/quarter)	

Software

RT11	Operating System
FORTRAN /RT11	
BASIC /RT11	
Manuals	

DEC INFORMAL USERS GROUP MEETING

(The following article was submitted by J. Wray)

On April 29th people using PDP-8's, LSI-11's, VAX's, DEC-20's and DEC-10's, from both inside and outside the University, were noticed sitting in a room together. What was it? It was the first area-wide informal DEC Users Group Meeting.

Some of the meeting was given over to a general discussion of possible meeting topics and frequencies. Much of the value of such meetings is (and was) a chance to meet other users of similar machines and find out what their problems and solutions have been. Time was left for such discussions, and that will be planned for in the future meetings.

After the meeting the volunteer coordinating committee met and responding to some of the suggestions set up the following for a trial run:

1. Meetings are scheduled for June 24 and July 22 in Room 115 Digital Computer Lab. (Since there is a slight chance that we will have to change rooms if we conflict with a scheduled class, we suggest that you arrive a little early. You may have to walk a block or two to a different room.) The meeting will start at 4 and the room is reserved until 5:30. All users of DEC computers on and off campus are welcome.
2. At the June 24 meeting the Chemistry, Coordinated Science, Materials Research, Physics and Psychology systems will be described briefly.
3. The July 22 meeting will be an RT11 Special Interest Group (SIG) meeting for RT11 users in this area.
4. The questionnaires which have been returned have been xeroxed and members of the coordinating committee have copies. CSO has distributed a similar questionnaire for mini-micro users in general. We will provide copies of the questionnaires we have collected to CSO for inclusion in their publication, so you do not have to fill out both.

In addition to the above, the following topics were suggested for future meetings:

1. RT11 to RSX11M migration.
2. Software packages available and their use.
3. Presentations by non-DEC vendors (hardware and software).

The following people volunteered to serve on a coordinating committee:

Name	Address	Telephone
Art Gaylord	152 Noyes Lab	333-1728
Virginia Metze	244 Materials Research Lab	333-6665
Walter Schneider	Psychology	333-6819
Randy Stein	255 Morrill	333-3245
Steve Wilkus	2-107 Coordinated Science Lab	333-6444
Jerry Wray	487 Loomis Lab	333-4922

All the above are at the University of Illinois. The mail address of the Psychology Building is in Champaign, all the rest are in Urbana.

PURPOSES OF THE INFORMAL DEC USERS GROUP

Some questions and comments at the meeting made it clear that some clarification of the distinction between the informal users group and the CSO LSI-11 project is needed. Simply stated, they are separate but are somewhat parallel in intent. They do share some of the same broad goals.

If the users group had been in existence for a few years, it is likely that the LSI project would have been suggested by the group in recognition of the specific needs of a particular subgroup of users -- the LSI users on campus. The CSO LSI-11 project was formed in recognition of that specific need.

The CSO project is currently only concerned with on-campus users of LSI-11's. They want to be able to help people get or stay on the air by providing quick and easy access to hardware. Help with system software problems is desirable, but as yet it is unclear how much of it they will be able to provide. There is, of course, a charge to the user of these services and facilities. A major function of the project is the collection, in a single location, of information on existing programs or hardware in use on the LSI equipment.

On the other hand, facilitating interchanges among users of all DEC machines is one of the main reasons for setting up a users group. These interactions might be trading user software, ideas for new hardware, ways to get around problems, fixing software bugs, etc. The users group does not have any hardware 'warehousing' function or budget. Also, the group is open to users of any DEC computer, not just LSI-11's, and not just campus users. There is no charge for participating in the users group.

This is by no means a complete list of parallels, differences, shared goals, etc, but we hope that it is clear that the two are not competing. There are needs being met by both and areas where both feel that the other is the obvious group to carry the ball. People who are involved in the LSI-11 project will probably want to be in the users group as well, and people who are not interested in the LSI-11 project may still find that the users group fills a need.

A COSMIC EXPERIENCE

One of our users, Paul Opryszek, was working in DCL on May 1 when the power went out. In his own words, "the system crashing was no big thing - but the lights going out too, well, that was truly cosmic." He has written and submitted the following poem about that experience and we thought our readers might enjoy sharing it with us.

A Cosmic Experience

The human spirits were
Glued at video screens. The
Master nourished
only Total awareness.

Access space, never enough
Intense competition always,
For access to the
Power intense.

For the human ghosts
 Flickering patterns of
 Energy were more
 Real than the
 Three space geometry
 Through which their bodies
 Groped as they lived in the
 System's Reality.

Lights flash brightly
 Too bright, too fast.
 Flashing energy pulsed
 Too bright, too fast.
 Terminals surged.

Buzzzzzap!

First thoughts...a
 Problem, programmable, solvable?

Darkness
 Stunned, total silence

Unbelieving, uncomprehending,
 Anxious, held breath.

Reality had Ended!
 Reality had Crashed!

Shaft of a dim
 Emergency light from
 Above.

All had died,
 Each contemplated
 If there was
 Life after Death in the
 Strange new three space geometry's
 reality.

Anxious questioning of a
 Time after life,
 Had the Creator
 Wiped clean the Disk?
 Was resurrection possible?

Shadows, silence, anxiety
 Replace Reality of Energy.

Human ghosts
 fade away

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POLICY

KEYPUNCH SERVICE

As announced in the April issue of OFF-LINE, CSO has discontinued internal processing of keypunch work. This move was made for financial reasons since the amount of data entry provided by CSO no longer justified continuance of a dedicated data entry staff.

At the time the April article was written, we planned to use an off-campus commercial data entry service with CSO providing all interfacing with the contracting agency. Since that time, another campus unit, Survey Research Lab (SRL), has indicated a desire to assume CSO's data entry workload. An agreement has been worked out with SRL which we hope will minimize the amount of information which must be transferred between CSO and SRL with the attendant possibilities for confusion.

Users whose data entry work is funded through the Research Board will see little change. Requests for data entry funds are to be made through existing channels, input is to be delivered to CSO for punching at SRL, and output is to be picked up at CSO. Allocations will continue to be made in numbers of cards to be punched and CSO will continue to provide all accounting associated with data entry. Occasionally, a user with a complex data entry task may be asked to talk directly to the data entry staff at SRL. Data entry work funded through the Research Board is to be taken to the CSO Accounting Office and completed data entry jobs are to be picked up there. This office, as well as document sales and terminal rentals, is scheduled to move to 1208 West Springfield during July.

Users whose data entry work is being funded with hard contract money are to deal directly with SRL. These users are to submit their work directly to the SRL data entry staff, and claim the completed work at SRL. They will be billed directly by SRL for services delivered. SRL's rates are \$7.25/hour for normal work and \$10.50/hour for priority work. The number of cards produced per hour will vary with the data being entered. A rough estimate, based on previous experience in CSO's data entry shop, is 100 cards per hour. Users paying for data entry services with hard contract funds should make all arrangements with Mrs. Frances Sykes, 310 SRL, 1005 West Nevada, Urbana (333-7328).

SRL maintains a staff of three full-time data entry operators and hires part-time help to staff a second shift whenever the load requires it. Additional full-time personnel will be hired if needed to maintain reasonable turnaround time.

SYSTEM NOTES

MAY RELIABILITY REPORT

CYBER 175: 5 recoverable interruptions
 13 non-recoverable interruptions
 7 of these were for more than 15 minutes

Mean Time Between Failures = 32 hours
 Mean Time to Repair = 63 minutes
 Availability: 96.5% of the scheduled time

Major cause of downtime was related to software problems with disk.

IBM 360/75: 32 non-recoverable interruptions
 15 of these were for more than 15 minutes

Mean Time Between Failures = 22 hours
 Mean Time to Repair = 25 minutes
 Availability: 94.9% of the scheduled time

Major cause of downtime was related to hardware problems with CPU.

"Recoverable interruptions" means those interruptions from which a user may normally recover (may continue work being done at the time of the interruption by doing a RECOVER, tty when the system comes back up). "Non-recoverable interruptions" means that a major problem has occurred, and recovery of work in progress at the time of interruption is not possible.

CYBER

NEW ZETA PLOTTERS

Because CalComp will no longer guarantee maintenance of the CalComp 763 and CalComp 1136 plotters in use at CSO, two new ZETA plotters (Models 1453 and 3653SX) have been installed as replacements. Software has been developed for their use on the CYBER and they are now in limited service in parallel with the CalComp plotters.

Each plotter contains a builtin microprocessor-based controller which permits it to be connected to the CYBER as if it were a 1200 baud terminal and provides hardware character and vector generation. The 1453 is a small desktop-sized unit which plots on 12-inch wide paper (only 11 inches of usable space). It has an increment size of .0025 inches and can plot

at rates up to 14.14 inches per second diagonally. The 3653SX is a large floor-standing unit which plots on 36-inch wide paper (only 34 inches of usable space). It has an increment size of .001 inches and can plot 21 inches per second diagonally. An interesting hardware feature of the 3653SX is a sliding "throttle" which allows the operator to slow down the plotter if this is needed to maintain plot quality with the pens, ink and paper in use. Both plotters have four program-selectable pens and can support ballpoint, rolling writer and liquid ink pens. Rolling writer plots, new to CSO, are darker than ballpoint pen plots and are nearly the equal of liquid ink plots in quality. The smallest liquid ink pen supported by the ZETA plotters is .25mm. (Note: Liquid ink pens are not currently supported, but will be in the near future.)

Libraries which generate ZETA plot codes and a new command, PLOTZ, have been installed on the CYBER. To use the new plotters, CYBER users should use different GRAB commands to access the new libraries:

OLD	NEW
GRAB,GCSCALC.	GRAB,GCSZETA.
GRAB,CALCOMP.	GRAB,ZETA.

The command, PLOTZ, must be used instead of the command, PLOT, to route the files to the plot queue. At the present time, only a single file may be used on the PLOTZ command. CalComp users who are calling the symbol routine with an integer equivalent rather than a character should be aware of differences in the integer equivalence tables. The ZETA integer equivalence tables can be seen in the Systems Consulting Office (166 DCL). No other program changes should be required.

The following options are available on the PLOTZ command:

- There are two types of pens used: ROLLING and BALL. If you do not specify a /Px= option (where x is 1, 2, 3, or 4 for the four pens, respectively), the default action will be as follows:

```
/P1=ROLLING (rolling writer pen)
/P2=BALL (ball point pen)
/P3=BALL
/P4=BALL
```

You may change this action by specifying /P1=BALL or /P4=ROLLING, for example.

- You may specify or change the default pen color by using the /Cx= option (where x is 1, 2, 3, or 4 for pens 1 through 4, respectively). If you omit this option, the default colors are:

```
/C1=BLACK
/C2=BLUE
/C3=GREEN
/C4=RED
```

You may change the default by specifying /C2=RED or /C4=BLACK, for example.

- The /FORMS= parameter must be one of the following:

FANFOLD	8.5 by 11 inch fanfold paper
	NOTE: This is the default.
WIDE	34-inch wide roll paper
ROLL	11-inch wide roll paper

- The /TIME= option may be used to specify the maximum plotter time in minutes. Default value is 5 minutes.
- The /LENGTH = option may be used to specify the maximum plot length in inches. Default is 51 inches (which is 6 fanfold pages).
- The /COPIES= option may be used to specify the number of copies desired. Maximum number of copies is 31; default value is 1. NOTE: Currently, only *one* copy is allowed.
- The /BIN= option may be used to specify a specific bin number from 00 to 99 in which to place the output. Default is the last two digits of your ID number.
- The /JOBNAME= option sets the jobname which will be printed on the plot burst page. The name may not be longer than 8 characters.

Plots made on the default fanfold paper fold flat and can be transported easily without damage. Users should be aware, however, that a pen in the "pen up" position may drag across the "out fold" as the fold passes under the pen, producing a short unwanted line. Because of this, best results are obtained when each plot fits on a 8.5-inch by 11-inch page. Plots not satisfying this condition should be plotted on roll paper.

Users should also be aware that unlike the PLOT command, PLOTZ will not produce any printer output. Plot output will be found in the usual places. Plots on fanfold paper will be found in trays next to the roll paper plot bins with plots stored in numbered trays according to the last digit of their bin number. Users not finding their fanfold plots are asked to check the appropriate roll paper plot bin since we may have to generate the plot on roll paper under some circumstances.

We are presently working on ZETA plotter support for the IBM 360/75 and expect to have software in production by mid-July. IBM users will be urged to use this software when it is announced. Use of the ZETA rather than the CalComp plotters by IBM users is mandated by concerns for both reliability and turnaround time. Since the IBM 4341, which will replace the 360/75 by the start of the fall semester, will not support the on-line CalComp plotter, only the off-line CalComp plotter will be available to process user jobs. The off-line CalComp plotter will remain in service for a period of time sufficient to allow users to convert to the ZETA plotters.

SOME UTILITIES ALLOW CONTINUATIONS

The local utilities, PRINT, PUNCHC, PLOT, TYPE, and SENDJOB, now allow for continuation lines and a maximum of 20 file names. Previously, there was a limit of 10 file names.

To indicate continuation, end the command with a comma. If you are running a card batch or deferred batch job, or are using a procedure file, the next line should be the continuation. If you are entering the command at a time-sharing terminal, you will be prompted with the message:

CONTINUATION:

Then, you simply finish the command line.

You may have any number of continuation lines by simply terminating each line with a comma. To end the continuation, place a period at the end of the command line.

MORE NONLINEAR PROGRAMMING ALGORITHMS FLEX AND GMET

FLEX: The flexible tolerance range method, FLEX, is an algorithm for solving nonlinear optimization problems. FLEX is available on the CYBER and can be accessed with the statement:

GRAB,FLEX.

The use of FLEX requires that the user provide a user subroutine and a data file. The format of the time-sharing control statements used to execute FLEX is:

FTN,REW,*l*=user subroutine,*L*=0.
P.LOAD(LGO);FLEX,*data file*,*lfn*.

Where *lfn* is a local file to which the FLEX results are written.

GMET: GMET is an algorithm for solving geometric programming problems. GMET can be accessed on the CYBER with the statement:

GRAB,GMET.

The format of the time-sharing control statements used to execute GMET is:

GET,*data file*.
GMET,*data file*,*lfn*.

Where *data file* is the user supplied file containing information about the problem and *lfn* is the local file to which the GMET results are to be written.

A user manual for GMET and a writeup containing more information about FLEX are available for inspection in the Systems Consulting Office, Room 166 DCL. Questions or problems about either GMET or FLEX should be directed to Manoochehr Ghiassi (Room 193 DCL, 333-7904).

SIMULA NOW AVAILABLE THROUGH GRAB

CDC has dropped support of the SIMULA compiler with Release 5 of the NOS Operating System. However, CSO has made the CDC SIMULA 67 compiler available through GRAB. It may be accessed by entering the statement:

```
GRAB,SIMULA.
```

On or about September 1, 1980, we will no longer allow SIMULA to be used as a system command. Therefore, we suggest that all procedure files referring to SIMULA be converted to include the "GRAB,SIMULA." statement. Note that this is exactly the same SIMULA compiler as is currently on the system.

The "S" option (and all of its associated options) on the SIMULA compiler does not presently work (and we are uncertain if it ever did work here). If time permits, we will fix this problem some time in the future.

STATISTICAL SERVICES

BMDP-77 ON THE CYBER

The set of biomedical statistical programs, BMDP-77, has been installed on the CYBER. The manual, *BMDP Biomedical Computer Programs P-Series 1979*, is available at the CSO Distribution Center.

In addition, a document describing the differences between the CYBER BMDP-77 version and the IBM BMDP-79 version is available at the Statistical Services Office (65 Commerce West) or may be obtained by entering the following commands at the terminal:

```
WRITEUP,BMDP.  
PRINT,BMDP/CC/EJ/RJE=remote site.
```

To run BMDP from a time-sharing terminal, assuming the problem information and data are already in *file1* and the output is to be written to *file2*, enter the following:

```
GRAB,BMDP.  
BMDP(P=BMDPxx,I=file1,L=file2)
```

Where BMDPxx is the name of the particular BMDP routine you wish to use, e.g., BMDP1D or BMDP1M.

To run BMDP from cards or deferred batch (using SENDJOB or SUBMIT) use:

From Cards

```
/*CYBER
jobname.
SIGNON university id.
password.
BILL,charge,project.
PRINT/CC/EJ/RJE=remote site
GRAB,BMDP.
BMDP(P=BMDPxx)
7/8/9
    (BMDP program and data)
7/8/9
/*
```

From Deferred Batch

```
/JOB
jobname.
SIGNON university id.
password.
BILL,charge,project.
PRINT/CC/EJ/RJE=remote site
GRAB,BMDP.
BMDP(P=BMDPxx)
/EOR
    (BMDP program and data)
/EOR
```

Where BMDPxx is the name of the particular BMDP routine you wish to use.

HELP WANTED

NEEDED - AN 8-LINE ASYNCHRONOUS ULM

I need to switch from a 4-line asynchronous QTY (Data General Model 4060) to an 8-line asynchronous ULM (Data General Model 4241-A). Will have a surplus QTY to trade. If there is a NOVA minicomputer user who needs a 4-line QTY, please contact H. B. Puckett, 333-0808.

OFF-LINE's Mailing List

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OFF-LINE is the newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. OFF-LINE is printed monthly. Articles may be reprinted provided that the source of the article is noted. CSO operates an IBM 360 Model 75 with one million bytes of fast core and two million bytes of slow core, under HASP and OS, and a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

POLICY

RATE REDUCTION PERIOD

During the period between August 1 and September 1 inclusive, the rates charged to internal University users for CSO's CYBER and IBM services will be reduced by 40 percent. All services billed at the end of the job are included in this rate reduction. This includes charges for tape and disk mounts, printing, punching, and plotting as well as charges for I/O, memory, CPU seconds, connect time charges and, where applicable, line transmissions. UNIX rates, and rates for disk space and keypunching will not be reduced.

The mechanism used to reduce rates during similar periods in the past has been to devalue the dollar value of the service unit. Users whose computing was funded through the Research Board and students who utilized class funds were not directly benefited since their allocation of computer time was denominated in service units rather than in dollars. As a group these users did benefit since the reduced dollar value of the bill paid by the campus on their behalf allowed the campus to allocate more service units. Users who paid computing charges with hard contract funds benefited directly since the bills generated at the end of the month were for smaller dollar amounts.

A different mechanism will be used during this year's period of reduced rates. Briefly, computer charges will be calculated internally the same as now, but a multiplier of 0.6 will be applied to the service unit cost of each job before its cost is recorded in the billing database and before any PS number or user number balance is decremented by the cost of the job. Since the service unit cost of the job is being reduced, all users, regardless of the source of their funding, will benefit directly.

SERVICE UNIT RATES TO BE REDUCED

Effective after the end of the present discounted price period (September 1, 1980), the cost of a service unit will be reduced from \$\$0.68 to \$0.62. This continues the planned reduction of prices which we have been following for four years.

In addition, the prices for IBM services are being revised to reflect the new IBM 4341 system. These pricing changes are explained in the following article.

RATE CHANGES FOR THE IBM 4341

With the installation of the IBM 4341, which is replacing the IBM 360/75, a revision in pricing policy for IBM services will become effective September 2, 1980. These prices will be for the continuation of old services available under OS/MVT in batch mode. Further revisions will occur with the anticipated initiation of terminal-based services.

The two principal changes are to be in the areas of disk storage and the effect of memory on CPU or I/O charges.

Disk charges will be reduced from 0.01 service units per track per day to 0.0017. At the rate of \$0.62 per service unit, this would mean a charge of 3.93 service units at a cost of \$2.43 to store one million bytes for one month.

Processing charges are to be computed according to the formula:

$$0.00036(100T + IO)(0.0014R + 0.7)$$

Where:

- T = CPU time in seconds
- IO = number of IO requests issued
- R = memory Region in thousands of bytes

This will replace the old formula:

$$0.00036(100T + IO)(0.0045RF + 0.0015RS + 0.5)$$

where RF and RS were fast and slow regions, respectively.

The effect of the change will depend on the memory required, and the relative speed of the two machines for a specific job. The larger the memory requirement, the greater the decrease in service units per hour. The following examples should illustrate this -- assuming that the 4341 is 85 percent as fast as the 360/75.

<i>Region in 1000 bytes</i>	<i>Service Units Charged to do a One-hour 360 Job</i>	
	<i>360/75</i>	<i>4341</i>
0	64.80	106.73
128	139.44	134.05
256	214.09	161.37
512	363.40	216.02
1024	662.00	325.31

The new formula will give an approximate equivalence to CYBER batch charges, where the memory component was reduced a year ago.

SYSTEM NOTES

JUNE RELIABILITY REPORT

CYBER 175: 6 recoverable interruptions
 18 non-recoverable interruptions
 12 of these were for more than 15 minutes

Mean Time Between Failures = 22 hours
Mean Time to Repair = 26 minutes
Availability: 97.9% of scheduled uptime

Major cause of downtime was related to
software problems with disk and 2550's.

IBM 360/75: 69 non-recoverable interruptions
 48 of these were for more than 15 minutes

Mean Time Between Failures = 10.5 hours
Mean Time to Repair = 28 minutes
Availability: 94.2% of scheduled uptime

Major cause of downtime was related to
hardware problems with CPU.

"Recoverable interruptions" means those interruptions from which a user may normally recover (may continue work being done at the time of the interruption by doing a RECOVER, tty when the system comes back up). "Non-recoverable interruptions" means that a major problem has occurred, and recovery of work in progress at the time of the interruption is not possible.

CYBER

CSO VIDEOTAPES

CSO has recently completed the initial stages in the preparation of videotapes describing the CYBER 175. The following three tapes are available for viewing.

- CSOVT1 *Introduction to Computing at CSO.* This videotape is intended for the first time computer user, and for people wishing to learn more about CSO's facilities.
- CSOVT2 This videotape consists of four sections:
- *Using a Terminal* - How to operate a computer terminal.
 - *Introduction to CYBER Time-Sharing* - How to access the CYBER using a terminal.
 - *File Usage* - Local files and indirect access permanent files.
 - *Introduction to ICE Text Editing* - The basics of time-sharing editing.
- CSOVT3 This videotape, *Running a FORTRAN Program on the CYBER*, consists of three sections.
- Concepts involved
 - PROGRAM statement
 - CYBER control statements

Anyone may view these tapes by going to the Undergraduate Library in person to make a reservation to use the videotape equipment. The library hours are 8 AM - 8 PM Monday through Thursday, 8 AM - 5 PM Friday, and 1 PM - 5 PM Saturday and Sunday.

When you check out the videotapes, you should also pick up one of the handouts that are available with the tapes. The handout summarizes the contents of each tape in more detail, and facilitates note taking.

Your opinions regarding these videotapes would be greatly appreciated. You may use the last sheet of the handout, or write directly to:

CSO VIDEOTAPES
164 DCL
CAMPUS

PRINT AND PUNCH CHARGES MORE ACCURATE

Print requests from the CYBER to any of the IBM remote job entry (RJE) sites were not always charged correctly in the past. As a result of some changes which became effective July 23, the charges for printing to the IBM now will be as follows:

- The user number issuing the print request will be billed at the standard rate for the current charge, project number in use.
- The PS number will be billed:

at the correct rate for the RJE site (some remotes have different rates)

only for lines actually printed - if a print request is cancelled, there will be no charge for any unprinted portion

for unused print lines caused by specifying /EJECT (same as the IBM)

- If the print request is cancelled or sent to a remote that is charged at a non-standard rate, the PS number will be charged correctly, but the user number will be charged as if all lines were printed at the standard rate.
- In addition, cards sent to the IBM punch will be charged at the correct rates. Previously, they were charged at a reduced rate.

Overall, the charging will more accurately reflect the published rates.

Until now (July 23), this situation of non-standard rates at some RJE sites required special handling by the CSO Accounting Office. For example, the Accounting Office had to search through the records and issue refunds for things such as charges being made for printouts which were cancelled, etc. Due to the new changes, this will no longer be necessary.

ON-LINE 763 PLOTTER GONE

The CALCOMP 763 on-line plotter has been removed from service at CSO as planned when the new plotters were ordered. Hardware problems caused the plotter to go down several weeks ago. Since the cost of repair was very high, and the plotter would not be compatible with the IBM 4341 that is currently being installed, CSO decided to remove it from service sooner than originally anticipated.

All CYBER users are urged to use the new ZETA plotters which were recently installed. The July issue of *OFF-LINE* contained an article on the ZETA plotters and how to use them.

NUMERICAL SERVICES

IMSL EDITION 8

IMSL has released Edition 8 of their subroutine library; we have received and installed both the IBM version and the CDC CYBER version for testing.

The IBM version is available in dataset SYS9.IMSL, which can be accessed by using LIBFILE=SYS9.IMSL in your FORTRAN JCL. For example:

```
// EXEC FORTLDGO,LIBFILE=SYS9.IMSL
```

To access the CDC version, enter the statement

```
FUTURE,IMSL.
```

in place of GRAB,IMSL. Edition 8 will become the default on September 1, 1980.

Changes in Edition 8 include four deleted routines and 41 new routines. The deleted routines are:

GGAMS	- replaced by GGAMR
GGAMT	- replaced by GGAMR
GGBIR	- replaced by GGBM
GGMLT	- replaced by GGMTN

Exploratory Data Analysis

Four new routines implementing some of the techniques of exploratory data analysis have been added to the Library. One routine, BEMDP, does median polish of a two-way table; another routine, BOLTV, produces "letter value" summaries. A third new routine, USSLF, produces stem and leaf plots, and a fourth new routine, USBOX, yields boxplots of one to several samples on a single set of axes. The output from this latter routine allows easy comparison of the samples and also provides clear indication of the dispersion characteristics of each sample.

Categorized Data Analysis

Abilities for log linear model analysis have been provided in a new routine, CTLLF, that does iterative proportional fitting. Another new routine, CTPR, computes exact probabilities for two-way tables. This latter routine supplements the existing routine CTRBYC.

Differential Equations

A subroutine, DTPTB, which solves differential equation systems with two-point boundary conditions has been added. This routine utilizes a multiple shooting technique, using IMSL initial value routine DVERK to solve the differential equations each "shot." Another new routine, DBLINT, calculates double integrals, using DCADRE to calculate each simple integral.

Eigensystem Analysis

A code, EIGBS, to find eigenvalues and eigenvectors of band symmetric matrices is included in Edition 8. The existing routines for real symmetric and complex Hermitian matrices have also been extended to allow input in full storage mode.

Transforms

New routines include an inverse Laplace transform code, FLINV, and a subroutine, FFT3D, which calculates fast Fourier transforms of two- and three-dimensional arrays.

Random Number Generation

Ten new routines have been added to Chapter G in the Library. GGUO and GGNO are routines to generate order statistics from a uniform and a normal distribution, respectively. Any set of order statistics from the i -th to the j -th from a given sample size may be generated. Two other new routines are for generation of variates from a nonhomogeneous Poisson process using an efficient thinning method. Another basic uniform generator, GGUBT, has been added to the Library for the user who would prefer an alternate multiplier. The shuffled generator GGUW has been modified so the user may call it from any subroutine in the chapter if it is desired to perform shuffling prior to generation of nonuniform variates. A routine for generation of discrete uniform deviates, GGUD, as well as two routines, GGDA and GGDT, for generation of variates from general discrete distributions has been provided. One of the general routines uses a table lookup method and the other uses the alias method. In addition to the new routines added, the efficiencies of the current routines for generation of gamma, beta and multinomial variates have been substantially improved.

Interpolation; Approximation; Smoothing

Featured additions are easy-to-use companions to the existing cubic spline interpolation and smoothing subroutines. The easy-to-use interpolatory spline routine, ICSCCU, achieves high accuracy without requiring user-supplied end conditions, while the easy-to-use smoothing spline routine uses statistical considerations to determine the degree of smoothing needed. Additional one-dimensional approximation subroutines calculate a cubic spline interpolant with periodic end conditions (ICSPLN) and a least squares approximation using user-supplied basis functions (IFLSQ). Two-dimensional advances include a new code, IQHSCV, which fits a smooth surface to data given at irregularly spaced points and modifications to all the bicubic

spline routines so that they use C. de Boor's "not-a-knot" boundary conditions rather than the less accurate "natural" boundary conditions.

Linear Algebraic Equations

Two new subroutines have been added to Chapter L for Edition 8. LLBQF computes high accuracy solutions to linear least squares problems. LGINF, a subroutine to compute the generalized inverse of a matrix, has also been added.

Probability Density and Distribution Functions

Two new routines in Chapter M, MDGC and MDGCI, allow evaluation of a general continuous distribution function or its inverse, using a table of values of the density function. A new routine has been added to Chapter N, NDKER, for nonparametric estimation of the density function using the kernel method.

Regression Analysis

Edition 8 allows two useful alternatives to least squares estimation in regression models. The new routine RLLAV performs a least absolute values fit of a linear model, and a second new routine RLLMV computes a minimum maximum deviation fit.

Zeros and Extrema; Linear Programming

A more robust nonlinear equation solver ZSCNT has been added which should be used instead of ZSYSTEM for all new applications. ZSYSTEM will be deleted for Edition 9. A new linear programming routine has been added which may eventually replace ZX3LP and ZXOLP. This subroutine, ZX4LP is expected to handle large problems with greater reliability. User comparisons between ZX3LP and ZX4LP are invited.

A complete listing of the 41 new routines follows.

<i>NAME</i>	<i>PURPOSE</i>
BDLTV	Produce letter value summary
BEMDP	Median polish of a two-way table
CTLTF	Log-linear fit of contingency table
CTPR	Compute exact probabilities for contingency tables
DBLINT	Numerical integration of a function of two variables over a rectangular region

DTPTB	Solve an ordinary differential equation system with boundary conditions at two points, using a multiple shooting method
EIGBS	Find some eigenvalues and (optionally) eigenvectors of a real symmetric band matrix
FFT3D	Compute the fast Fourier transform of a complex valued 1, 2, or 3 dimensional array
FLINV	Compute the inverse Laplace transform of a user-supplied complex function
GGBN	Binomial random deviate generator
GGDA	General discrete distribution random deviate generator using alias method
GGDT	General discrete distribution random deviate generator using table lookup method
GGEXT	Random deviate generator for a mixture of two exponentials
GGMTN	Multinomial random deviate generator
GGNO	Generate set of order statistics from normal distribution
GGNPP	Nonhomogeneous Poisson process generator with rate function LAMDA(T)-fixed interval, fixed number or one-at-a-time
GGPER	Generate a random permutation of the integers 1 to K
GGSRS	Generate a simple random sample from a finite population
GGSTA	Stable distribution random deviate generator
GGUBT	Uniform (0,1) pseudo-random number generator using alternate multiplier
GGUD	Discrete uniform random number generator
GGUO	Generate set of order statistics from uniform (0,1) distribution
ICSCCU	Cubic spline interpolation (easy-to-use version)
ICSPLN	Cubic spline interpolation with periodic end conditions

ICSSCV	Cubic spline smoother (easy-to-use version)
IFLSQ	Least squares approximation with user-supplied basis functions
IQHSCV	Smooth surface fitting with irregularly distributed data points
LGINF	Compute the generalized inverse of a real matrix
LLBQF	Solution of linear least squares problem - high accuracy solution
MDGC	General continuous probability distribution function, given ordinates of the density
MDGCI	Inverse of a general continuous probability distribution function, given ordinates of the density
MMPSI	Logarithmic derivative of the gamma function
NDEST	Evaluate probability density function at specified points
NDKER	Nonparametric probability density function (one dimensional) estimation by the kernel method
OCDIS	Compute pairwise Euclidean distances between the columns of a matrix
RLLAV	Perform linear regression using the least absolute values criterion
RLLMV	Perform linear regression using the minimax criterion
USBOX	Print a box plot (K samples)
USSLF	Print a stem and leaf display
ZSCNT	Solve a system of nonlinear equations
ZX4LP	Solve the linear programming problem via the revised simplex algorithm (alternate easy-to-use version)

ACSL VERSION 6A

Version 6A of the Advanced Continuous Simulation Language (ACSL) for the CYBER has been installed in FUTURE and will become the system default on September 1, 1980. Before then, Version 6A can be accessed by entering:

```
FUTURE,ACSL.
```

Please note that, as per the JUNE 1980 issue of *OFF-LINE*, the procedures ACSLCOM and ACSLGO used to run ACSL will be CCL (CYBER Control Language) procedures; "CALL" will no longer work. ACSLCOM, for instance, will be called by entering

```
ACSLCOM,INPUT=file,OPTION=options,...
```

and ACSLGO will be called by entering

```
ACSLGO,INPUT=file,OUTPUT=out,PLOT=plotter,...
```

The positional parameter feature of CCL can be used to a limited extent to shorten these calls. For example,

```
ACSLCOM,MODEL,OPTION=T.
```

can be used to translate the model definition in file MODEL, with a full translator listing (option T). Also,

```
ACSLGO,RUNCON.
```

could be used to run a translated model, using the run control commands in file RUNCON.

Procedure SAMPLES (accessed by GRAB,SAMPLES.) can be used to obtain sample model definitions, particularly for the examples of Appendix A of the *ACSL User's Guide*.

Following is a summary of the changes and enhancements for Version 6A.

- Subroutines LINES and PAGE were added to allow page control from external FORTRAN routines.
- The debug printout has been modified to identify system variables, state variables and algebraic variables.
- The default maximum step size MAXT has been changed to 1.0E10 from the previous value of 1.0.
- A discrete event capability has been added, invoked by setting the algorithm to zero (IALG=0). A full description can be obtained from Stan Kerr. This algorithm should be used in current simulations which now have a separate DERIVATIVE section using IALG=6, the unsynchronized euler. Algorithm 6 will be eliminated eventually.

- A start has been made to introduce a linear analysis capability. At the moment it will find a steady state (if the model is reasonably linear), evaluate the Jacobean and evaluate the eigenvalues and eigenvectors. See Stan Kerr for a full description.
- A subroutine, LOG, has been added for selective data logging. To force high frequency data logging at every derivative evaluation, add to the end of the DERIVATIVE section the statement

IF (*condition*) CALL LOG.

which will write the OUTPUT list and save the PREPAR list every time through, while *condition* is .TRUE.

- The ACSL Newsletter in which Version 6A is described also contains several suggestions, including:

A macro by which all FORTRAN intrinsic integer functions can be automatically declared INTEGER to ACSL, rather than the default of REAL which ACSL assumes for all variables and functions.

A macro which can be used to facilitate solution of difference equations with algorithm 3 or 0.

A technique for measuring average step size and integration efficiency for the variable step algorithms.

For further details and copies of the ACSL Newsletter, see Stan Kerr, Room 175 DCL (333-4715).

CCL REMINDER

This is to remind you that the procedures listed below, which are currently KCL procedures invoked by CALL or "-", will become CCL procedures on September 1, 1980, as announced in the June 1980 issue of *OFF-LINE*. The CCL versions are currently accessed via FUTURE.

GRAB name

USERLIB	(parameter XREF changing to NX)
ACSL	
CONVPRC	(will be MIMI after Sept. 1)
TIDYPRC	(will be TIDY after Sept. 1)
ALTRAN	
DEBLOCK	
TBLOCK	

Brief help information on these is available from the CYBER HELP program.

MISCELLANEOUS

CSO SHORT COURSES

CSO offers a number of introductory courses every semester. Topics usually include:

- How to use the CDC CYBER 175 and the ICE text editor.
- How to use the RNF text formatter.
- How to do plotting with NCAR and GCS.
- How to use magnetic tapes.
- How to use various statistical packages, including SPSS, SOUPAC and FOSOL.
- How to use the mathematical libraries and packages.

The offerings each semester vary considerably, depending on needs and demands.

An announcement of course offerings is sent to everyone on the *OFF-LINE* mailing list who lives within 50 miles of the campus. An announcement is also made via the on-line HEARYE program and the RJE Bulletin posted at each remote job entry site. Our biggest problem has always been that the introductory classes fill up too quickly, and further applicants are turned away. We are trying to solve this problem by keeping a waiting list for each course. When we have a sufficient number of applicants on the waiting list to fill another class, we will attempt to open another session of the class whenever possible.

If you have any questions or complaints about the current short courses, please direct them to Scott Lathrop, 187 DCL (333-6618).

MAILING LIST UPDATE

We are currently updating the on-campus section of the *OFF-LINE* mailing list and would appreciate help from our user community. Off-campus and foreign subscribers do not need to return the form to maintain their subscription. However, if these subscribers do move or wish to terminate their subscription, we would appreciate word from them.

If you are an on-campus subscriber (or have a mailing address in Champaign or Urbana), and would like to continue receiving a copy of the newsletter, *please* take a few minutes of your time to check the special box labelled "Continue my subscription" on the mailing list form at the end of this issue, add your *current* mailing address, and return the form to 164 DCL.

Also, departmental secretaries may be of great assistance by taking any copies of *OFF-LINE* that are sent to members of their department who are no longer there, marking the copies "LEFT" or "NO LONGER HERE", and returning them to 164 DCL.

An updated mailing list keeps down expenses, saves the Mailing Center many frustrations and returns, and I'm sure, saves departments the frustration of receiving mail month after month for someone who has left.

Since this issue may not reach some people due to summer activities, this notice will be repeated in the September issue. However, beginning the first of October, we will delete all names of persons who have not returned the form. Thank you for your cooperation in helping us maintain an updated mailing list.

HELP WANTED

NEEDED - COMPUTER PROGRAMMER

1/4 research assistantship, August 21, 1980 - at least 1 year. Skills needed: FORTRAN programming, knowledge of behavioral science statistics, ability to run SPSS programs. Contact Barbara Tinsley, Dept. of Psychology (333-6371).

PROGRAMMER NEEDED

We are looking for a programmer for an 11-month, 1/2 time assistantship for the 1980-81 academic year. The position involves work in computerized movement control research in the Physical Education Department, and provides an opportunity for programming on a PDP-11/03 and graphics display. Requires familiarity with FORTRAN and assembly languages, and some experience with graphics work. Interested persons please contact Karl M. Newell, Institute for Child Behavior and Development, 51 Gerty Drive (333-6563).

OFF-LINE's Mailing List

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

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University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

EDITOR: Lynn Bilger
PHONE: (217) 333-6236
139 Astronomy Building
Urbana, Illinois 61801

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CSO DIRECTORY - STAFF AND SERVICES

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Director	George Badger	150	DCL	333-4103
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Mgr, UNIX Operations	Larry Sautter			
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		300	baud	333-4000
		1200	baud	333-4001

Asst Dir Systems and Operations	Sandra Moy	177	DCL	333-4703
Asst Dir Development	J. M. Randal	120	DCL	333-9772
Asst Dir Engineering	Cliff Carter	195	DCL	333-3723
CYBER-IBM Operations	Jack Knott	194a	DCL	333-6562
UNIX Operations	Debbie Weller	203	Astronomy	333-8150
Telecommunications	Tom Kerkering	16	DCL	333-0816
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Laboratory Support Project	Lee Hollaar	193	DCL	333-7904
RJE Operations	Rex Duzan	162	DCL	333-6285

RJE Sites

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OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of August 29, 1980.

CSO operates an IBM 4341 with four million bytes of fast core running HASP-OS/MVT under VM, a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

SYSTEM NOTES

JULY RELIABILITY REPORT

CYBER 175: 17 recoverable interruptions
18 non-recoverable interruptions
18 of these were for more than 15 minutes

Mean Time Between Failures = 16 hours
Mean Time to Repair = 46 minutes
Availability: 94.3% of scheduled uptime

Major cause of downtime was related to disk pack problems and power outage due to storm.

IBM 360/75: 54 non-recoverable interruptions
50 of these were for more than 15 minutes

Mean Time Between Failures = 13 hours
Mean Time to Repair = 90 minutes
Availability = 91.3% of scheduled uptime

Major cause of downtime was related to memory failures and power outage due to storm.

IBM 4341: 15 non-recoverable interruptions
15 of these were for more than 15 minutes

Mean Time Between Failures = 7.5 hours
Mean Time to Repair = 83 minutes
Availability = 83.7% of scheduled uptime

Major cause of downtime was related to installation of disk drives.

(NOTE: The IBM 4341 replaced the IBM 360 on July 27, 1980.)

"Recoverable interruptions" in time-sharing are those interruptions from which a person may normally recover work being done at the time of the interruption by doing a RECOVER, *try* when the system comes back up. "Non-recoverable interruptions" means that a major problem has occurred, and recovery of work in progress at the time of the interruption is not possible.

CYBER

CSO VIDEOTAPES

This article is repeated from the August issue.

CSO has recently completed the initial stages in the preparation of videotapes describing the CYBER 175. The following three tapes are available for viewing.

- CSOVT1 *Introduction to Computing at CSO.* This videotape is intended for the first time computer user, and for people wishing to learn more about CSO's facilities.
- CSOVT2 This videotape consists of four sections:
- *Using a Terminal* - How to operate a computer terminal.
 - *Introduction to CYBER Time-Sharing* - How to access the CYBER using a terminal.
 - *File Usage* - Local files and indirect access permanent files.
 - *Introduction to ICE Text Editing* - The basics of time-sharing editing.
- CSOVT3 This videotape, *Running a FORTRAN Program on the CYBER*, consists of three sections.
- Concepts involved
 - PROGRAM statement
 - CYBER control statements

Anyone may view these tapes by going to the Undergraduate Library in person to make a reservation to use the videotape equipment. The library hours are 8 AM - 8 PM Monday through Thursday, 8 AM - 5 PM Friday, and 1 PM - 5 PM Saturday and Sunday.

When you check out the videotapes, you should also pick up one of the handouts that are available with the tapes. The handout summarizes the contents of each tape in more detail, and facilitates note taking.

Your opinions regarding these videotapes would be greatly appreciated. You may use the last sheet of the handout, or write directly to:

CSO VIDEOTAPES
150 DCL

CSO SHORT COURSES FOR THE CYBER 175

CSO is once again offering short courses during the fall semester 1980 to acquaint people with our facilities and the Control Data Corporation (CDC) CYBER 175 computer system.

To register for a course:

Come in person to Room 150 DCL, or
Phone 333-6630.

Registration is free and limited to 30 persons per class. If you find that all of the available classes on a topic are full, please leave your name on our waiting list. We will call you if someone drops a course or we open another session.

The following courses are being offered (check the Short Course mailout or call 333-6630 for further details -- time and place).

GENERAL COURSES

Introduction to the CYBER 175
MANAGE
CYBER Control Language (CCL)
CYBER Magnetic Tapes
Math Libraries
Differential Equations
Curve Fitting
Non-Linear Programming and NETWORK

RNF TEXT PROCESSING COURSES

Introduction to the CYBER for RNF Users
Introduction to the RNF Text Formatter
Advanced Usage of RNF

GRAPHICS COURSES

Graphics at CSO
ZETA Plotters
NCAR Plot Package
TEKTRONIX 4027 Color Terminal Usage
Introduction to GCS Plot Package
Advanced usage of GCS

STATISTICAL COURSES

FOSOL
SAS
SOUPAC
SPSS

IBM

IBM PUBLIC FACILITY GONE

The IBM "PUBLIC" facility, which allowed public access to user-contributed software, is no longer in existence. It has not been added to in the last several years, and it was recently noted that the supporting dataset has been idle for so long that it has disappeared completely. Since we feel that this is indicative of the demand for the facility, we do not plan to revive it. If there should be a strong demand for revival, we will revive it, but it may not operate in the same way. Please contact Stan Kerr (333-4715) with comments or suggestions.

MATHEMATICAL SERVICES

HELP INFORMATION DUMPED FROM PROCS

The HELP information available from procedures MATH, SAMPLES, and DYNAMO via the statement "-HELP,proc" has been added to the system HELP files. This information will be removed from the procedures on October 1, 1980. After that date, enter the system command "HELP" followed by the name of the *proc* you wish help information for.

APEX SNAFU

We have discovered that the APEX manuals currently supplied by CDC are Revision G, for Version 1.2 of APEX. However, we are running Version 1.1 of APEX. Therefore, be wary of features described in the manual on pages marked with a G at the bottom, and features marked with vertical change bars. In particular, one feature which is not available in Version 1.1 is the dual simplex algorithm invoked by the DUAL verb.

T.O.M.S. ALGORITHM TAPE

We now have a tape containing all algorithms published in *Transactions on Mathematical Software* to the present date (the first is algorithm 493, published in Volume 1, 1975). Users can access this tape by using the directory of files supplied in file

TOMS/UN=MATHLIB.

All algorithms are supplied in their original form and may require conversion to run on the system here; some are subroutines, some are main programs.

For example, from the directory you would find that algorithm 498, published in Volume 1, Number 4, for calculation of Airy functions is in tape file 6 and contains 348 cards. You could read and save this as follows:

```
GRAB,DEBLOCK.
LABEL,TAPE,VSN=TOMS-N140,D=PE,LB=KU,F=S,CV=EB,PO=R.
SKIPF,TAPE,5.
DEBLOCK,DISK=ALG498.
SAVE,ALG498.
RETURN,TAPE.
```

Please note that the Systems Consulting Office (Room 166 DCL) has notebooks with all the Collected Algorithms of the ACM (from 1 on up).

NEW ROUTINES IN UOILIB

Three new routines, NSPIV, RMFFT and CMFFT, have been added to UOILIB.

NSPIV

NSPIV is a routine for sparse Gaussian elimination, published as algorithm 533 in *Transactions on Mathematical Software*, Volume 4, Number 4 (December 1978). With this routine, a sparse matrix can be passed as a vector of non-zero values together with arrays of pointer indices that tell where the non-zeros are positioned in the matrix. Because Gaussian elimination may generate additional non-zero matrix elements (at each stage of the reduction), the routine must be supplied with enough work storage to allow for this growth; in some cases, it may be difficult to tell how much growth will occur, so the routine should be applied only after this aspect has been analyzed.

To print a brief description of the parameters of NSPIV, enter the following:

```
GRAB,MATH.
MATH,UOILIB,NSPIV.
PRINT,DOC.
```

RMFFT and CMFFT

RMFFT and CMFFT are routines for computing the fast Fourier transform (FFT) of a large real (RMFFT) or a complex (CMFFT) sequence or multi-dimensional array stored on a random-access disk file. These codes were published as algorithm 545 in *Transactions on Mathematical Software*, Volume 5, Number 4 (December 1979). With them, a very large sequence or array can be broken down into small portions, stored on a CYBER FORTRAN random-access file, and transformed.

To print descriptions of RMFFT and CMFFT, enter the following:

```
GRAB,MATH.
MATH,UOILIB,RMFFT.
MATH,UOILIB,CMFFT.
PRINT,DOC.
```

The original version of the algorithm supplied to us includes random access drivers for other machines, including PDP-11's. If you are interested in these, please contact Stan Kerr, Room 175 DCL (333-4715).

PERMANENT FILE SUBROUTINES

Permanent and local file subroutines for use from FORTRAN on the CYBER have been installed in UOILIB. There is a routine, PF, for doing permanent file operations, and a routine, LF, for local file operations (currently LF only does a RETURN).

LF is called as follows:

```
CALL LF("RETURN","lfn1","lfn2",...,"lfnr")
```

Where each local file name can be given as a character constant, e.g., "FILE", or as the FORTRAN unit number for a file specified in the PROGRAM statement, e.g., CALL LF("RETURN",7).

PF is called as follows:

```
CALL PF(request,lfn,pfn,key1,opt1,key2,opt2,...,keyn,optn)
```

Where:

<i>request</i>	is the desired permanent file request ("APPEND", "ATTACH", "CHANGE", "DEFINE", "GET", "PERMIT", "PURGE", "REPLACE", or "SAVE"). The "PERMIT" request requires special format -- see Note 3 below.
<i>lfn</i>	is the local file name, given in character format as for LF, or as a FORTRAN unit number.
<i>pfn</i>	is the permanent file name given in character format. Only <i>one</i> permanent file can be accessed per call to PF.
<i>key and opt</i>	are pairs of keywords and options, in character format, subject to the restrictions mentioned below.

For example:

```
CALL PF("GET",1,"DATA","UN","USERNO","PW","STRING")
CALL PF("ATTACH","TAPE2","BIG","M","N")
CALL PF("PURGE",5,LTAPE3,"SUPERC","NA")
CALL PF("DEFINE","TAPE3","ULTRAC","CT","S")
```

The options are parallel to those provided by NOS (see the NOS Manual, Volume 1, Section 8 or the Time-Sharing User's Reference Manual) with the following additions:

"NONE"	used to nullify specific keywords
"RC"	returns error code in integer format
"RRC"	returns error code in real format
"NA"	inhibits rollout if a direct access file is busy
"SS"	retains subsystem mode of saved file
"UC"	retains the user control word

The following examples illustrate different ways of performing the same permanent file functions, viz., obtain a permanent file "PERM" as a local file named "TAPE10" (assume that TAPE10 is in your PROGRAM statement and is *not* equated to something else).

```
CALL PF("GET","TAPE10","PERM")
CALL PF(3LGET,6LTAPE10,4LPERM)
CALL PF("GET",10,"PERM")
```

If the same name is desired for both the permanent and local files, then one of the parameters for *lfn* and *pfn* may be zero. The following examples all get a permanent file named "NICKLE" as a local file of the same name.

```
CALL PF("GET","NICKLE","NICKLE")
CALL PF("GET",0,"NICKLE")
CALL PF("GET","NICKLE",0)
```

Please pay special heed to the following notes:

1. Make sure that local files are declared in the PROGRAM statement. If they are not, you will be able to GET, etc., but FORTRAN cannot do I/O with the file.
2. Before calling PF, ensure that **BUFFERS ARE FLUSHED!** The FORTRAN statements REWIND and ENDFILE can be called to do this (but note that either of these adds an /EOP to a text file).

3. The "PERMIT" request requires a special format such that the user number (only Zone may be specified) and permission mode must include the "UN" and "m" keywords, e.g.,

```
CALL PF("PERMIT","MYFILE","UN","YOURS","M","R")
```

4. ERROR PROCESSING -- The combination of the "RC"/"RRC" and "NA" options select a number of responses from PF:

- If option "NA", "RC", or "RRC" *is not* specified, and the function fails, the standard NOS error message is written to your dayfile and your program is aborted. To specify NA, include

```
"NA",value
```

as a keyword/option pair in the call to PF. The *value* is immaterial, e.g., "NA",0 will do fine.

- If either "RC" or "RRC" *is* specified and the function fails, the NOS numeric error code is placed in the return code parameter. A zero value indicates a successful operation.

For instance, the keyword/option pair

```
"RC",IRC
```

in your call to PF indicates you want the value of the error code, as an integer, placed in variable IRC. The pair

```
"RRC",X
```

in your call to PF indicates you want the value of the error code, as a real number, placed in variable X.

- If "NA" *is not* specified, a call to PF for a direct access file which is currently attached in write mode by someone else will cause your program to "roll out" and wait until the file becomes available.
- If "NA" *is* specified and the function fails, your program continues, and an error code is returned if you specified "RC" or "RRC" as above.

5. If you use a FORTRAN unit number for the local file, and that unit is equated to a file in your PROGRAM statement, it is the name of this latter file which is used as the local file name. If, further, this file is overridden on the "LGO" card, the name of the overriding file is used. For example, suppose your PROGRAM statement is

```
PROGRAM FU(INPUT,OUTPUT,CAT,TAPE1=CAT)
```

and you execute using

```
LGO,DATA,OUT,DOG.
```

and, if your program contains

```
CALL PF("GET",1,"COW")
```

then, permanent file COW will become the local file DOG, and references to FORTRAN unit 1 will use local file DOG and not local file CAT.

IMSL EDITION 8 MANUAL - ERRATA

We have discovered an error in the IMSL Version 8 Manual. Under the routine USSLF, there is a parameter to the routine called IUNIT. The writeup in the manual claims that this parameter is never changed by USSLF, but in fact, it can be. If you have questions about this, please contact Stan Kerr (333-4715).

MISCELLANEOUS

**COMPUTER RELATED DISCOUNTS
AVAILABLE THROUGH PURCHASING DIVISION**

The following computer related discounts are available through the Urbana campus Purchasing Division. These discounts are valid only during the Fiscal Year 1981.

CRT TERMINALS

Vendor: Kal-Tronics Corp., 3677 Woodhead Dr., Northbrook, IL 60062

Lier Siegler	ADM3A	U/L Case Interactive Display	\$695.00
Retro Graphics (Graphics capability for ADM3A)	RG512		\$860.00

Vendor: Bronson & Bratton, Inc., 5161 S. Millard Ave, Chicago, IL 60632

Infoton	GT101		\$850.00
	Visual 210		\$890.00

Vendor: IBM, Data Proc Div, 1133 Winchester, White Plains, NY 10604

IBM	Model 3101	\$1046.36
(Good until 2/28/81)		

PRINTING TERMINALS

Vendor: Hall-Mark Electronics, 13789 Rider Trail, Earth City, MO 63045

Texas Instrument	743	U Case only	\$863.00
	743	U/L Case	\$935.00
	745	U Case only, portable	\$1218.00
	745	U/L Case, portable	\$1290.00
	785		\$1899.00
	787		\$2240.00
	810		\$1380.00
	810	with package	\$1568.00
	820		\$1570.00
	820	with package	\$1737.00

Vendor: David Jamison Carlyle Co., 4200 Marine Dr., Chicago, IL 60613

DecWriter	LA34DA	\$895.00
	LA34AA	\$1084.00
	LA120	\$2074.00
Teletype	4320AAA	\$940.00
	4320AAK	\$1015.00

Vendor: Xerox Data Sys., 450 W. Algonquin Rd., Arlington Heights, IL

Diablo-Xerox	1640	Receive only	\$2306.00
	1640	Keyboard	\$2640.00
	1650	Receive only	\$2389.00
	1650	Keyboard	\$2720.00

Vendor: Information Systems Inc., 9806 W. Farragut Ave., Rosemont, IL 60018

Spinwriters - NEC	5510-1	\$2361.00
	5520-1	\$2433.00
	5515-1	\$2693.00
	5525-1	\$2782.00
	5530-1	\$2362.00
	5540-1	\$2811.00

COMPUTERS

Micro-mini, Apple II

\$1902.48

Sample Configuration

- 1 Apple II with: Integer and Extended Basic, 32K RAM,
Necessary cables and manuals
- 1 RS232 Serial Interface Card
- 1 Disk II drive and interface
- 1 12" B&W monitor

ACOUSTIC COUPLERS (300 BAUD)

Vendor: ComData Corp., 8115 N. Monticello Ave., Skokie, IL 60076

302A2-13	General Purpose	\$176.90
150A2-14B	DecWriter, includes cable	\$128.00
150A2-14C	TTY 43, includes cable	\$128.90

ADDRESS CHANGE

Due to the various moves that are continuing to be made at DCL, the mailing address for all documentation (comments on manuals, newsletter, etc.) has been changed from 164 DCL to **150 DCL**. This address change will be made in our documentation as manuals, etc., are updated.

Also, for those users returning to campus after a summer off, the Systems Consulting Office has been moved to **Room 166 DCL**, the Accounting Office and Distribution Center have both been moved to **1208 W. Springfield**.

MAILING LIST UPDATE

This article is reprinted from the August issue. I would also like to take this opportunity to thank our users for the tremendous response I have received to this request. - Lynn Bilger, Editor.

We are currently updating the on-campus section of the *OFF-LINE* mailing list and would appreciate help from our user community. Off-campus and foreign subscribers do not need to return the form to maintain their subscription. However, if these subscribers do move or wish to terminate their subscription, we would appreciate word from them.

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Beginning the first of October, we will delete all names of persons who have not returned the form. Thank you for your cooperation in helping us maintain an updated mailing list.

HELP WANTED

IBM SELECTRIC I/O WRITER

One IBM Selectric I/O Writer is available locally. If interested, contact Cliff Carter, 333-3723.

***OFF-LINE's* Mailing List**

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

- Check one:
- ☐ New subscriber
 - ☐ Removal request
 - ☐ Address correction

 - ☐ Continue my subscription

Name: _____

Address: _____

CAMPUS or Zip Code _____

(If address correction, give old address and zip code below.)

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Urbana, Illinois 61801

EDITOR: Lynn Bilger
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139 Astronomy Building
Urbana, Illinois 61801

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Text Processing Consulting		207	Astronomy	333-7318
Asst Dir User Services	Robert Penka	173	DCL	333-4709
Mgr, Statistical Services	Larry Sautter	91	Comm West	333-2170
Mgr, UNIX Operations	Larry Sautter			
Documentation	Lynn Bilger	139	Astronomy	333-6236
Distribution Center		1208	W Springfield	333-6760

Hardware/Software Support

Terminal Repair Service		150	DCL	333-0969
CYBER Dial-up Numbers		110	baud	333-4000
		300	baud	333-4000
		1200	baud	333-4001

Asst Dir Systems and Operations	Sandra Moy	177	DCL	333-4703
Asst Dir Development	J. M. Randal	120	DCL	333-9772
Asst Dir Engineering	Cliff Carter	195	DCL	333-3723
CYBER-IBM Operations	Jack Knott	194a	DCL	333-6562
UNIX Operations	Debbie Weller	203	Astronomy	333-8150
Telecommunications	Tom Kerkering	16	DCL	333-0816
Hardware Selection Assistance	Cliff Carter	195	DCL	333-3723
Laboratory Support Project	Lee Hollaar	193	DCL	333-7904
RJE Operations	Rex Duzan	162	DCL	333-6285
Don McCabe	1528		W Springfield	333-7720

RJE Sites

Agriculture		M103	Turner Hall	333-8170
Chemistry		153	Noyes Lab	333-1728
Commerce West		70	Comm West	333-4500
DCL Routing Room		129	DCL	333-6203
Electrical Engineering		146	EEB	333-4936
Florida Ave Res Hall			FAR	333-2695
Illinois St Res Hall			ISR	333-0307
Mechanical Engineering		65	MEB	333-1430
Psychology		453	Psych Bldg.	333-7531
CRH Snack Bar		120	Snack Bar	333-1851
Social Science		202	Lincoln Hall	333-0309

OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of September 25, 1980.

CSO operates an IBM 4341 with four million bytes of fast core running HASP-OS/MVT under VM, a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

SYSTEM NOTES

AUGUST RELIABILITY REPORT

CYBER 175: 8 recoverable interruptions
 15 non-recoverable interruptions
 15 of these were for more than 15 minutes

Mean Time Between Failures = 24 hours
Mean Time to Repair = 57 minutes
Availability: 95.9% of scheduled uptime

Major cause of downtime was related to
disk problems.

IBM 4341: 57 interruptions
 30 of these were for more than 15 minutes

Mean Time Between Failures = 12 hours
Mean Time to Repair = 44 minutes
Availability: 85.9% of scheduled uptime

Major cause of downtime was related to
installation.

(NOTE: The IBM 4341 replaced the IBM 360
on July 27, 1980.)

"Recoverable interruptions" in time-sharing are those interruptions from which a person may normally recover work being done at the time of the interruption by doing a RECOVER, *tty* when the system comes back up. "Non-recoverable interruptions" means that a major problem has occurred, and recovery of work in progress at the time of the interruption is not possible.

CYBER

PASCAL BUGS FIXED

The PASCAL compiler has had a number of bugs fixed, including the following which were brought to our attention by the users:

- Correct indexing of packed arrays with eight elements per word (i.e., 7 bit entries).
- Restrict NEW to pointer variables.
- Prevent explicit assignment to FOR-DO loop control variables and nesting of FOR-DO loops with the same control variable.
- Prevent the compiler from infinite looping when trying to compile incorrect declarations (e.g., set of 1..N; N, a variable) or set constructions (e.g., [1..255], [1..3.5], etc) with max > 58 (Integer).
- Correct runtime Division by Zero Error message.
- Insure pointer is valid before disposing node in PSYSTEM.

To date, 40 bugs have been corrected. This version of PASCAL (S.2) is in:

GRAB,PASCAL/F.

Present binaries will not work with this new version.

IBM

NEW VERSUS OLD

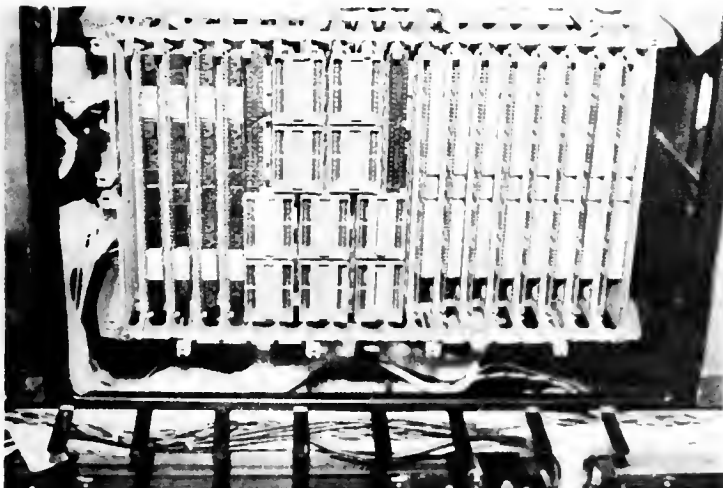
We though you would enjoy seeing the results of nearly a decade and a half of progress in building computers. The following pictures graphically demonstrate the continuing trend of miniturization of electronic components. The "before" pictures are of the IBM 360/75 which was installed in the late sixties. The "after" pictures are of the IBM 4341 which was installed in late July 1980. The two machines have nearly identical computing power, but the 4341 has more memory and channels.



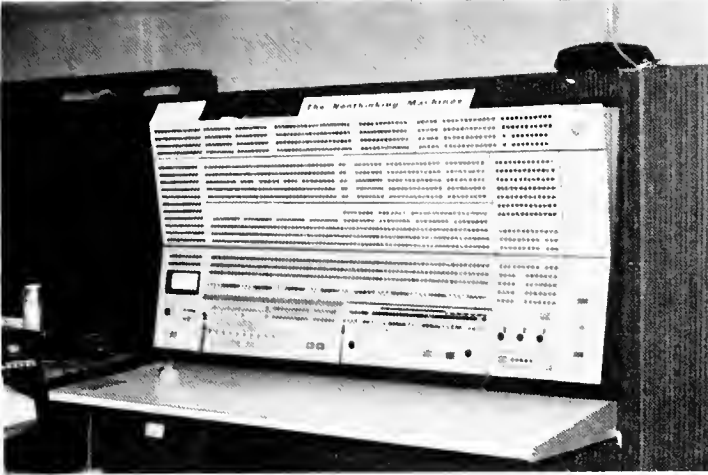
BEFORE The monolithic unit (built of many cabinets) which seems to run the length of the room forms the central processing unit, one megabyte of memory, and the operator console of the 360/75. An entire cabinet (approximately six feet long) is required to contain a quarter megabyte of memory!



AFTER This is the 4341 -- all of it! It replaces the monolithic unit in the previous picture plus a number of physically separate boxes some of which cannot easily be seen because of the crowded condition of the room.



AFTER No bigger than a breadbox, but equal of the 360/75! These circuit boards are the heart of the 4341 and contain 4 megabytes of memory and the central processing unit.



BEFORE The control panel of the 360/75. It contains approximately 1300 lights and more than 100 switches and dials.

AFTER The "control panel" of the 4341. Actually, the engineers have access to a few other switches inside the cabinet. The CRT console seen in the picture of the 4341 together with an internal diagnostic computer serve the same function as the switches and lights on the console of the 360/75. In addition, the CRT displays are formatted for human interpretation and are much easier to read than the lights on the 360/75 console.



MATHEMATICAL SERVICES

SLAM - UPDATES AND NEW FEATURES

Updates and enhancements for the SLAM simulation package have been received and installed. Enhancements include the following:

- It is now possible to request a summary report on selected runs. The options available for the ISMRY field on the GEN card are:
 - N - No summary reports
 - Y - summary report after every run (default)
 - Y/E - summary report after every run (same as the Y option; default)
 - Y/F - summary report after first run only
 - Y/S - summary report after the first and last runs
 - Y/n - summary report after every nth run
- It is now possible to clear statistics based on observations selectively between runs. Two optional fields have been added following the JJCLR field on the INITIALIZE card, giving the card the form:

INIT,TTBEG,TTFIN,JJCLR/NCCLR/JCNET,JJVAR,JJFIL;

Statistics to be cleared are defined as follows:

<i>Variable</i>	<i>Options</i>	<i>Default</i>
JJCLR	"Y" - clear user-collected statistics with STAT code less than NCCLR "N" - clear user-collected statistics with STAT code greater than or equal to NCCLR	"Y"
NCCLR	integer equal to breaking point for clearing of user-collected statistics	largest statistics code defined + 1
JCNET	"Y" - clear network-collected statistics "N" - do not clear network-collected statistics	JJCLR

- Two new functions have been added:

FFAWT(IFILE)	will return the average waiting time in file IFILE
NNBLK(IACT,IFILE)	will return the number of entities associated with activity number IACT and blocked by the node associated with file IFILE

If you have problems or questions about SLAM, contact Stan Kerr (Room 175 DCL, 333-4715 or through TELL,UN=MATHLIB on the CYBER).

THE PORT LIBRARY

CSO has installed the Bell Labs PORT mathematical library on the CYBER. It can be accessed by entering:

GRAB,PORT.

Following this you can compile and run a FORTRAN program which calls PORT routines.

There is a manual for PORT available for inspection in the Systems Consulting Office, Room 166 DCL. Manuals can be purchased for \$20.00 from Bell Laboratories Computing Information Service, 600 Mountain Avenue, Murray Hill, New Jersey (07974). A copy of Bell Labs Computing Science Technical Report #47, which has an overview and rationale for the library, is also available for inspection.

The purpose of the library is to provide the first "portable" library of general mathematical routines, written in a FORTRAN which is acceptable to all present computer systems. Only three routines in the library must be adjusted for a given computer system: RIMACH, DIMACH and IIMACH which define real, double precision and integer machine constants, respectively. This is in contrast to a library such as IMSL, which is maintained in slightly differing versions for different models of computers.

PORT is divided into functional areas as follows:

1. *Approximation, Interpolation and Extrapolation*

This includes routines for approximating discrete and continuous functions. For the former, there are codes for best uniform approximation by rational functions, splines (both cubic and the more general B-splines), and least squares approximations by splines. For the latter, there are least squares approximations using B-splines.

2. ***Computer Arithmetic***

This includes routines for performing complex double precision arithmetic, using a 2-element vector of double precision numbers to represent a complex number.

3. ***Differential Equations***

Currently, this only has a variable step algorithm for non-stiff (no sharp transient) systems using a modified midpoint rule with extrapolation.

4. ***Linear Algebra and Eigensystems***

Currently, this only has general algorithms for solving real and complex linear systems, or obtaining least-squares solutions, and for finding eigenvectors and eigenvalues of a real matrix.

5. ***Mathematical Programming***

This section is empty in the current PORT.

6. ***Optimization***

Currently, this section has only one very simple routine. Others will be added later.

7. ***Probability and Statistics***

Currently, this section has only a uniform random number generator.

8. ***Quadrature and Differentiation***

This section presently includes several routines for adaptive quadrature, cubic spline quadrature or differentiation, and Gaussian quadrature.

9. ***Roots***

Currently, this includes routines for solving real or complex polynomials and for solving a set of real simultaneous nonlinear equations, with or without derivatives required.

10. ***Special Functions***

This includes Bessel functions I and J, of complex argument and integer order, and several standard trigonometric functions.

11. ***Transforms***

This includes several Fast Fourier transform routines, for real and complex data.

12. *Utility Routines*

This includes routines for:

- centralized error handling
- dynamic storage allocation
- specification of machine-dependent quantities
- operations on one-dimensional arrays (including sorting)
- evaluation of the ceiling and floor of a number

Errors in PORT routines will be reported to Bell Labs; they will not be fixed by CSO. Questions about PORT should be directed to Stan Kerr (Room 175 DCL, 333-4715 or through TELL,UN=MATHLIB on the CYBER).

HARWELL LIBRARY ON THE IBM 4341

Since we expect to continue IBM service for some time, we have decided to install the bulk of the Harwell subroutine library on the IBM 4341. This library consists of several hundred subroutines, developed at the Atomic Energy Research Establishment in Harwell, England. It is organized by lettered chapters as follows (Note: only starred chapters are available at present -- see Stan Kerr for others):

- D* - differential equations
- E - eigenvales and eigenvectors of matrices
- F* - mathematical functions (also random numbers and Fourier transforms)
- G - geometrical problems
- I - integer valued functions
- K - sorting
- L* - linear programming
- M* - linear algebra (includes good sparse matrix codes)
- N* - nonlinear equations
- O - input/output aids
- P - polynomial and rational functions
- Q* - numerical integration
- S - statistics
- T* - interpolation and approximation
- V* - optimization and nonlinear data fitting
- Z - non-FORTRAN system facilities

The library is available automatically in all standard FORTRAN and PL/I procedures on the IBM 4341.

Bugs in Harwell routines will be reported to Harwell; they will not be fixed by CSO.

A manual is available for inspection at the Systems Consulting Office, Room 166 DCL. At present, this is the only copy. If you have questions about the Harwell subroutine library, contact Stan Kerr (Room 175 DCL, 333-4715).

MISCELLANEOUS

RESEARCH BOARD DEADLINE FOR DEPARTMENTAL ALLOCATION REQUESTS

The Research Board has established a November 3, 1980 deadline for submission of departmental requests for research computer allocations. This deadline affects allocations for the period December 24, 1980 through June 26, 1981.

Research Board allocations are expected to support faculty research, thesis and dissertation research. Departmental requests and the allocations they subsequently receive are based on individual user requests. Those persons who will need research computer time for this allocation period should be sure to submit their requests to their department via the Research Board form A. These forms and further instructions are available from the University departments.

CSO PERSONNEL HONORED

Several of CSO's non-academic personnel were recently honored for long service to the University.

Tom Kerkerling, who is responsible for data communications, received a 30-year award. Both Ed Pelg and Estil Carter received 25-year awards, and Gary Bouck received a 15-year award.

We appreciate the continuing efforts of these people, and recognize the value of their accumulated experience.

HELP WANTED

POSITION AVAILABLE

Manager of Data Processing for new state agency: Illinois Health Finance Authority. The job is to design and maintain a data system to collect hospital cost data and to help determine rates that hospitals can charge.

Salary: \$25,000 - \$30,000

Contact: Michael Koetting, Director, 312-793-5940

Location: Chicago

SPECIAL EDITION ARTICLES AND INDEX

ON-LINE STORAGE

Reprinted from *OFF-LINE*, September 1979

The CYBER on-line storage now consists of two levels, disk and a mass storage unit. The disk portion of the system is presently about two billion characters (three million PRU's) and will be upgraded during the next 12 months to about six billion characters. Mass storage holds about twenty billion characters and may be upgraded to forty billion.

Over the past year, CSO has developed an archive system based on disk and tape. Files appear in the user catalog when they are at either level of this hierarchy, and movement back and forth will become rapid and convenient as the mass storage unit replaces tape.

This archive system was developed as a prototype of the new hierarchy, and we are now testing the mass storage unit in place of the magnetic tape. It is possible that other uses of the mass store will be available later, e.g., user-controlled transfers. The processes and behavior of the archive system have been carefully observed since the beginning so that reasonable policies and operating philosophies could be developed.

That portion of the storage complex which is associated with the catalog (i.e., all files known to the system) is viewed as one resource. Actual location of specific files is chosen to maximize performance, which generally means having the smallest return traffic from mass storage to disk and the most possible free space on the disks.

All of this has led to the following pricing policy for on-line cataloged storage:

- The price for on-line storage space is being cut by 80 percent on December 22, 1979.
- As of December 22, 1979, space for all files appearing in the catalog will be charged at the same rate, independent of where they reside in the storage hierarchy.
- No charge will be made for recalling files or moving them to mass store.
- The per-file cover charge will remain as before.
- Limits will be applied to the total cataloged space. The disk space limit will be doubled for all users and project managers.

Current CYBER disk charge practice is as follows:

- All files, regardless of type, size, or residency, are charged 0.15 SRU's per day for overhead.
- All disk resident files are charged for space allocated at the rate of 0.03 SRU's per PRU per day (this price may be reduced 80 percent on December 22, 1979).
- Non-disk resident (migrated) files are not charged for space allocated (this will change on December 22, 1979).
- Charges are made once every 24 hours.
- Files which belong to identifiable projects which have run out of funds are charged for 7 days after the project runs out of funds. Thereafter, they are not charged.
- Files which belong to projects which are one (or more) of the following are not charged:

not identifiable (i.e., AAAA)

cancelled

expired

out of funds more than 7 days

owner of file does not belong to project

For further information on CSO disk policy, see the January, 1979 issue of *OFF-LINE*.

MAGNETIC TAPES FROM SCRATCH

This article was originally published in the December 1979 issue and was adapted with permission from *Two Bits Worth*, the newsletter of the University of Southwestern Louisiana Computing Center. Alicia Towster wrote the original article on the basis of interviews with Sam Bullard, Bob Sonnier and James Dugel.

Magnetic tapes are simply very long thin strips of mylar backing coated with a thin layer of some material which can retain magnetic information. They are an economical and relatively durable way to store information; for \$10 you can acquire a tape capable of storing up to about 4.5 million words of useful information on the CYBER or about 34 million bytes of useful information on the IBM; and if you are able to keep this tape away from heat, humidity, dirt, magnetic fields, and malfunctioning tape drives, it can give you reliable service for several years. (Even under the best circumstances, tapes will eventually begin to show signs of wear. Thus, cautious tape users will often keep more than one copy of their important data.) Magnetic tapes have a standard width of one-half inch; several lengths are available: 400', 1200', 2400', and 3200'. At either end of a tape is a shiny aluminum patch to mark the Beginning of Tape (BOT) and End of TAPE (EOT).

It sounds simple enough.

Why, then, when you approach a computer installation carrying a "foreign tape" (that is, one which was not created on that particular computer), does the staff eye you with misgivings, rather as though you were carrying a foreign virus? They are hoping that you can describe it clearly enough that they will quickly know what treatment to prescribe.

You see, it is not nearly as simple as tape cassettes -- tape them on one machine, play them back on another. There is a considerable variety of ways that information can be written on a magnetic tape. And it is entirely possible to produce a tape which is totally incompatible with the machine on which you desire to use it. These incompatibilities may be due to either hardware (the kinds of tape drives which are available) or software (programs which read and write tapes, normally supplied by the manufacturer).

First, there are differences in the ways that tape drives can physically arrange and/or access information on a tape. Some drives will read or write nine bits (binary digits, either a zero or one) in a row across the width of the tape; these are called "nine-track" drives, and the tapes they produce are called, reasonably enough, nine-track tapes. There are also seven-track drives which deal with seven-track tapes on which rows of seven bits are stored.

Information can also be arranged differently down the length of the tape: this is called tape "density" and is measured in "bpi" which stands either for bits per inch (if you think in terms of only one track at a time) or bytes per inch (if you think of the entire row of tracks as a byte). Possible densities are 200 bpi, 556 bpi, 800 bpi, 1600 bpi, and 6250 bpi. A particular drive is limited in the number of different densities that it can handle.

In addition to data bits, tapes contain additional information that enables the drives to continually be checking on whether or not they are reading your data successfully. For example, on a nine-track 800 or 1600 bpi tape, one bit in each row is used as a "parity bit" -- that is, it is not actually part of your data; rather, its value is a function of the value of the other bits in the same row.

Most typically, "odd parity" is used; that is, the ninth bit is set so that the sum of the one bits in the row will be an odd number. On 800 bpi tape, parity information is also computed for groups of rows and written at regular intervals along the tape. On 1600 bpi tape, the zero bits are actually written, rather than denoted by the absence of a one bit. In addition, unique patterns of bits are written at intervals for the purpose of synchronization. Normally you can remain totally unaware of these extra bits; the tape drive hardware/firmware generates them and/or checks them automatically. If they fail to check out, the proper action is left to the program which is controlling the attempted read. Often such a program will elect to retry the read; if this does not work, you will, of course, get an error message. Such a message could indicate a bad tape, a malfunctioning drive, or a mismatch between the way your tape actually is (tracks, density, or parity type) and what the drive expects it to be.

Information is not written continuously along the length of the tape; it is written in "blocks" or "physical records". These physical records may well differ in size from the logical division of the data ("logical records") which you have placed on the tape. If logical records are short, several may be grouped together into one physical record; long logical records may also span several physical records. Most typically, physical records will be of uniform size, but it is also possible for their size to vary. The space between records is called the "interrecord gap".

The tape drive itself deals only in terms of these physical records, moving them from the tape to a buffer in the computer's memory (or vice versa, in the case of writing a tape). Because these buffers must reside in the computer's real memory, many installations will have some upper limit on the size of physical tape records that they can handle.

But this is only a small part of what makes tapes difficult. Consider -- how are those meaningful bits of data to be interpreted? Remember that a CYBER word consists of 60 bits and your tape consists of numerous rows of 8 bits and 8 does not go evenly into 60, whereas an IBM word consists of 32 bits and 8 does go evenly into 32 ... or perhaps your tape was created on yet another computer with a different word size?

Well, luckily there are standards. But unfortunately there are more of these than we might like. First there is the theoretical standard: the American National Standards Institute's (ANSI) specification of how to map those rows of bits on tape back and forth between words on the computer. Then there is the de facto standard: the IBM standard, which has sheer numbers on its side. But there is nothing to prevent *any* of the computer manufacturers from developing their own internal standards, tailored to their hardware, and so they do. This can potentially produce more efficient or appropriate use of tapes so long as you are committed to a particular brand of computer, but will almost certainly cause problems if you try to switch brands and take your data with you.

To complicate matters still further, these various standard tapes can have subtypes. Tapes may be either labeled or unlabeled. Labels are, in theory, extremely helpful, since they contain information about the tape you are dealing with. But there's a catch: label formats can vary, too, and some computer installations may not have programs available to interpret tape labels. Thus, they *could* actually make your tape harder to read.

Another complication arises from the different ways that information can be represented inside various computers. The internal binary representation of machine instructions or data will normally be specific to a particular computer; thus, it is useful to tape such binary

information only if the tape will be reread on exactly the same sort of computer. "Portable tapes" (that is, tapes which are to be carried to a different sort of computer) should use one of the standard sets of character codes to represent the information; there are two widely used standards: EBCDIC, which is promulgated by IBM, and ASCII, the American Standard Code for Information Exchange. In the absence of other information, you may expect most IBM format tapes to use EBCDIC and most ANSI tapes to use ASCII.

With so many variables involved, clearly it is only sensible to write down the appropriate information about the tape when it is created and to keep this information with the tape. However, this does not ensure that it can be read by the computer of your choice, which simply may lack the hardware or software that you need.

This is a lot of information to keep straight, so here are some checklists.

Ways in which tapes (and installations) can vary:

- number of tracks
- density
- type of parity
- size of records
- size of block
- type of format
- labeled or unlabeled
- type of encoding

Portable tapes which both the CYBER and IBM can handle:

- nine-track
- 800 or 1600 bpi
- odd parity
- fixed record size
- fixed block size between 18 and 6000 characters (for the CYBER, it is preferable that the blocksize not exceed 5120 characters)
- IBM and ANSI forms

- most types of labels
- ASCII or EBCDIC encoding

A tape of this sort could be read at many installations:

- nine-track
- 800 bpi
- odd parity
- a fixed record size
- a fixed block size no larger than 2048 characters
- IBM format
- unlabeled
- EBCDIC encoding

When you send someone a tape, be sure you also send complete information about the characteristics of the tape. If you receive a tape from someone, be sure you also receive complete information about the tape's characteristics.

Tapes may be a little difficult, but misinformation or lack of information about them can make them much, much worse.

CSO MAILBOX FACILITY

Reprinted from *OFF-LINE*, January 1980

CSO has recently completed the development and testing of an electronic mailbox facility for use on the CYBER 175. The purpose of the facility is to allow you to leave messages for another person who uses the CYBER and/or to view messages left for you.

CAUTION: Since this is a new facility, there will be bugs or inconsistencies for a time. Please report these along with any suggestions you may have by using TELL,UI=103.

There are three basic utilities connected with the mailbox facility:

- WHO to determine if a person is on the system
- TELL to leave a message for one or more people

- MESSAGE to view messages left for you and optionally respond to them.

You can refer to one or more people in a number of ways:

- You can use their name(s) as it has been entered under the MANAGE program. However, this may be inadequate if someone has a common name.
- You can use their University ID number.
- You can use their user number.
- You can use their user index or their user index hash.
- You can refer to anyone in the same charge, project with which you are associated.
- You can refer to a predefined set of names that you have established in your OPTION file.

The following features and options exist in this facility:

- A copy of the message is placed in the local file NEWMAIL automatically.
- All messages are placed in a central system file. If you send a message to many people, only one copy of the message is kept in this central file.
- After everyone has seen the message, it is automatically removed from the central file.
- If a message remains in the central file over two weeks, the originator of the message is warned that not everyone has seen it and that the message will be removed after one more week (this means the message would be in the central file for a total of three weeks). The originator would then be allowed to extend this deadline one more week, thereby keeping the message in the central file for four weeks. After this extended period, the originator will again be warned if not everyone has seen the message.
- At any time, you can delete a message you have sent to others.
- After viewing a new message, you may:

REPLY to the sender.

FORWARD a copy to other people.

COPY the file to a local file or to the terminal again.

SAVE a copy of the message in a permanent file.

Go on to the next message - making the current message no longer accessible except from the local file NEWMAIL.

- Get on-line assistance via the HELP command of the mailbox facility.
- If you are going on vacation, you can have any future messages that are sent to you routed to a friend so that someone can respond to your messages while you are gone.
- You can receive a SUMMARY of all messages waiting to be seen by you, and all messages you have sent to others that have not yet been received.
- You can create a local file containing a message and use this file as input when "telling" someone.

Full details on all options are available via the HELP commands of the mailbox facility. To access these HELP files, enter one of the following:

MESSAGE/HELP.
TELL/HELP.
WHO/HELP.

To use these three commands, in the simplest form, you do the following:

- Determine whether a person you know is on the system by using the WHO command:

WHO,THOMAS MIKE.

- Having found that this person is on the system, you can leave the person a message by entering:

TELL,THOMAS MIKE.

You will then be prompted by:

WHAT?

Enter your message after this prompt. End the message with a bare carriage return after the prompt of a single question mark. You then will receive an acknowledgment that the person has been "told".

- You can view messages to you by entering:

MESSAGE

You will be given a summary of all messages waiting to be seen. Then you will be asked

WHAT TO DO?

simply press the carriage return to see a message that has been sent to you.

When there are no more messages to see, you can exit from MESSAGE by entering the command:

E

Whenever you login to the system, you will be told if you have any messages waiting for you.

In the future, there will be a more complete reference to the system, and all of the options will be described more thoroughly.

USE COMMAND AVAILABLE FROM TIME-SHARING

Reprinted from *OFF-LINE*, January 1980

The USE command, which was previously announced for batch use (*OFF-LINE*, November 1978, "USE Program Now Available") is now available from time-sharing as well. The purpose of USE is to guarantee that any needed file which has been migrated is reloaded before an attempt is made to use it.

The format of the USE command is:

USE, *file1*, *file2*, ..., *filen*.

or

USE, *file1*, *file2*, ..., *filen* / UN = *user number*.

Where *file1*, *file2*, etc. are the names of permanent files which must be on disk if subsequent processing is to succeed. The USE command should appear before any of the named files appear in a GET, ATTACH, or OLD command.

When used from time-sharing, USE will produce no output if all the named files are on disk. If one or more of the named files have been migrated, USE will generate a RELOAD request and issue the message

xxxxxxx WILL BE RELOADED

at the terminal for each file that must be reloaded. After issuing all the required RELOAD requests, USE aborts with the message:

SOME FILES UNAVAILABLE TRY AGAIN IN 30 MINUTES.

USE behaves in a similar fashion when it is used in a batch job. In this case, however, USE reports the files which had to be reloaded in the dayfile and waits for completion of the generated RELOAD requests instead of aborting.

Multiple USE commands are processed together. Contiguous USE commands are processed as if there were a single USE command with an extended list of file names. For time-sharing jobs, this behavior insures that all necessary RELOAD's are generated before aborting. For

batch jobs, it eliminates multiple waits for RELOAD's. A maximum of 100 file names may be used in a contiguous group of USE commands.

TEXT PROCESSING SERVICES AT CSO

Reprinted from *OFF-LINE*, January 1980

CSO offers text processing services on two systems, CYBER and UNIX. Most general-purpose text processing is done on the CYBER 175 at DCL, using the text editor ICE in conjunction with the text formatter RNF. If you are not presently a CYBER user, and wish to get started, ask for assistance from your department, or contact the CSO Accounting Office, Room 162 DCL, 333-6769.

CYBER

Once you have acquired a CYBER signon, your next step is to learn how to create and edit files. This is done using ICE, which is a text editor. The ICE tutorial, *A Tutorial Guide to the ICE Text Editor*, contains the necessary instructions to do simple file creating and editing tasks. For the user who wishes to acquire more proficiency, a copy of the *ICE Reference Manual* will be useful. Another manual which contains useful information for a beginner on the CYBER is the *Introduction to the CYBER 175*. These manuals may be obtained in the CSO Distribution Center, Room 164 DCL.

RNF is a program which reads a file containing text, interspersed with formatting commands, and then produces formatted output. The following are some of the more important features of RNF:

- Pagination - titles, sub-titles, page numbers
- Filling of text and right-margin justification
- Numbered lists
- Paragraphing
- Tabs
- Single, double, and triple spacing
- Automatic chapter, section, and sub-section numbering
- Macros and variables for user-defined text structures

Output from RNF can be displayed directly on any time-sharing terminal, or it can be stored in a file for later use. Typical output devices are CRTs, DECwriters, and the line printers at CSO RJE sites.

The following is an example of some RNF output:

An RNF Example

This is some text which has been run through RNF on the CYBER. The right margin is justified by default, but that can be changed easily with a simple RNF command. The text below is a list with justification turned off:

1. The numbers at the beginning of each entry of the list are generated automatically by RNF.
2. The indents are also handled automatically. This output was done on the Diablo printer.

The user can	also create
indents and	tabs to suit
many	documentation
needs.	

For final, camera-ready copy, the best quality output can be obtained from a Diablo-type terminal equipped with a carbon ribbon. CSO maintains a dial-up Diablo terminal for general use, in Room 209 of the Astronomy building. The user must call 333-8150 to make a reservation for its use. A lead time of 2 or 3 days is recommended. The cost of using the Diablo terminal is 15¢ per page of output. (For further information on the Diablo, see the December issue of *OFF-LINE*, "Diablo Output Service")

For more information on RNF and how to use it, pick up copies of the *RNF User's Guide* and the *RNF Reference Manual*, either in the CSO Distribution Center, Room 164 DCL, or at CSO South, Room 70 Commerce West.

UNIX

CSO also provides a text processing service on the PDP-11/50 UNIX operating system which is located on the second floor of the Astronomy Building. This system features the TROFF formatting program developed by Bell Labs, equation and table formatting programs, and a phototypesetter for high-quality, camera-ready output. Using TROFF, its associated macro packages, and the equation and table programs, the user can generate a wide variety of document styles, including footnotes, automatic table of contents, multiple columns, equations, and complex tables, in several different fonts and point sizes.

Following is some output from TROFF, using both the table and equation programs:

Composition of Foods			
Food	Percent by Weight		
	Protein	Fat	Carbo- hydrate
Apples	.4	.5	13.0
Halibut	18.4	5.2	...
Lima beans	7.5	.8	22.0
Milk	3.3	4.0	5.0
Mushrooms	3.5	.4	5.0
Rye bread	9.0	.6	52.7

Name	Function
Gamma	$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t} dt$
Sine	$\sin(x) = \frac{1}{2i} (e^{ix} - e^{-ix})$
Error	$\operatorname{erf}(z) = \frac{2}{\sqrt{\pi}} \int_0^z e^{-t^2} dt$
Bessel	$J_0(z) = \frac{1}{\pi} \int_0^\pi \cos(z \sin \theta) d\theta$
Zeta	$\zeta(s) = \sum_{k=1}^\infty k^{-s} \quad (Re\ s > 1)$

Access to UNIX is available on a restricted basis, which is determined in part by the need for using its facilities. Inquiries should be directed to Debbie Weller (333-8150).

Which System to Use?

The choice of which text processing system to use depends on several factors. The primary advantage of RNF on the CYBER is its easy accessibility for a large portion of the user community. It is easy to learn, and inexpensive (RNF runs usually cost about 10¢ per page of output, for computer time used, and line printer output costs are about 5¢ per page). However, it does not have footnoting, or a reliable superscript or subscript capability. Also, its output is limited to the standard alpha-numeric character set, and it provides no support for devices with extended character sets or special plotting features, thus ruling out most equation-type applications.

TROFF, on the other hand, although a great deal more powerful and versatile, is expensive. For example, typeset copy costs from \$3.00 to \$4.00 per page for typical composition, and sometimes more for complicated applications, such as matrices, multiple columns with densely packed text, equations, and tables.

If you are already using one of the two systems, help is available from the Text Processing Consulting Office, in Room 207 Astronomy, phone 333-7318. Consulting hours are from 9:00 AM to 12:00 noon and from 1:00 PM to 4:00 PM daily.

SERVICE KEYPUNCHING AT CSO

Reprinted from *OFF-LINE*, April 1980

Due to the declining use of service keypunching, CSO is planning to contract all keypunch work to a commercial keypunch service. Users will see little change in the service and will continue to deal only with CSO when submitting or retrieving keypunch jobs. CSO itself will provide all interfacing with the contracting agency.

Over the past 18 months, use of service keypunching has been at a level too low to justify the cost of in-house processing. This has held true even though charges for the service have been held at a level below the usual commercial costs. At the same time, it is impractical to simply reduce the size of the operation since it is now at the minimum level to accommodate large jobs with reasonable turnaround times.

The target date for conversion of the service is July 1, 1980. The exact date will be governed by how quickly the present data entry staff can be placed in other similar positions on the campus. It is expected that there will be a transition period during which some work will be processed in-house, and the remainder will be processed commercially.

We emphasize that CSO is continuing to offer service keypunching as one of its services. The method of processing submitted jobs is changing, but little else. It is expected that small keypunch jobs (400 cards or less) will experience an additional one or two day delay because of transit times. Larger jobs should be processed more quickly since a larger staff will be available to keyboard the data.

CSO is planning to adjust its method and rate of charging for keypunch service to be consistent with the contracting agency. Users who have received Research Board support for keypunch services will not be affected by the rate change since their allocation is denominated in the number of cards to be punched. Other users will probably incur higher data entry costs.

CATALOG OVERFLOW - SIZE

Reprinted from *OFF-LINE*, April 1980

If you have ever tried to **SAVE** or **REPLACE** a file and received the following message:

CATALOG OVERFLOW - SIZE

read this article to learn why you receive such a message, and what to do about it.

If you are trying to **SAVE** a new permanent file, the message indicates that you have tried to exceed the amount of permanent **INDIRECT** access disk space you are permitted. To verify this, you can check your disk space limitations by entering the command

LIMITS.

and checking the displayed value for disk space. Then, by entering the command

```
DIRECT/PROJ/SUM.
```

you can determine how many PRU's of indirect files you are currently using.

If you are doing a REPLACE to update a permanent file and receive the message, the above discussion may apply. However, there is another possibility. To understand it, we'll have to explore the connection between files, projects, and limits.

When a file is created, the charge,project used at the last signon is stored along with the user's data (file). This charge,project is then billed for the disk space used by the file. The Project Manager can control the amount of disk space funded by the project by setting the various file limits for each person in the project (e.g., the disk space limit we are currently discussing).

The BILL or CHARGE command sets these limits for the user at signon, using the charge,project specified. If a user signs on using one project and REPLACES a file belonging to another project, the limits associated with the current signon are not applicable to that file. The limits which must be enforced are those set by the owning project. Ideally, these limits would be extracted from the same database used at signon by the BILL or CHARGE command. This solution, however, is very difficult and costly, and an alternate solution has been adopted.

The alternate solution is to store, at file creation, not only the owning charge,project, but also the file limits currently in effect. Whenever a REPLACE is done on a file belonging to a project other than the one used at signon, these stored limits are used. Note that the usual limits (those set up at signon and displayed by the LIMITS command) are used whenever the project stored with the file matches that used at signon.

We now come back to the error message we started with. If you receive this message after a REPLACE command, you must first determine which limits are being enforced -- those displayed by the LIMITS command or those stored with the file. If all of your files were created under the charge,project you used at signon, your current project limits are being used. If this is not the case, enter the command:

```
DIRECT,file/PROJ/LIMITS.
```

This will display both the charge,project which owns the file and the limits stored with the file. You can update this information by entering:

```
CLAIM,file.
```

This will replace the charge,project stored with the file with the charge,project used on the last BILL or CHARGE command, and also will replace the stored limits information with your current limits information. The output from

```
DIRECT,file/PROJ/LIMITS.
```

should then reflect the changed information. Using the CLAIM command also will cause all disk space charges for the file to be charged to the charge,project current at the time of the CLAIM.

SECURITY SAFEGUARDS

Reprinted from *OFF-LINE*, May 1980

Due to some recent incidents with unauthorized users on the CYBER, CSO would like to take this opportunity to remind all users about security safeguards for files and accounting information. It may be legal to look at files which the owner has not taken proper steps to protect. However, it is illegal to pose as another person, through the presentation of identification and passwords, for the purpose of making unauthorized use of their accounts.

Allocations of service supported by campus funds are for specified research and instructional purposes. Their use for harassment of others, for violations of file privacy, or as a means of gaining illegal access to other accounts will result in disciplinary or legal action.

To safeguard your resources from such abuse, please be sure that your files which contain accounting information, especially passwords, are properly protected. Such files should be restricted to private mode. If it is necessary to allow access to a few people, you can permit the files explicitly to their user identifications.

We advise all CYBER users to change their passwords frequently. Users with null passwords should assign passwords to their User Numbers. If someone has been using your resources illegally, however, just changing the password may not provide adequate protection. You should also check the permission privileges for all your files, and change the permission of any public files to private if they should be protected.

The following commands show a number of ways to check and change the permission privileges of files, and to change your password.

DIRECT/CT=PU.	Will list all files in your area which are public, i.e., can be accessed by anyone signed on to the CYBER.
DIRECT/PTOTAL.	Will list all files in your area with the specific IDs permitted to access them.
GET, <i>pfn</i> .	Will get a local copy of the file <i>pfn</i> .
PURGE, <i>pfn</i> .	Will delete the permanent copy of file <i>pfn</i> .
SAVE, <i>pfn</i> .	Will save the file <i>pfn</i> in your permanent directory with no permission privileges assigned to it.

PERMIT,*pfn*,*userid*=R.

Permits read-only access to file *pfn* for the specified *userid* only.

PASSWOR,*oldpas*,*newpas*.

Changes the password *oldpas* to a new password *newpas*. This changes the password immediately, and the new password must be used the next time you sign on. An even safer way to change your password is to simply enter the command PASSWOR. The computer will then prompt you for the old and new passwords and the entries you type in will not be echoed on the screen. If your password is presently null, enter a carriage return when prompted for *oldpas*.

Project Managers should check to ensure that no User Numbers have been illegally added to their project. Also, if they have a null project code word, they should assign a code word to their project immediately. To assign a code word to a project, enter:

```
MANAGE.
P,charge,project
CODE WORD=newcode/PN
E
```

One other word of caution: it has been observed that some users have signed onto public terminals and have not logged off when leaving for a short period of time. Perhaps the reasoning for this is that they believe this "reserves" the terminal for them. However, it is a dangerous practice because it allows *anyone* to then use that signon for whatever purpose -- to access the files, use the person's funds, etc. If you do this type of thing, you must accept the responsibility for what happens. *LOG OFF* when you leave a public terminal - protect your files and your funds!

NCAR GRAPHICS SOFTWARE

Reprinted from *OFF-LINE*, May 1980

CSO has installed the NCAR Graphics Software on the CYBER. This software, obtained from the National Center for Atmospheric Research, contains graphics utility subroutines for drawing

- Contour plots
- 3-D surfaces with hidden lines removed
- World map projections

and other high-level applications. Plots may be produced on a Tektronix graphics terminal or a CalComp plotter.

The NCAR Graphics Software is a library of subroutines called from a FORTRAN program. The NCAR software achieves device independent plotting by writing a local disk file of plotter commands, which is later plotted on a specific device requested by the user. This file of plotter commands is called the meta-code file.

Documentation describing the subroutine usage and parameters is available for inspection in the CSO North Consulting Office (Room 138 DCL). This same information is available on the CYBER via a procedure, NCARDOC. The commands

```
GRAB,NCARDOC.  
NCARDOC.
```

will give a brief summary and directions to obtain additional information and subroutine writeups.

A typical use of the NCAR software involves the following sequence of commands:

GRAB,NCAR.	Attach the NCAR library.
FTN,I= <i>program</i> ,L=0.	Compile the FORTRAN program with calls to NCAR subroutines.
LGO.	Execute the program. This does not generate the plot itself, but rather, the meta-code file of plot instructions.
NCARTRN.	To display the plot on a Tektronix terminal.
NCARTRN,PLOT=CALC.	To display the plot on a CalComp plotter.
PLOT,TAPE99.	This plot statement is necessary to actually send the file to the plotter.

Once the meta-code file has been generated, it may be displayed at will on either Tektronix or CalComp equipment by using the appropriate NCARTRN statement.

NOTE: The file name NCARMC *must* appear on the program statement of your FORTRAN program. This is the name of the meta-code file written by the NCAR software.

A sample program and plot are shown here:

```
PROGRAM NCARTST(INPUT,OUTPUT,NCARMC)
C
C   THE FUNCTION
C
C        $Z(X,Y) = .25*(X+Y+1./(X-.1)**2+y**2+.09)$ 
C            $-1./((X+.1)**2+Y**2+.09))$ 
C
C   IS EVALUATED FOR
C
C       X=-1. TO 1. IN INCREMENTS OF .1 AND
C       Y=-1.2 TO 1.2 IN INCREMENTS OF .1.
```

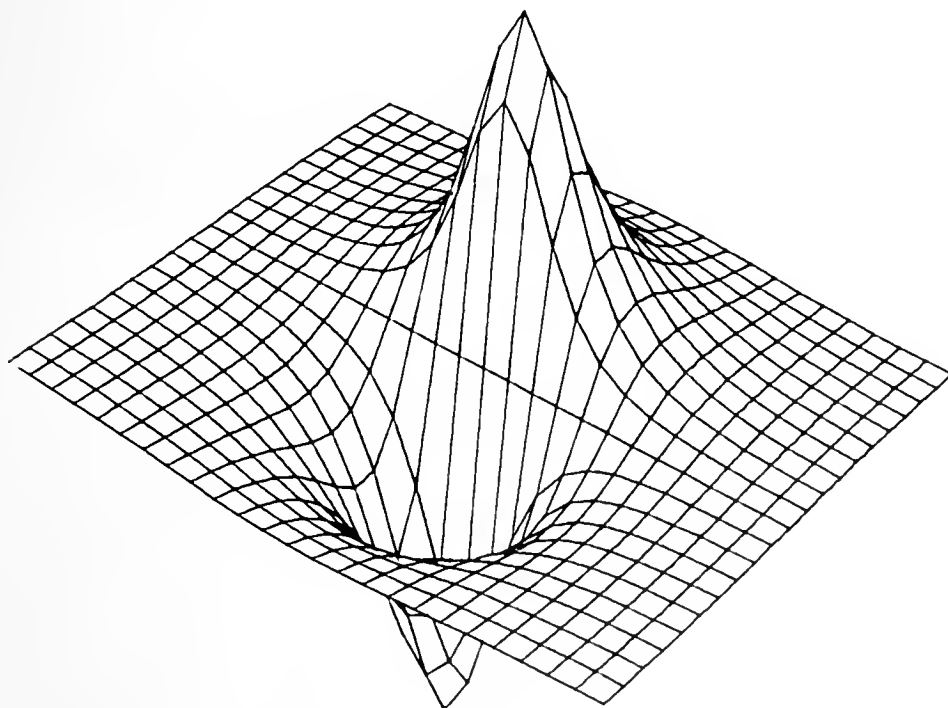
```

C
C XX CONTAINS THE X-DIRECTION COORDINATE VALUES FOR Z(X,Y)
C YY CONTAINS THE Y-DIRECTION COORDINATE VALUES FOR Z(X,Y)
C Z  CONTAINS THE FUNCTION VALUE
C S  CONTAINS VALUES FOR THE LINE OF SIGHT FOR SRFACE.
C WORK IS A WORK ARRAY
C
  REAL XX(21), YY(25), Z(21,25), S(6), WORK(1050)
C
  DATA S(1), S(2), S(3), S(4), S(5), S(6)/
1    -8.0, -6.0, 3.0, 0.0, 0.0, 0.0/
C
C FILL XX AND YY COORDINATE ARRAYS AND Z FUNCTION VALUE ARRAY
C
  DO 20 I=1,21
    X= .1*FLOAT(I-11)
    XX(I)=X
    DO 10 J=1,25
      Y= .1*FLOAT(J-13)
      YY(J)=Y
      Z(I,J)=(X+Y+1./((X-.1)**2+Y**2+.09))-
1        1./((X+.1)**2+Y**2+.09))*25
10    CONTINUE
20    CONTINUE

  CALL SRFACE (XX, YY, Z, WORK, 21, 21, 25, S, 0)

  STOP
  END

```



DIABLO RESERVATION SERVICE TO CHANGE

Reprinted from *OFF-LINE*, June 1980

Effective June 2, 1980, users will no longer be able to make reservations to use the Diablo terminal located in Room 209 Astronomy. Instead, CYBER users will be required to queue their RNF output, intended for printing on the Diablo, by executing a CYBER Control Language (CCL) procedure. Users unfamiliar with RNF are referred to the RNF User's Guide or the RNF Reference Manual (available in the Distribution Center, Room 164 DCL).

All RNF source files must contain the .LPT command in the first line of the file, and must be processed by RNF into an output file. All non-RNF source files must have carriage control and begin with a page eject. The RNF output file or the non-RNF source file can then be submitted to the Diablo queue via the CYBER CCL procedure.

The following conventions have been established:

1. The top of the form (page) will be set to one line below the horizontal perforation in the paper.
2. Plain white 20-lb paper, 14 7/8" wide by 11" long, will be used.
3. If the pica font is selected, the printing will be done with 10 characters and 6 lines per inch.
4. If the elite font is selected, the printing will be done with 12 characters and 6 lines per inch.

After you have prepared your file for submission, you should access and execute the DIABLO procedure by issuing the following commands from time-sharing on the CYBER:

```
GRAB,DIABLO.  
DIABLO.
```

The procedure then prompts you for your name, telephone number, choice of font (pica or elite), and the name of your RNF output file. The RNF output file may be either a local or a permanent file. If the procedure is unable to find your file, it aborts with a message to that effect. If the procedure finds the specified file, it places it in the Diablo queue.

On-line help is available by entering the command

```
HELP
```

and then by entering DIABLO (the name of the procedure) after the question mark prompt.

Turnaround time should be no longer than 24 hours, except in cases of system downtime or hardware malfunctions. The output of jobs received on Fridays or prior to a University holiday will be available the next working day.

Your printouts may be picked up at 203 Astronomy. The cost will continue to be \$0.15 per page, rounded up to the nearest dollar. You may pay for the printing by charging it to a University account number or with a personal check.

Questions regarding this service should be directed to Debbie Weller, 209 Astronomy (333-8150).

KEYPUNCH SERVICE

Reprinted from *OFF-LINE*, July 1980

As announced in the April issue of *OFF-LINE*, CSO has discontinued internal processing of keypunch work. This move was made for financial reasons since the amount of data entry provided by CSO no longer justified continuance of a dedicated data entry staff.

At the time the April article was written, we planned to use an off-campus commercial data entry service with CSO providing all interfacing with the contracting agency. Since that time, another campus unit, Survey Research Lab (SRL), has indicated a desire to assume CSO's data entry workload. An agreement has been worked out with SRL which we hope will minimize the amount of information which must be transferred between CSO and SRL with the attendant possibilities for confusion.

Users whose data entry work is funded through the Research Board will see little change. Requests for data entry funds are to be made through existing channels, input is to be delivered to CSO for punching at SRL, and output is to be picked up at CSO. Allocations will continue to be made in numbers of cards to be punched and CSO will continue to provide all accounting associated with data entry. Occasionally, a user with a complex data entry task may be asked to talk directly to the data entry staff at SRL. Data entry work funded through the Research Board is to be taken to the CSO Accounting Office and completed data entry jobs are to be picked up there. This office, as well as document sales and terminal rentals, is scheduled to move to 1208 West Springfield during July.

Users whose data entry work is being funded with hard contract money are to deal directly with SRL. These users are to submit their work directly to the SRL data entry staff, and claim the completed work at SRL. They will be billed directly by SRL for services delivered. SRL's rates are \$7.25/hour for normal work and \$10.50/hour for priority work. The number of cards produced per hour will vary with the data being entered. A rough estimate, based on previous experience in CSO's data entry shop, is 100 cards per hour. Users paying for data entry services with hard contract funds should make all arrangements with Mrs. Frances Sykes, 310 SRL, 1005 West Nevada, Urbana (333-7328).

SRL maintains a staff of three full-time data entry operators and hires part-time help to staff a second shift whenever the load requires it. Additional full-time personnel will be hired if needed to maintain reasonable turnaround time.

RATE CHANGES FOR THE IBM 4341

Reprinted from OFF-LINE, August 1980

With the installation of the IBM 4341, which is replacing the IBM 360/75, a revision in pricing policy for IBM services will become effective September 2, 1980. These prices will be for the continuation of old services available under OS/MVT in batch mode. Further revisions will occur with the anticipated initiation of terminal-based services.

The two principal changes are to be in the areas of disk storage and the effect of memory on CPU or I/O charges.

Disk charges will be reduced from 0.01 service units per track per day to 0.0017. At the rate of \$0.62 per service unit, this would mean a charge of 3.93 service units at a cost of \$2.43 to store one million bytes for one month.

Processing charges are to be computed according to the formula:

$$0.00036(100T + IO)(0.0014R + 0.7)$$

Where:

- T = CPU time in seconds
- IO = number of IO requests issued
- R = memory Region in thousands of bytes

This wil replace the old formula:

$$0.00036(100T + IO)(0.0045RF + 0.0015RS + 0.5)$$

where RF and RS were fast and slow regions, respectively.

The effect of the change will depend on the memory required, and the relative speed of the two machines for a specific job. The larger the memory requirement, the greater the decrease in service units per hour. The following examples should illustrate this -- assuming that the 4341 is 85 percent as fast as the 360/75.

<i>Region in 1000 bytes</i>	<i>Service Units Charged to do a One-hour 360 Job</i>	
	<i>360/75</i>	<i>4341</i>
0	64.80	106.73
128	139.44	134.05
256	214.09	161.37
512	363.40	216.02
1024	662.00	325.31

The new formula will give an approximate equivalence to CYBER batch charges, where the memory component was reduced a year ago.

CSO VIDEOTAPES

Reprinted from *OFF-LINE*, August 1980

CSO has recently completed the initial stages in the preparation of videotapes describing the CYBER 175. The following three tapes are available for viewing.

- CSOVT1 *Introduction to Computing at CSO.* This videotape is intended for the first time computer user, and for people wishing to learn more about CSO's facilities.
- CSOVT2 This videotape consists of four sections:
- *Using a Terminal* - How to operate a computer terminal.
 - *Introduction to CYBER Time-Sharing* - How to access the CYBER using a terminal.
 - *File Usage* - Local files and indirect access permanent files.
 - *Introduction to ICE Text Editing* - The basics of time-sharing editing.
- CSOVT3 This videotape, *Running a FORTRAN Program on the CYBER*, consists of three sections.
- Concepts involved
 - PROGRAM statement
 - CYBER control statements

Anyone may view these tapes by going to the Undergraduate Library in person to make a reservation to use the videotape equipment. The library hours are 8 AM - 8 PM Monday through Thursday, 8 AM - 5 PM Friday, and 1 PM - 5 PM Saturday and Sunday.

When you check out the videotapes, you should also pick up one of the handouts that are available with the tapes. The handout summarizes the contents of each tape in more detail, and facilitates note taking.

Your opinions regarding these videotapes would be greatly appreciated. You may use the last sheet of the handout, or write directly to:

CSO VIDEOTAPES
164 DCL
CAMPUS

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CSO DIRECTORY - STAFF AND SERVICES

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Secretary	Joyce McCabe	150	DCL	333-1637

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Text Processing Consulting		207	Astronomy	333-7318

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Mgr, Statistical Services	Larry Sautter	91	Comm West	333-2170
Mgr, UNIX Operations	Larry Sautter			
Documentation	Lynn Bilger	139	Astronomy	333-6236

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		300	baud	333-4000
		1200	baud	333-4001

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Asst Dir Engineering	Cliff Carter	195	DCL	333-3723
CYBER-IBM Operations	Jack Knott	194a	DCL	333-6562
UNIX Operations	Debbie Weller	203	Astronomy	333-8150
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RJE Operations South	Don McCabe	1208	W Springfield	333-2171
				333-7752

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Agriculture	M103	Turner Hall	333-8170
Chemistry	153	Noyes Lab	333-1728
Commerce West	70	Comm West	333-4500
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CRH Snack Bar	120	Snack Bar	333-1851
Social Science	202	Lincoln Hall	333-0309

OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of October 24, 1980.

CSO operates an IBM 4341 with four million bytes of fast core running HASP-OS/MVT under VM, a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

POLICY

EXTENSION OF COMPUTING SERVICE

The service plans for CSO have recently been revised to include a major expansion of CYBER facilities. A request for approval of the acquisition of a CYBER 174 has been submitted to the Board of Trustees, and if approved at their November 20, 1980 meeting, the new CYBER 174 will be installed during the semester break.

Presented below is a statement to the Computer Policy Committee which served as the basis of their discussion and approval of this plan.

More details regarding the use planned for the system will be in the next issues of *OFF-LINE*.

In the fall of 1976 CSO installed the CDC CYBER 175. The selection of this machine was the result of a very extensive competition between vendors, including benchmarking and a competitive financial bid. In concluding the final details of the acquisition it was necessary to make a balance between the financial life of the machine and the capacity of the machine to meet the demands of the campus. Since unlimited funds were not available, a financial plan in terms of the life of the machine was a necessity and had to be followed up by making the allocation system support that financial life in a reasonable fashion.

The balance that was achieved was a combination of a lease and purchase agreement with purchase payments extending over seven years. At the end of that seven-year period, the majority of the system would be owned with no outstanding debt.

The demand for computing service, through the allocations systems of Instructional and Research committees and through the contract support, has continued to grow at least as rapidly as the computing systems would allow. In addition to those needs which have been well met by the current equipment, there are at least two categories of need which still have not been met in a satisfactory fashion. The availability of low cost, large scale computation has been partially met through the bulk system. However, there are increasing numbers of faculty and graduate students whose problems have reached substantial size where the availability of computing is a major determinant in the speed with which they progress. Second, the introduction to computing for students in lower level courses is carried out in what is now an obsolete fashion - through the use of punch cards and printed output rather than interacting with computers through a terminal.

CSO is now proposing a modification of the seven-year plan consisting of the addition of another machine and the extension of the plan to a total of nine years. To treat the time period first, our initial plan called for the equipment to be paid off and the financial life of the machine to terminate in the middle of 1983. At that point the majority of the funds currently going into the CYBER system would become available for a successor system. The ability to continue operating the CYBER while utilizing the successor system would, of course, consume part of the funds during the early years, but this would be a relatively low share

because the mortgage payments would have been completed. The new plan would leave us in essentially the same position in 1985 with ownership of all present computers, the 4341 IBM system, the CYBER 175 and the proposed system the CYBER 174. The equipment being proposed is discussed in more detail later.

Over the past year and a half CSO has been looking at alternative means of supporting elementary teaching of computing and the general increase of computer literacy on campus. There are, through the Computer Science service courses, approximately 2,000 students a semester involved in introductory level computing. In addition, there are many courses given by individual departments for their students introducing the use of the computer to relatively large numbers. Perhaps another one to two thousand students are involved in this. The majority of these courses have used punched cards as their input, paper as their output, and have done their processing using the EXPRESS system on the 360.

There have been two major complaints voiced with increasing frequency concerning this manner of teaching. The first is simply that the approach to the computer through cards is obsolete and does not represent a modern introduction to computing capability which the student should be exposed to. The second is, perhaps, the more serious and comes from those who teach advanced courses which use the computer. The complaint is that what was learned in the 100 level courses does not provide an introduction to computing that is useful in the advanced courses, since the students in advanced courses are almost completely on terminal-based systems. The difference between using an editing system with files and using punched cards must be bridged by taking up class time in each course where the computer is used. Since this is frequently not well taught by the faculty in the advanced courses it represents a substantial consulting and support load as well as a burden on the instructors.

We have looked at a number of alternatives for meeting both of these complaints. Most of these alternatives address one but not both. For example the use of small computers such as a PDP-11 to edit programs for submission to a host has been widely criticized here because the editing system and the access to the computer is not similar to that which would be used in advanced courses. This is despite the fact that this approach has been extremely successful at many other places and that it is a relatively cost-effective approach.

The use of the present equipment is an attractive alternative except that the addition of several thousand students would seriously interfere with present commitments to research programs and advanced instruction. Although the machine is very fast at computation, adding many simultaneous users would be a serious problem. The strong desire which has been expressed has been for continuity from introduction through advanced courses and this has been a major determinant in our seeking out a solution which has been presented here.

The equipment being proposed is another member of the CYBER 170 family, the model 174. It is exactly the same vintage as the 175 and is capable of running the identical software. The significant elements of the configuration we are considering, the processor and memory, are compatible with the present system, both in hardware characteristics and in operational potential. The 174 consists of two central processors, each approximately 25% to 30% of the speed of the 175. Thus for straight computation the equipment is approximately half of the 175. The memory is 196,000 words which allows the largest jobs being run on the 175 to also be run on the 174. Thus no artificial distinctions between users, based on problem

characteristics, would be necessary. The operating system and the file system including the disk hardware would also be compatible with that presently in use.

It is likely that rather than attempt to absolutely synchronize the two machines' software, one machine might receive software upgrades earlier than the other to allow testing before all services were committed to new releases of software.

Given the systems we have looked at and a number of ways in which they could be operated, two are receiving final discussion. The method of operation has to be looked at in terms of how the machines are interconnected and how the clientele are divided between them. The two reasonable ways of running the machines are: each machine operating in a standalone fashion, or both machines fully integrated with all peripherals, such as disks, being available to both machines. For reasons of practicality we would probably start with the systems running as completely separate and gradually integrate them until they were fully shared. This integration might take as long as a year and a half to be completed, since we don't want to disturb the quality of the service on the old machine in order to make these changes.

The division of clientele which makes most sense to us is to devote one machine largely or exclusively to support of instruction while devoting the other to graduate student and faculty research. As an operational definition instructional computing could be considered that which is supported with instructional allocations while research computing is that which is supported by the Research Board, and Grants and Contracts. Obviously when the students are not on campus the machine would be useful for other purposes and we would make arrangements so that other work could be carried out on it.

Given this kind of split and some surveys we have done of other installations running a CYBER 174, we feel that the new system could support approximately 100 terminals for introductory level work plus 100 terminals for the advanced student work. This would represent a substantial increase over the present load of advanced students and would solve the problem of the introductory level students. In addition to the use of this machine for introductory courses those students who are going to remain on the IBM service throughout their academic career would be given their introduction using terminals on the IBM 4341.

Some upgrading of the IBM facility will probably occur to support this, and is within the five-year financial plan.

At the present time, when the academic program is in full swing, the distribution of terminal time is about half research and half instruction. This is the highest fraction of instructional computing that goes on so it should be recognized that a substantial load will be moved off the 175 during that time. Our experience has been that the 175 research load does not go down substantially when school is not in session so a more uniform appearance of the service and capacity throughout the year would be presented to the faculty.

Given the proposed division of facilities between Research and Instruction, the highly seasonal work load presented by students leaves large gaps in demand. These can readily be converted into a combination of expanded batch services and bulk computing. In terms of computing, we should easily be able to obtain a doubling of the present allocation in terms of real compute power.

In addition to the increased capacity presented by working countercyclically with the student load, the removal of students from the 175 presents substantial room for growth by the research community. It probably does not represent an opportunity to get further bulk service on the 175 simply because the time of day loading has already been taken into account in researching the present level.

In the longer term, if the machines are closely linked, a reasonable way of operation in times of relatively light demand is to present all of the time-sharing services through the CYBER while retaining the CYBER 175 as a batch machine. The ability to go back and forth between the various modes of operation, utilizing identical software and with files held in common between the two machines, gives us the opportunity to exploit the capacity of the systems effectively.

Other Alternatives

It is always difficult to speculate on the timing of the availability of new machines with substantially improved cost-effectiveness. It is widely believed, however, that within the next year, IBM will announce their next generation of equipment which has gone under the name H-series. If this date is accurate then we would expect an additional one to two years before the earliest possible installation of that newer equipment and the associated peripherals necessary to take advantage of it. This would of course, fit very nicely with the 1983 time if we were interested in having one of the earliest deliveries which we could achieve.

Once IBM has announced their new generation of equipment, Control Data will, of course, respond with theirs which could be expected to have the relative performance and price that defines CDC's place in the current market. Again, we would be talking about a 1983 to 1984 installation of a machine the size of the 175 or larger.

Based on these dates our extension of the financial plan to 1985 means that we would not get the earliest possible delivery of new equipment but rather we would get the equipment after it had been in the field and through the initial testing. It is quite likely that any large successor machine would come from either the IBM compatible or CDC families and that we would overlap whichever family we had not chosen from.

The question of large machines vs multiple small machines continues to heat up but the answers are far from becoming clear. The extension of an additional one or two years on our present equipment gives more time for those debates to present better alternatives or clearer guidance. CSO is actively looking at the networking requirements for use of small machines, and the potential use of small systems in courses.

The issues of continuity, both for the researcher over a period of years and for the student through a sequence of courses, is viewed with considerable concern on the campus because of the very heavy investment in learning and program development. The additional continuity offered by this expansion has been one of its best received features. This plan, of course, represents a very strong commitment to continuity for at least another five years and that is a comforting thought to many people.

Summary

What is proposed above is an extension of a general pattern of services utilizing IBM and CDC hardware and software systems, presenting the majority of our services through terminals with batch processing of work prepared at terminals accounting for much of the larger scale work. The selection of an additional CYBER machine represents an extension of at least two years in the serviceability of the CDC equipment and an expansion in the amount of terminal hours which can be presented. It represents a substantial upgrade in the amount of non-prime BATCH service which can be presented to the research community.

The plan is financially sound in that it provides for the University to own all of its equipment in 1985 with no outstanding debt and to have the full cash flow associated with the old systems available for selection of either a large scale replacement or a collection of smaller computers to meet the next generation needs. The only cost which is traded off against this immediate expansion of service is a deferral for two years of the options of making wholesale replacements based on the seven-year life of the CYBER 175.

After discussion with various committees and members of the faculty and after studying the needs for student computing which have been presented over the last year, we feel that this is a good plan and should be undertaken as quickly as possible. We request the support of the Computer Policy Committee in setting this direction.

CSO CONSULTING SERVICES

CSO provides consulting help to general users, users of statistical packages, and users of text processing facilities. Since these services are both vital and scarce, we want to tell you what consulting help is available and how to use it efficiently.

The Systems Consultants, located in 166 DCL (333-6133), can help you with general system questions. They can help you select the proper documentation, identify or analyze system or program malfunctions, recommend appropriate programs and software packages, and help you interpret diagnostic messages. The Systems Consultants will not provide individualized instruction on the use of the computer, write or design programs for users, or provide lengthy diagnoses of program logic errors. In the latter case you will be given suggestions as to how to diagnose the error yourself.

The Statistical Consultants, located at 65 Commerce West (333-2170), will answer general systems questions, but specialize in helping users with the statistical packages available on CSO's computers. They will help you select the appropriate statistical package and supporting documentation, provide advice on how to implement a model and prepare data for input, and help you interpret output. Consulting assistance usually does not include help with choosing a model, selecting the appropriate statistical technique, writing or running programs, or interpreting the statistical meaning of results.

The Text Processing Consultant, located at 207 Astronomy (333-7318), will help you use the text processing services available through CSO. He will explain the services available to you, answer questions about their use, and help you solve text processing problems you encounter.

Bring your problem to a consultant only after first trying to solve it yourself using the documentation known to you. Because there are heavy demands for consulting help, you should do your part to minimize the amount of time the consultant must spend on your problem. This includes, first and foremost, bringing a complete and current set of supporting output: source listings, program output demonstrating the error, load maps, dumps, etc. All output must be current. A source listing which has been manually updated for recent program changes, for instance is worthless. Explain your problem briefly and concisely and then allow the consultant to approach the problem in his or her own way. There is little to be gained by the consultant repeating your own diagnosis.

Realize that consultants are human and not extensions of the system which has frustrated you. Common courtesy will result in the best service. Don't expect instant solutions to complex problems or be put off if you are referred to another consultant more knowledgeable in your problem area. Graciously accept a request to make an additional run to produce additional diagnostic output. The consultant is only asking you to do what he/she would do if the problem were the consultant's own.

The Systems Consulting and Statistical Consulting offices are open 9AM - 5PM Monday through Friday. Text Processing Consulting is available 9AM - Noon, 1PM - 4PM, Monday through Friday. Since there is only one text processing consultant you should call first to make sure that he is free.

VACATION SCHEDULES

The CYBER 175, IBM 4341 and UNIX will be available throughout the scheduled Thanksgiving vacation, finals week and Christmas vacation. However, during these periods, offices and RJE sites will operate according to the following schedules. Any additional changes to the schedules will be posted on the doors of the RJE sites, and published in HEARYE.

THANKSGIVING VACATION

CSO Departmental and Consulting Offices

Thursday Nov 27 - Sunday Nov 30
Monday Dec 1

CLOSED
Resume regular hours

ISR, FAR, SB (Snack Bar)

Wednesday Nov 26 - Sunday Nov 30
Monday Dec 1

CLOSED
Resume regular hours

CSO South - COM (70 Comm West)

Wednesday Nov 26
Thursday Nov 27 - Saturday Nov 29
Sunday Nov 30

Close at 4:00 PM
CLOSED
Resume regular hours

Agriculture (M-103 Turner Hall), **Chemistry** (153 Noyes Lab), **Electrical Engineering** (146 EE), **Mechanical Engineering** (65 ME), **Psychology** (453 Psych), **Social Sciences** (202 Lincoln Hall)

Wednesday Nov 26
Thursday Nov 27 - Sunday Nov 30
Monday Dec 1

Close at 5:00 PM
CLOSED
Resume at 8:00 AM

CSO North - LOCAL (129 DCL)

Thursday Nov 27
Friday Nov 28 - Saturday Nov 29
Sunday Nov 30
Monday Dec 1

CLOSED
8:00 AM - 5:00 PM
8:00 AM - 2:00 AM
Resume regular hours

FINALS WEEK

ISR, FAR, SB (Snack Bar)

Saturday Dec 13 - Friday Dec 19

Open 12:00 noon to 4:00 PM

CSO South - COM (70 Comm West)

Saturday Dec 13 - Friday Dec 19

Open 8:00 AM to 8:00 PM

CHRISTMAS VACATION

CSO Departmental and Consulting Offices

Wednesday Dec 24
Thursday Dec 25 - Sunday Dec 28
Monday Dec 29 - Tuesday Dec 30
Wednesday Dec 31 - Sunday Jan 4
Monday Jan 5

Close at 12 noon
CLOSED
Resume regular hours
CLOSED
Resume regular hours

ISR, FAR, SB (Snack Bar)

Friday Dec 19
Saturday Dec 20 - Sunday Jan 18
Monday January 19

Close at 4:00 PM
CLOSED
Resume regular hours

CSO South - COM (70 Comm West)

Tuesday Dec 23
Wednesday Dec 24 - Wednesday Jan 7
Thursday Jan 8

Close at 5:00 PM
CLOSED
Resume regular hours

Agriculture (M-103 Turner Hall)

Friday Dec 19
Saturday Dec 20 - Sunday Jan 4
Monday Jan 5

Close at 5:00 PM
CLOSED
Resume regular hours

Chemistry (153 Noyes Lab), Electrical Engineering (146 EE), Mechanical Engineering (65 ME), Psychology (453 Psych), Social Sciences (202 Lincoln Hall)

Wednesday Dec 24	Close at 12 noon
Thursday Dec 25 - Sunday Jan 4	CLOSED
Monday Jan 5	Resume regular hours

CSO North - LOCAL (129 DCL)

Wednesday Dec 24	Close at 4:00 PM
Thursday Dec 25	CLOSED
Friday Dec 26 - Wednesday Dec 31	8:00 AM - 5:00 PM
Thursday Jan 1	CLOSED
Friday Jan 2 - Sunday Jan 4	8:00 AM - 5:00 PM
Monday Jan 5	Resume regular hours

SYSTEM NOTES

SEPTEMBER RELIABILITY REPORT

CYBER 175: 18 recoverable interruptions
 13 non-recoverable interruptions
 8 of these were for more than 15 minutes

Mean Time Between Failures = 30 hours
 Mean Time to Repair = 42 minutes
 Availability: 97.4% of scheduled uptime

The major downtime of nine hours occurred on September 4 for handling disk problems. We have been running since then with no further hardware trouble on the new disk drives. It is hoped that problems related to the installation of new equipment are finally over.

IBM 4341: 13 interruptions
 8 of these were for more than 15 minutes

Mean Time Between Failures = 51.9 hours
 Mean Time to Repair = 40 minutes
 Availability: 96.2% of scheduled uptime

Major cause of downtime was related to diagnostic error and software problems.

"Recoverable interruptions" in time-sharing are those interruptions from which a person may normally recover work being done at the time of the interruption by doing a RECOVER, *ity* when the system comes back up. "Non-recoverable interruptions" means that a major problem has occurred, and recovery of work in progress at the time of the interruption is not possible.

IBM

IBM SSP TO GO

Because it is extremely outdated, the IBM SSP library will not be automatically available after the 1980 Fall Semester -- specifically, it will not be available after January 5, 1981. After that date, it will only be available for those who still may have a need to use it by specifying:

```
LIBFILE='SYS1.FORTSSP'
```

For example:

```
// EXEC FORTLDGO,LIBFILE='SYS1.FORTSSP'
```

If you are using SSP, we ask that you convert to an equivalent IMSL or HARWELL routine. See Stan Kerr in Room 175 DCL (333-4715), or use TELL,UN=MATHLIB if you have questions. It is likely that SSP will eventually be removed entirely.

MATHEMATICAL SERVICES

Q-GERT: SIMULATION LANGUAGE FOR MODELERS

Q-GERT is a network approach to modeling procedural systems. The Q-GERT analysis program has been designed and built to simulate Q-GERT networks. Currently, the only documentation available is the book, *Network Modeling and Analysis Using Q-GERT*, by A. Alan B. Pritsker. This book is available for inspection at the Systems Consulting Office, Room 166 DCL.

QGERT is accessed by entering the statement:

```
GRAB,QGERT.
```

This places a binary file, QGERT, in your local file space.

This file can then be run in one of two ways:

1. If your network is described entirely by a QGERT data deck, enter

QGERT,input,output.

Where *input* represents a file containing the data deck, and *output* represents the file that will receive the simulation report. To PRINT this output file, you must use the /CC option on the PRINT command. Neither the input nor the output file is rewound by QGERT.

2. If you must include auxiliary FORTRAN routines, enter:

FTN,I=subs,...
LOAD,LGO.
QGERT,input,output.

Where *subs* is the file containing the routines. "... " represents other parameters you may want to use with FTN such as REW, L=0, etc.

A number of sample QGERT problems, taken from the text of the book mentioned above, are available from the procedure SAMPLES. For information on SAMPLES, see Reference Guide RF-4.13, or obtain the on-line information by entering the command HELP and typing SAMPLES in response to the question mark prompt.

Questions about QGERT should be addressed to Stan Kerr (333-4715) or Manoochehr Ghiassi (333-3938).

MISCELLANEOUS

NEW CSO DOCUMENTATION AVAILABLE

A CSO manual called *An Index to Software on the CDC CYBER 175* is now available free from the CSO Distribution Center, 1208 West Springfield. The index contains brief descriptions, support levels (maintenance and consulting), and a list of available documentation for each software package supported by CSO on the CYBER. An index of unsupported software is in progress.

A document called the *List of Mini- and Micro-Computers in the Local Area* is also available to interested persons at the Distribution Center. This document contains the listing of those persons (and their respective computers) who returned the DEC and CSO survey sheets published in *OFF-LINE*. An on-line copy of the list is available by entering:

WRITEUP,SURVEY.

This will place the on-line document CMPLIST in your local file space to be viewed or printed.

Hopefully, by the time this issue of *OFF-LINE* is on the stands, the new ZETA manuals will have arrived. CSO is currently writing several manuals to help users convert from CalComp to ZETA. Announcements will appear in HEARYE when these manuals are ready.

DEC USERS GROUP MEETINGS

The DEC Users Group meetings scheduled for November and December are:

- | | |
|-------------|--|
| November 11 | Cliff Carter will speak on what CSO has learned about various terminals on the market. |
| December 9 | Walter Schneider will speak on trouble shooting on small machines. |

The meetings will be held at 4 PM in the auditorium of the Coordinated Science Building, located at the corner of Springfield and Goodwin in Urbana.

***OFF-LINE's* Mailing List**

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CSO operates an IBM 4341 with four million bytes of fast core running HASP-OS/MVT under VM, a CYBER 175 with 256K words of central memory and 512K words of ECS, under NOS, serving up to 190 simultaneously active text and graphics terminals, and a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter with the UNIX Operating System.

POLICY

CYBER FILES - DAILY BACKUP PROCEDURE

The procedure for providing daily backup of CYBER files has been changed, primarily to improve the time it takes to restore a destroyed disk pack. Keep in mind while reading about the new procedure that *all* backups are done after midnight.

The previous method was to backup daily on tape all files modified within the last 24-hour period. This was done every day of the week except on Sunday when a full backup of all files was done. Each of these daily tapes were kept for that week and then reused the next week.

The new method still provides for the full backup of all files on Sunday. However, the daily backup method has changed. Each day of the week, all files that are on disk and have been modified since Sunday (the last full backup) are dumped to tape. This implies that a full disk pack restore only requires the processing of two sets of tapes; a full backup tape and the most recent incremental tape of files modified since Sunday that are still on disk. Under the old scheme, the worst case required up to seven sets of tapes.

There is a significant difference in how daily backup tape sets are used. Under the old scheme, seven tape sets (one for each day) were required; under the new scheme, three tape sets are required and are used as follows:

<i>Daily Tape Set</i>	<i>Used on</i>
1	Monday and Thursday
2	Tuesday and Friday
3	Wednesday and Saturday

The significance of this is that should you create a file on Monday, it will be backed up on the Tuesday (early morning) daily tape. If you then accidentally purge the file on Tuesday, it will not appear on the Wednesday or Thursday incremental tapes. If you then wait until Friday to come to the Consultants to restore your purged tape, it will be too late because the Tuesday tape will have already been written over by the early morning Friday tape.

NOTE: This means that you no longer have a full week in which to get a file restored; you now have only two days!

This approach improves our recovery time in the event of a disk problem, and reduces the CSO tape storage needs. For example, a worst-case (Saturday) disk failure results in a reload of four 6250 tapes in contrast to the 50-60 1600 BPI tapes previously required; thus, reducing the chances of tape problems and considerably simplifying the restore procedure, as well as requiring less time to spin through all necessary tapes.

TIME-SHARING WEEKEND RATES REDUCED

Starting on Friday, November 21, CSO began charging reduced rates for weekend time-sharing use on the CYBER. The period of reduced rates begins each Friday afternoon at 4:00 PM and ends the following Monday morning at approximately 6:00 AM when the system goes down for scheduled engineering.

Time-sharing jobs which both begin and end during the low-cost period are billed at 60% of the full rate. Session costs reported at logoff do not reflect the reduced rate; the rate reduction is applied when billing information is processed at the end of the day.

IBM jobs and CYBER batch jobs are billed at the regular rate. Time-sharing jobs which logon before the period of reduced rates begins and logoff during the period of reduced rates are also billed at the regular rate.

SYSTEM NOTES

OCTOBER RELIABILITY REPORT

CYBER 175: 21 recoverable interruptions
 12 non-recoverable interruptions
 22 of these were for more than 15 minutes

Mean Time Between Failures = 16 hours
 Mean Time to Repair = 31 minutes
 Availability: 95.3% of scheduled uptime

Major cause of downtime was related to
 CPU failures.

IBM 4341: 16 interruptions
 11 of these were for more than 15 minutes

Mean Time Between Failures = 44 hours
 Mean Time to Repair = 33 minutes
 Availability: 95.7% of scheduled uptime

Major cause of downtime was related to
 disk and other hardware problems.

"Recoverable interruptions" in time-sharing are those interruptions from which a person may normally recover work being done at the time of the interruption by doing a RECOVER, *tty* when the system comes back up. "Non-recoverable interruptions" means that a major

problem has occurred, and recovery of work in progress at the time of the interruption is not possible.

CYBER

NEW DIABLO SERVICES

Effective December 1, 1980, a new Diablo service will be offered on the CYBER. The new service will be similar to the queued service now being offered with a few changes.

Users of the Diablo service will still run a procedure on the CYBER. However, the new procedure will prompt you for your surname and whether or not you wish to charge the printing to a UOI account number. Costs for printing can only be charged to "real money" UOI accounts; class accounts or research board accounts are not allowed.

If you choose to pay by UOI account number, you will be prompted for the account number and title at the time the procedure is running. If you choose to pay by check, you will not be prompted for an account number or title. You will also be prompted for a choice of the pica or elite font and you will be asked for the name of your local file containing your RNF output. NOTE: The procedure will not perform a get if it cannot find a local file by the name given.

Finally, at the conclusion of the procedure, you will be told the number of PRUs (one PRU equals 640 upper case characters, 320 lower case characters) and the dollar cost associated with its printing. The new charge is \$0.05 per PRU and is comparable to the old charge of \$0.15 per page. All charges continue to be rounded up to the nearest dollar.

You will be sent a message on the CYBER once your file has been printed on the Diablo. You may pick up your printout at DCL. If you chose to pay by check, you will make out a check at that time to the University of Illinois for the amount indicated on the billing sheet you receive with your printout. If you chose to pay by UOI account number, your account will automatically be billed for the cost indicated on the billing sheet.

It should be pointed out that once something has been submitted to the queue it will be printed and you will be charged! Please take every precaution to print your RNF output on an upper and lower case line printer or DECwriter prior to submission to the Diablo queue. Refunds will not be given for printouts submitted by mistake.

If you have any questions concerning this service, please call the operator at 333-8150.

PLEASE CONVERT TO THE ZETA PLOTTER

The Calcomp plotter has become increasingly unreliable and hardware support is unpredictable. The Calcomp company has dropped support of the plotter as part of a reorganization of their product line. As a result, availability of repair parts is not guaranteed and Calcomp engineers are under no obligation to respond to requests for repairs.

CSO has installed three replacement plotters manufactured by the Zeta company. These plotters have been in service on the CYBER for several months, and IBM support has recently been completed. We are asking all users of the Calcomp plotter to convert as quickly as possible to the ZETA plotters. CSO plans to remove the Calcomp plotter from service at the end of this semester (December 21, 1980).

CYBER Users

If you generate your plots on the CYBER, you can convert to the ZETA plotters by simply using different control statements as follows:

Present Control Card

GRAB,CALCOMP.
GRAB,GCSCALC.
GRAB,GCSCALC/F.
PLOT,filename.

Replacement Control Card

GRAB,ZETA.
GRAB,GCSZETA.
GRAB,GCSZETA/F.
PLOTZ,filename.

New parameters on the PLOTZ command eliminate the "special handling" statement; other parameters have a different format from those on the PLOT command. Parameters accepted by PLOTZ are documented in Reference Guide RF-7.31.

IBM Users

If you have been using the IBM to generate your plot, conversion may be as simple as adding two subroutine calls to your program and changing your JCL, or it may require more extensive code changes. Approximately half of the subroutines available in the IBM Calcomp library are available in identical form in the new ZETA library; a fourth are available in slightly altered form which will require minor source changes; the remaining fourth have no ZETA equivalents. A conversion document, *IBM Calcomp to ZETA Conversion*, is available at the Distribution Center, 1208 W. Springfield (or from the Routing Room personnel or the Systems Consultants).

If you cannot convert your programs to the ZETA by the planned date (December 21) for the removal of the Calcomp plotter, please contact Bob Penka, 173 DCL (333-4709).

FORTRAN VERSION 5

Earlier this year, CDC introduced a new FORTRAN compiler, FORTRAN Version 5. At that time CDC indicated that it would support both the new compiler and the current compiler, FORTRAN Extended Version 4, for approximately two years and then drop support for Version 4. Although CSO is not yet running a version of the operating system under which this product is officially supported by CDC, we have adapted FORTRAN Version 5 to our current operating system in order to offer our users a chance to acquaint themselves with the new compiler and avail themselves of its added capabilities. The new compiler is accessed via the FTN5 control statement as in,

FTN5,I=*source*,L=*listing*.

FTN5 was designed to conform to the new ANSI FORTRAN Standard (X3.9-1978). Although most of the new features in this standard have been implemented in some existing FORTRANs, many of them will be new to CYBER users. Among the new features are the following:

- Many of the syntactic rules have been liberalized to allow expressions where only more restricted forms such as simple variables or constants were allowed before. For example, constant expressions (i.e., expressions not involving variables) may be used in array dimension specifications and expressions may be used to control DO loops.
- The PARAMETER statement allows one to define symbolic constants which can then be used in most places that explicit constants can be used. For example,

```
PARAMETER (NEQS=10,NRHS=2,TWOPI=2*3.14159)
REAL A(NEQS,NEQS),B(NEQS,NRHS)
INTEGER IWRK((NEQS*(NEQS+1))/2)
.
.
.
Y=SIN(TWOPI*X)
.
.
.
```

- DO loops may now be controlled by REAL variables and expressions as well as INTEGERS. If the increment expression has a negative value, DO loops will run backwards. If the terminal condition of a DO loop is satisfied by the initial value of the control variable, the body of the loop is not executed. (Such "zero-trip" loops are in contrast to the "one-trip" loops produced by the current compiler, in which the loop body is always executed at least once. FTN5 offers an option to compile "one-trip" loops if they are required for program compatibility.)
- Array subscripts are no longer required to start at 1. For example,

```
REAL ARRAY(0:99)
```

- Most of the intrinsic functions are now generic, i.e., they may be applied to arguments of more than one type. For example, SQRT can now be applied to either REAL or DOUBLE PRECISION arguments, rather than requiring SQRT for the former and DSQRT for the latter, as in the current compiler.
- A new CHARACTER data type allows characters to be stored without worrying about the specific characteristics of the machine on which the program is running. For example,

```
CHARACTER*80 CARD
```

New operations and intrinsic functions facilitate the manipulation of this new data type.

- A new block-IF construct facilitates easier selection among blocks of code. For example,

```

      .
      .
      .
      IF (ANSWER.EQ.'YES') THEN
        IOPT=1
        PRINT *, 'AFFIRMATIVE'
      ELSE IF (ANSWER.EQ.'NO') THEN
        IOPT=2
        PRINT *, 'NEGATORY'
      ELSE
        PRINT *, 'I DIDN'T UNDERSTAND'
        GO TO 1000
      END IF

```

- Now OPEN and CLOSE statements give the programmer greater control over the files manipulated by a FORTRAN program and, indidentally, free the programmer from the requirement of listing all files to be used by a program on the PROGRAM statement. An INQUIRE statement is now available to determine the characteristics of the files available to a FORTRAN program.
- FORTRAN now supports a random access file capability similar to that offered by DEFINE FILE on the IBM machine. (The old READMS/WRITMS routines are also still available.)
- FORMATS have been extended in several minor, but useful ways.
- READ and WRITE may be used in conjunction with CHARACTER variables to provide a capability similar to that offered by DECODE and ENCODE. (DECODE and ENCODE are still available, but non-standard.)

- CHARACTER expressions may now be used as FORMATS. In particular, statements such as

```
WRITE(IUNIT, '(1X,3I10)')I,J,K
```

are now allowed.

- END= and ERR= specifiers, similar to those already familiar to IBM FORTRAN users, may be used in place of the EOF function to detect end of file. Alternatively, the specifier IOSTAT= can be used to return the input/output status in a variable.
- The ENTRY statement now has its own parameter list, as in IBM FORTRAN.
- Alternate RETURNS are now supported in a manner similar to IBM FORTRAN.
- A new declaration, SAVE, can be used to indicate which variables in a subprogram are to retain their values between executions. This new declaration helps assure that this happens, even when the subprogram is part of a segment overlaid program.

More complete information on the language supported by FTN5 and the control statements used to run it may be found in the *FORTRAN Version 5 Reference Manual*, which may be found in the CSO manual racks or the Consulting Office, or which may be purchased at the Distribution Center, 1208 W. Springfield.

Users should be aware that we are running the first official release of FTN5 and that it has known deficiencies. A list of known problems is being maintained in the file FTN5BUG/UN=CONSULT. This file may be examined via the command

```
TYPE,FTN5BUG/UN=CONSULT/ASCII.
```

As we receive new versions of FTN5, we will investigate the possibility of adapting them to our current operating system if they appear to have significantly fewer deficiencies.

Although FTN5 has been designed to offer the same capabilities present in FTN, in some cases the syntax used to express these capabilities has changed. CDC has provided a translation program, F45, to assist in the conversion of FTN source to FTN5 source. Access to F45 is obtained through the GRAB command, as in,

```
GRAB,F45.
```

F45 may then be invoked by the command,

```
F45,I=source,L=listing,P=newsource.
```

More complete information on the conversions performed by F45 and its control statement options may be found in the *FORTRAN Extended Version 4 to FORTRAN Version 5 Conversion Aid Program Version 1 Reference Manual*, which may be found in the CSO manual racks or in the Consulting Office. This manual has been ordered and should be available for purchase at the Distribution Center within the next few weeks.

STATISTICAL SERVICES

NEW FOSOL PROCEDURES

Two new FOSOL procedures written in CYBER Control Language (CCL) have been installed on the CYBER. They are intended to replace the KCL procedures previously available with the GRAB,FOS and GRAB,MAN commands. The new CCL procedures have somewhat different features than their predecessors. GRAB,FOS and GRAB,MAN will be removed from the system on January 9, 1981!

To access FOSOL using the new procedure, use the following commands:

```
GRAB,FOSOL.  
FOSOL(I=file1,L=file2)
```

Where *file1* is the name of your local file containing the FOSOL problem information (INPUT is the default) and *file2* is the name of the local file to which your output will be written (OUTPUT is the default).

The FOSOL Interactive Manual is accessed by entering

```
GRAB,FOSMAN.  
FOSMAN(L=file2)
```

Where *file2* is the name of the local file to which output from the EXCERPT mode in the FOSOL Interactive Manual is to be placed (OUTPUT is the default).

On-line help files are available for both of these procedures and may be accessed by entering the command, HELP, and then entering

```
FOSOL  
or  
FOSMAN.
```

after the question mark (?) prompt. If you have any questions concerning FOSOL, please contact the CSO Statistical Services at 65 Commerce West (333-2170).

NEW SOUPAC PROCEDURE

A new SOUPAC procedure written in CYBER Control Language (CCL) has been installed on the CYBER. It is intended to replace the KCL procedure previously available with the GRAB,SOUP command. It is almost identical in operation. GRAB,SOUP will be removed from the system on January 9, 1981!

To access SOUPAC using the new procedure, use the following commands:

```
GRAB,SOUPAC.  
SOUPAC(I=file1,L=file2)
```

Where *file1* is the name of your local file containing the SOUPAC problem information (INPUT is the default) and *file2* the name of the local file to which your output will be written (OUTPUT is the default).

An on-line help file is available and can be accessed by entering the command, HELP, and then entering

```
SOUPAC.
```

after the question mark (?) prompt. If you have any questions concerning SOUPAC, please contact the CSO Statistical Services at 65 Commerce West (333-2170).

MATHEMATICAL SERVICES

MINPACK ON THE CYBER

MINPACK, a library of nonlinear least-squares routines and nonlinear equation solvers developed at Argonne National Laboratory, is now available on the CYBER via GRAB. A test version of MINPACK was announced in the May issue of *OFF-LINE*.

The library is accessed by entering the control statement,

```
GRAB,MINPACK.
```

Following this, you only need to compile and run a FORTRAN program which calls one or more MINPACK routines.

Source and writeups of MINPACK routines are available via the MATH procedure (see Reference Guide RF-4.12). A complete set of the writeups (93 pages) can be obtained and printed by entering

```
WRITEUP,MINPACK.  
PRINT,MINDOC/CC/EJ/RJE=LOCAL
```

The library consists of five basic routines, each paired with an "easy-to-use" version. There are three least-squares routines and two equation solvers. One of the least-squares routines and one of the equation solvers are derivative-free; you need not code the Jacobian matrix of partial derivatives.

All of the least-squares routines use a modification of the Levenberg-Marquardt method to solve the following problem:

Minimize the sum of the squares of m nonlinear functions in n variables.

The equation solvers handle the following problem:

Find a zero of a system of n nonlinear functions in n variables.

by using a modified form of the Powell hybrid method. For those routines which require you to supply FORTRAN code for evaluating both the function and its Jacobian, a routine CHKDER is supplied to help you check the consistency of your code before using the other MINPACK routines.

Following is a list of the routine pairs (names ending in 1 (one) are the "easy-to-use" versions):

LMDER/LMDER1	A least-squares routine. You must supply a routine which evaluates both the functions and the Jacobian (the matrix of partial derivatives of the functions with respect to the unknown variables). The memory required is on the order of $m \cdot n$ real numbers, which may be uncomfortably large in a curve-fitting problem where m would be the number of observations.
LMSTR/LMSTR1	A least-squares routine; a "space-saving" version. You must supply a routine which evaluates both the function and a specified row of the Jacobian. The memory required is on the order of $n^2 + 2m$ real numbers; since n is usually small, this is "reasonable".
LMDIF/LMDIF1	A least-squares routine; the derivative-free version. You must supply a routine to evaluate the function; the Jacobian is estimated by MINPACK using forward differences. The memory required, however, is on the order of $m \cdot n$ real numbers.
HYBRJ/HYBRJ1	An equation solver. You must supply a routine to evaluate the functions and to evaluate the Jacobian. The memory required is on the order of $1.5 \cdot n^2$ real numbers.
HYBRD/HYBRD1	An equation solver. You must supply a routine to evaluate the functions; the Jacobian is estimated by MINPACK using forward differences. The memory is on the order of $1.5 \cdot n^2$ real numbers.

Questions about or problems with MINPACK should be directed to Mary Ann Berg, 121 Altgeld Hall (333-2168) who is the local Argonne contact for MINPACK, or to Stan Kerr, 175 DCL (333-4715 or TELL,UN=MATHLIB).

DOCUMENTATION

NEW SECTION ADDED TO OFF-LINE

We have added this new section, entitled DOCUMENTATION, to *OFF-LINE* to keep the user community better informed about new or revised documentation.

Basically, it will be divided into four general categories: New Documentation, Revised Documentation, On-line Documentation, and Reference Guides. Listings of new documentation will include the price and an abstract. Listings of revised documentation will specify whether the revision is major or minor, and will contain brief descriptions of the revisions. The on-line section will list new manuals which have been added to the WRITEUP facility and new HELP files. The listings for Reference Guides will follow the same format as for the revised documentation.

We hope our readers will find this new section useful. Comments or suggestions should be directed to Lynn Bilger, 139 Astronomy (333-6236).

New Documentation

Compatible Plotting Subroutines - FORTRAN Reference Manual \$6.00

This manual, published by ZETA, describes vendor-supplied software for the ZETA plotters. A locally-produced addendum accompanies this manual.

IBM Calcomp to ZETA Conversion Manual Free

This manual is directed toward IBM users of CSO's Calcomp plotter and documents changes which must be made to convert to the ZETA plotters. (The ZETA plotters are replacements for the soon to be discontinued Calcomp plotter.)

FORTRAN Version 5 Reference Manual \$12.40

This CDC publication describes the FORTRAN language as defined by the 1977 ANSI Standard and the use of the CDC FTN5 compiler which implements it.

On-line Documentation

On-line documentation has been added for MINPACK, a library of nonlinear least-squares routines and nonlinear equation solvers from Argonne Labs. It may be accessed and printed by entering

```
WRITEUP,MINPACK.
PRINT,MINDOC/CC/EJ/RJE=LOCAL.
```

Several new help files have been added to the HELP facility. The new files are as follows:

FOSOL
FOSMAN
MESSAGE
SOUPAC
TELL
WHO

Reference Guides

With the addition of the following two Reference Guides, our reorganization of the Reference Guides has been completed:

RF-0.6 Disk Policy
RF-2.5 LISP

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Chemistry	153	Noyes Lab	333-1728
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CRH Snack Bar	120	Snack Bar	333-1851
DCL Routing Room	129	DCL	333-6203
Electrical Engineering	146	EEB	333-4936
Florida Ave Res Hall		FAR	333-2695
Illinois St Res Hall		ISR	333-0307
Mechanical Engineering	65	MEB	333-1430
Psychology	453	Psych Bldg.	333-7531
Social Science	202	Lincoln Hall	333-0309

OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of January 20, 1981.

CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of fast core running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

SPECIAL WEEKEND RATES

As of January 23, 1981, low-cost weekend rates were extended to include both batch and time-sharing on the CYBER 174 and 175 systems. The period of reduced rates is to begin each Friday at 4 PM and end each Monday at approximately 6 AM when the system is taken down for engineering. These lower rates are restricted to accounts of internal University users; they do not apply to bulk jobs.

To take advantage of these lower weekend rates you ***must both logon and logoff*** between the specified hours. For example, if you logon at 4:15 PM and logoff at 5:30 PM on Friday, you will be charged at the reduced rate. However, if you logon at 3:30 PM and logoff at 5:30 PM Friday, you will be charged at the usual rate since you logged on before the 4 PM start of the rate-reduction period.

During the rate-reduction period, batch and time-sharing jobs are charged at 60% of the usual rate. The rate reduction applies to all charges except those for printing and punching. The costs reported to you at the end of a batch job or a time-sharing session do not reflect the reduced rates. The rate reduction is applied at the end of the day when billing information is entered into the billing database, and the balances at the various accounting levels are decremented by the cost of the job.

Any jobs submitted to be run during this period ***must*** finish execution by the 6 AM Monday deadline. If these jobs are completed after the deadline, they will be charged at the regular rates. Users who do not wish their jobs to run at the regular rates can use the CANCEL command ***early*** Monday morning to delete (cancel) any job which has not yet completed execution. See the article, CYBER CANCEL COMMAND INSTALLED, under the CYBER section of this issue for further details.

Due to other pressing demands on manpower, no additional software support is being provided for this service. If practical experience dictates that further software support is required, the low-cost batch service will be withdrawn until such support can be provided.

A similar low-cost service is being planned for the IBM 4341. An announcement detailing its use will be made when this service becomes available.

REVISED RATES FOR PLOTTING

The published rate for plotting has for some time been set at 20 Service Units per hour. Due to overhead costs for collecting some plot billing data, charges were never issued for plots generated on the CYBER or plotted on the off-line plotter. Now that the Calcomp plotter is no longer in use and the ZETA plotters have been integrated into the CYBER system, usage data is being automatically gathered for all plot jobs. Starting February 16, we will charge for all plots on the basis of this data.

Rates charged for plotting have been reviewed and an attempt has been made to tie charges directly to costs. We will, for instance, produce plots on the default plotter quite cheaply since this plotter is run with a minimum of operator attention. No refunds will be given for defects such as pen skips. On the other hand, plots produced on the special plotter will be charged at a higher rate. This plotter is given close operator attention and plots produced on it are of guaranteed quality. Similarly, a higher charge will be made for wide paper than for narrow paper. A special charge will be made for use of liquid ink pens since they require both operator preparation and cleanup.

The new plotting rates are based on SRUs (100 SRUs = 1 Service Unit) and are as follows:

Default Plotter (minutes)	750	SRUs per hour
Special Plotter (minutes)	1200	SRUs per hour
Wide Plotter (minutes)	2400	SRUs per hour
Narrow Paper (inches)	2	SRUs per inch
Wide Paper (inches)	3	SRUs per inch
Special Paper (inches)	7	SRUs per inch
Liquid Ink Setups	250	SRUs per pen

NEW METHOD FOR COMPUTING DISK CHARGES

We are now computing disk charges on a weekly rather than a daily basis. Billing programs are run between 6 PM and midnight each Saturday night. Any file in existence when the billing program is run is charged for a full week's residency. Conversely, no charge is issued for any file or dataset which is purged before the billing program is run. This change was made to reduce the excessive number of billing records resulting from the present method of computing disk charges daily.

CSO SHORT COURSES - SPRING 1981

CSO is offering the following short courses for the CYBER 174 and 175 during the first half of the 1981 spring semester. Additional courses (to be announced at a later date) will be offered during the second half of the semester.

Registration is free, but limited to 30 people for some classes. To register for a course either

- come in person to Room 150 DCL, or
- phone 333-6630.

If all of the available classes on the topic you are interested in are full, leave your name on our waiting list. If anyone cancels, or another section of the class is set up, we will contact you immediately.

The short courses being offered are as follows:

INTRODUCTION TO THE CYBER (3 classes - 3 sessions each)

February 2,4,6	11-12 AM in Room 115 DCL
February 9, 11, 13	11-12 AM in Room 115 DCL
March 9,11,13	3-4 PM in Room 239 DCL

CYBER MAGNETIC TAPES (1 class - 3 sessions)

February 16, 18, 20	3-4 PM in Room 239 DCL
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GRAPHICS AT CSO (1 class - 1 session)

February 5	12-1 PM in Room 115 DCL
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CALCOMP TO ZETA CONVERSION (1 class - 1 session)

February 12	2-3 PM in Room 239 DCL
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NCAR PLOT PACKAGE (1 class - 1 session)

February 19	2-3 PM in Room 239 DCL
-------------	------------------------

GCS PLOT PACKAGE - INTRODUCTION (1 class - 6 sessions)

February 23, 25, 27 and	3-4 PM in Room 239 DCL
March 2, 4, 6	

GCS PLOT PACKAGE - ADVANCED (1 class - 4 sessions)

February 23, 25, 27, 30	11-12 AM in Room 239 DCL
-------------------------	--------------------------

MATH LIBRARIES (1 class - 3 sessions)

March 9, 11, 13	11-12 AM in Room 239 DCL
-----------------	--------------------------

INTRODUCTION TO THE CYBER FOR RNF USERS (2 classes - 3 sessions each)

February 16, 18, 20	11-12 AM in Room 239 DCL
March 16, 18, 20	3-4 PM in Room 239 DCL

INTRODUCTION TO RNF (2 classes - 3 sessions each)

February 23, 25, 27	11-12 AM in Room 239 DCL
March 23, 25, 27	3-4 PM in Room 239 DCL

NON-LINEAR PROGRAMMING AND NETWORK (1 class - 2 sessions)

February 24, 26	2-3 PM in Room 239 DCL
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MANOVA (1 class - 4 sessions)

February 24, 26, and March 3, 5	7-9 PM in Room 140 Com West
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SAS (1 class - 3 sessions)

February 16, 18, 23	7-9 PM in Room 241 Com West
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SPSS (1 class - 2 sessions)

February 9, 11	6:30-9:30 PM in Room 241 Com West
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SYSTEM NOTES

NOVEMBER AND DECEMBER RELIABILITY REPORTS

CYBER 175

November

December

21 recoverable interruptions
24 non-recoverable interruptions
28 of these were for more than 15 minutes

30 recoverable interruptions
52 non-recoverable interruptions
53 of these were for more than 15 minutes

Mean Time Between Failures = 12 hours
Mean Time to Repair = 33 minutes
Availability: 94.6% of scheduled uptime

Mean Time Between Failures = 6 hours
Mean Time to Repair = 46 minutes
Availability: 83.9% of scheduled uptime

Major cause of downtime was related to CPU errors and many hardware problems. The major problem was resolved by December 7, 1980.

Major cause of downtime was related to CPU failures, power failures, generator problems, and installation of the 174.

IBM 4341:

18 interruptions
11 of these were for more than 15 minutes

Mean Time Between Failures = 39.8 hours
Mean Time To Repair = 18.8 minutes
Availability: 98.8% of scheduled uptime

Major cause of downtime was related to software and hardware problems.

19 interruptions
9 of these were for more than 15 minutes

Mean Time Between Failures = 38 hours
Mean Time To Repair = 44 minutes
Availability: 98.7% of scheduled uptime

Major cause of downtime was related to power failure.

CYBER**CYBER CANCEL COMMAND INSTALLED**

We have installed a new command, CANCEL, which allows a user to delete (cancel) his/her job from the input, rollout, fetch, print, plot, or punch queue on the CYBER. The format of the command is

CANCEL,xxx.

where xxx is the FNT ordinal of the job. (The FNT ordinal is the number displayed to the left of the jobname in the response to a QUERY command.)

You can cancel only your own jobs. This means that when canceling a job you must be logged in under the same user number which you were using when the job was queued. (Technically, the user index hashes of the canceling request and the job to be canceled must match.) Explicitly, when canceling a batch job you must do the following:

- If you submitted the batch job through a card reader, you must signon under the same user number that you used in the batch job.
- If you used the SUBMIT or SENDJOB command to submit the job from another CYBER batch or time-sharing job, you must signon under the same user number that you were using when you issued the SUBMIT or SENDJOB command.

CYBER 174 INSTALLED

CSO is now operating a CYBER 174 in parallel with the CYBER 175. The two systems are running with identical operating systems and share all permanent files.

Although the two machines are running with identical operating systems, there are several differences:

- Due to the expense of obtaining second licenses, some software packages are being offered only on the CYBER 175. The packages involved are COBOL, GPSS, APEX, SORT/MERGE, Interactive Debug, and ALGOL-68.
- The CYBER 174 has no direct communication link with the IBM 4341. As a result, the following facilities are not available to jobs running on the CYBER 174:

SENDJOB and SUBMIT cannot be used to submit jobs to the IBM 4341.

The HASP (&D) command is not available.

CYBER 174 batch jobs cannot be submitted from a card reader. All the card readers are attached to the IBM 4341 which in turn is attached to the CYBER 175. Any CYBER job read into one of the card readers will be sent to the CYBER 175; however, **all** CYBER accounts are authorized to run batch jobs on the 175.

Output cannot be sent from the IBM 4341 to the FETCH queue on the CYBER 174.

- The CYBER 174 and CYBER 175 do not share queues. As a result, each machine has its own FETCH queue. It is also impossible for a job on one machine to enquire about the status of a job on the other. This has a practical bearing on print, plot, and punch jobs generated on the CYBER 174. These jobs initially are placed into the appropriate queues on the CYBER 174. While there, a CYBER 174 job can enquire on their status. However, these jobs are eventually transferred to the CYBER 175 where they are put into the corresponding print, plot, or punch queue. Once a job is passed to the CYBER 175 its status can no longer be determined by a CYBER 174 job.
- CYBER 174 jobs are limited to 35K (104,207 octal) words of memory between 8 AM and 8 PM and 75K (222,370 octal) words of memory after 8 PM.
- There are no user accessible tape drives on the CYBER 174.

The CYBER 174 is being dedicated to instructional use and the CYBER 175 to faculty and graduate research. Accordingly, all CYBER interactive computing by projects funded through class allocations is being restricted to the CYBER 174; all other interactive use is being restricted to the CYBER 175. There are no similar restrictions on batch jobs. If the hardware or software restrictions noted above make it impossible for a class to use the CYBER 174, that class will be permitted to use the CYBER 175. Instructors of such classes should contact the CSO Accounting Office.

To facilitate class preparation, project managers of class accounts will automatically be permitted to use both the CYBER 174 and CYBER 175. Similarly, teaching assistants and graders can be granted permission to use the CYBER 175 at the request of the project manager.

Approximately equal numbers of public terminals are available for use on the CYBER 174 and the CYBER 175. An attempt has been made to place the terminals near the populations using them, with CYBER 174 terminals concentrated at sites most used by students. For a complete guide to the location of public terminals, see Reference Guide RF-0.3 Job Entry Sites. Twelve dial-up ports (phone number 333-4004) are also available on the CYBER 174.

An attempt has been made to equalize costs between the two machines. This is accomplished by applying a multiplier to the actual CYBER 174 CPU time before it is recorded. The multiplier is chosen so that, for the average job, the CPU time recorded will equal the CPU time that would have been recorded had the job run on the CYBER 175. Since the recording of CPU time is done at the lowest level of the system, all code dealing with limits enforcement, usage reporting, or charging uses this adjusted value of CPU time.

Users will notice that jobs take about four times as long to execute on the CYBER 174 as they do on the CYBER 175. This is longer than might be expected considering that the CYBER 174 has approximately half the throughput capacity of the CYBER 175. This discrepancy is explained by the fact that the CYBER 174 is a dual processor but a job can make use of only one of the processors at a time.

GANDALF SWITCH INSTALLED

Over the break between semesters, we installed a Private Automatic Computer eXchange (PACX) built by the Gandalf Company. This device serves as an electronic switch between terminals and computers and is often descriptively referred to simply as "the Gandalf Switch" or "the switch."

A total of 58 public terminals are connected to one side of the PACX, and the CYBER 174 and CYBER 175 are connected to the other. A user stepping up to one of the terminals marked as being "on the Gandalf switch" can use that terminal on either the CYBER 174 or CYBER 175.

When using one of the switchable terminals, a modified signon procedure, documented on the terminal, must be used. We thought you might like a better idea of what's happening, so here's a fuller explanation of how to logon at one of these terminals:

- First, depress the BREAK key once and hold it down for about a second. When the PACX sees the BREAK signal, it puts your terminal into a queue of terminals waiting for service and responds by sending a sequence of null characters. Unfortunately, most terminals discard any null characters sent to them so you will not receive any visible acknowledgement that your BREAK character has been received. (The IBM terminals provided at several RJE sites are an exception. These terminals will print the null character as a backward question mark.) Some DOs and DON'Ts follow.

DO hold the BREAK key down for about a second. The PACX ignores a very short BREAK signal, considering it to be electronic noise. While some terminals will always send a BREAK signal of reasonable duration, others transmit only while the key is depressed. A good typist using one of these latter terminals can generate a BREAK signal so short that the PACX considers it noise.

DON'T hit the BREAK key more than once. Once a terminal has been placed in the service queue, another BREAK character will be treated as a request to remove it from the queue.

- Wait two seconds and hit the RETURN key. The two-second wait gives the PACX time to assign a server to your terminal. (A server is a component of the PACX which can communicate with you and complete the connection with your chosen computer.) The RETURN key signals the server to proceed. The terminal responds with "ENTER CLASS", the PACX's way of asking which computer you want to use. If your terminal does not respond, there are a couple of possible reasons:

A server has not yet been assigned to your terminal. There are a limited number of them available and you may have to wait for one to free up. Wait a couple of seconds and hit RETURN again. Try this at least three times before giving up on this diagnosis.

The PACX might not have seen your initial request for service. (This should not happen if you hold the BREAK key down for a full second.) If this has happened, the remedy is to go back to step one and depress the BREAK again. This is always a last ditch diagnosis, given the PACX's treatment of a BREAK for a terminal that is already in the service queue.

- Enter a three-digit code to identify the computer you wish to use, followed by a carriage return. The correct code is easy to remember; it's 174 for the CYBER 174 and 175 for the CYBER 175. If all goes well, your terminal responds with "CLASS xxx START" where xxx is the code you entered. You might, however get one of the following messages:

CLASS xxx UNASSIGNED

The three digit code xxx is unknown. You will be prompted for another.

CLASS xxx UNAVAILABLE

The class xxx is temporarily not available. The chosen computer might, for instance, be out of service for repairs. You will be prompted for another code.

CLASS xxx RESTRICTED

The code you have given is not acceptable from the terminal you are using. You might, for instance, have accidentally given a code that is recognized but is used only for diagnostic purposes. You will be prompted for another code.

CLASS xxx BUSY
 QUEUE SIZE yyyy DO YOU WISH TO QUEUE?

This pair of messages indicates that all paths to the computer you have chosen are busy and that the number of terminals waiting for a path to free up to this computer is yyyy. If you want to be put at the end of this waiting list, enter Y, but be aware that once you enter Y, you are placed in the queue and cannot do anything to get out of the queue until a path to the computer becomes available. While you are waiting you will receive periodic reports of your queue position. When a path becomes available, you will be prompted with a START message.

If you do not want to wait but want to try to connect to another computer instead, enter N. You will be prompted for another three digit code. If you want to abandon your attempt to use the computer, type Q. You will be disconnected from the PACX.

BYE

You waited too long (more than 20 seconds) to enter the requested three digit code. Your terminal has been disconnected from the switch and you will have to start over by depressing the BREAK key.

- Enter RETURN to initiate the usual CYBER logon sequence. From this point on, the PACX simply transmits every signal generated by your terminal directly to the computer. There is no way for your terminal to communicate with the PACX. The connection will be broken when the computer you are using sends a disconnect signal to the PACX, something that is normally done at logoff.

MORE EQUIPMENT CHANGES

Since the last issue of OFFLINE, the CYBER card reader, printer, and Calcomp plotter have been removed from service. The card reader and printer were removed for financial reasons. The money previously applied to their support has been applied to the new CYBER 174. Other installed equipment has sufficient capacity to absorb their workload. The Calcomp plotter was removed for reasons of reliability and has been replaced by three plotters manufactured by the Zeta Company.

All jobs which would normally have printed on the CYBER printer are now automatically being routed to the IBM system for printing at DCL. While waiting in the IBM print queue such jobs are given an IBM jobname of the form XXXXYYY where XXXX is the first four characters of the CYBER jobname and YYY is the bin number used to file the output. Jobs will be printed with an IBM burst page. The IBM printers will split any line longer than 133 characters (including carriage control) into two lines.

Users accustomed to using the CYBER card reader will have to make the following changes in their decks before reading them in on any card reader attached to the IBM system:

- A card containing the characters /*CYBER in columns 1-7 and blanks everywhere else must be placed at the beginning of the deck.
- The 6/7/8/9 multipunch card used to mark the end of the deck must be replaced with a card containing the two characters /* in columns 1-2 and blanks everywhere else.
- Any IBM Job cards contained in the deck must be removed.

Three facilities provided by the CYBER card reader which have been lost are:

- The ability to read an end of partition card (6/7/9 multipunch)
- The ability to read CYBER binary decks
- The ability to read and automatically translate decks punched in 026 format. In this case other provisions can be made. See a consultant for details.

Steps required to convert from use of the Calcomp to the Zeta plotters were documented in the December issue of OFFLINE. Consult it for details or see a consultant for conversion advice.

In the way of future changes, we are setting up procedures for using a Honeywell "page printer" being installed at the campus AISS computing center. This device prints on 8 1/2" by 11" sheets of paper at the rate of 8000 lines per minute, using an electrostatic printing process. We plan to use this device for printing very large output files. Details will be announced when the service becomes available.

NEW 6250 BPI TAPE DRIVES

In September, CSO acquired new tape drives for the CYBER 175, including 9-track drives capable of reading and writing at densities of both 1600 bpi and 6250 bpi. The transition to the new drives is now complete, and the tape drive configuration on the CYBER 175 is now

- Three 9-track 1600 bpi / 6250 bpi drives
- One 9-track 800 bpi / 1600 bpi drive
- One 7-track 800 bpi / 556 bpi drive (which can also read at 200 bpi)

This configuration introduces 6250 capability and reduces 9-track 800 bpi capability from four drives to one drive.

The 9-track tapes use odd parity. The 7-track tapes use odd parity for binary data and even parity for coded data.

Successful 6250 bpi usage requires that the type of tape used for writing at this density be the precise type to which the tape drives have been tuned. Our local drives have been tuned to Scotch 701 3200 foot tapes rated at 6250 cpi (cpi=bpi), and only that specific tape should be used here for writing at 6250 bpi. (The critical aspect seems to be the writing of the tape. Almost any tape written at 6250 bpi appears reliable for reading.) Scotch 701 3200 foot tapes may be purchased from the CSO Distribution Center, 1208 W. Springfield. (Scotch 701 in shorter standard lengths is thicker and will not match the tuning of the drives.)

Tape written at 6250 bpi can hold about three times as much information in a given space as tape written at 1600 bpi. Thus, 6250 bpi is well suited for recording massive quantities of data. But remember, our IBM 4341 does not have 6250 drives; therefore, this high density cannot be used to transfer data between the two computers, nor can the IBM analysis and data recovery programs be used on any problematic 6250 bpi tape. Also, when preparing tape for transferring information to another site, 1600 bpi or perhaps 800 bpi is preferable to 6250 bpi because not all sites have 6250 capability.

The usage of 6250 bpi and the new tape configuration require few changes, simply more attention to the density parameter in the LABEL statement and changes in the RESOURC statement. The details are summarized below.

The following discussion refers to 9-track tapes only. The usage of 7-track tapes is unchanged.

The default for CYBER 175 tape usage will remain 9-track 1600 bpi. To specify 9-track tape, include NT in the LABEL statement or omit the track designation and get 9-track by default. To read or write at the various 9-track densities, include the following in the LABEL statement:

- For 6250 bpi, always specify D=6250 or D=GE
- For 800 bpi, always specify D=800 OR D=HD
- For 1600 bpi, omit the D= specification and get 1600 by default, or specify D=1600 or D=PE (Including the density specification rather than using the default is good documentation.)

Some examples of 9-track LABEL statements are given below. For more information on the LABEL statement see Chapter 10 of the CDC *NOS Version 1 Reference Manual*.

```
LABEL(TAPE,VSN=ABCDEF·D444,D=GE,PO=W,SI=ABCDEF,QN=1,W)
```

```
LABEL(TAPE,VSN=MYTAPE·F555,D=PE,PO=W,SI=MYTAPE,QN=9999)
```

```
LABEL(TAPE,NT,VSN=NEWDAT·TEMP,D=800,PO=R,LB=KU,F=S,CV=EB)
```

The RESOURC statement is required when more than one tape will be used concurrently in a job. In the RESOURC statement, you must now specify the 9-track tape drives by the alphabetic characters for density:

- GE for 6250 bpi
- PE for 1600 bpi
- HD for 800 bpi

To specify two 9-track 1600 bpi drives, use

```
RESOURC(PE=2)
```

To specify one 9-track 800 bpi drive and one 9-track 1600 bpi drive, use

```
RESOURC(HD=1,PE=1)
```

To specify one 7-track drive and one 9-track 6250 bpi drive, use

```
RESOURC(MT=1,GE=1)
```

Users of the EXAMINE and ARCHIVE programs should be aware that the report of the amount of tape used that is returned by these programs will be too large for 6250 bpi tapes. Also, the tape density must not be specified in the EXAMINE statement for 6250 bpi tapes, and EXAMINE does not give a correct report of density for 6250 bpi tapes. In all other respects, the programs work satisfactorily with these tapes.

CSO VIDEOTAPES AVAILABLE

CSO has produced a series of eight videotapes which introduce the novice to the CYBER System. A viewing guide containing the major pictorials used in the series is available and can be used to facilitate note taking.

The title and a brief synopsis of each of the videotapes is given below. Running time is 10-15 minutes for each videotape.

Introduction to Computing at CSO

A brief look at the steps required to solve a problem using a computer and some of the hardware used.

Using a Terminal

A description of the physical operation of a terminal and some of the keys that have a special meaning to the CYBER.

Introduction to CYBER Time-Sharing

A tutorial on the logging on and off of the CYBER.

File Usage - Local File and Indirect Access to Permanent Files

An introduction to CYBER files and the commands used to manipulate them.

Introduction to ICE Text Editing

A tutorial on entering and modifying files with ICE.

Running a FORTRAN Program - Concepts

A discussion of the concepts of compilation loading and execution.

Running a FORTRAN Program - The PROGRAM Statement

A discussion of the PROGRAM statement and its relation to files accessed by the program.

Running a FORTRAN Program - Control Statement

A discussion of the control statements used to compile, load, and execute a FORTRAN program.

Anyone can view these videotapes by going to the Undergraduate Library in person to make a reservation for use of the videotape equipment. Ask for a copy of the viewing guide when you checkout the videotape for viewing.

Copies (Betamax format) of these videotapes are available for loan from CSO to any instructor wishing to use them in class. They were effectively used in this environment several times last semester with the instructor stopping the playback equipment whenever he/she wished to elaborate further or questions arose from the class.

To borrow a videotape for classroom use and obtain copies of the viewing guide for classroom distribution, call Scott Lathrop (333-6618). If you do not already have access to the required videotape equipment, Betamax viewing equipment can be borrowed from the Office of Instructional Resources (333-3690).

CHANGES TO MICROCOMPUTER SOFTWARE IN GRAB

On January 29, 1981, changes were made to four of the microcomputer support products available on the CYBER via GRAB. The four affected products are: INT8080, Z80, M6800, and M68000.

From a user's point of view, the most extensive changes were made to INT8080. Entering the command

```
GRAB,INT8080.
```

still places the three CCL procedure files I80ASM, I80SIM, and I80PLM in your local area. The I80PLM procedure file has not changed; however, I80ASM and I80SIM have been changed as follows:

- I80ASM now runs only the Intel 8080 cross-assembler (previously, it also ran the interpreter). I80ASM is called by entering:

```
I80ASM,I=source,L=listing,B=Intel binary,T=MUMS binary.
```

- I80SIM runs the Intel 8080 simulator. It is called by entering:

```
I80SIM,B=Intel binary input,I=command input,L=output.
```

In the Z80 procedures, some of the parameter names have been changed:

- Z80ASM is now called by entering:

```
Z80ASM,I=source,L=listing,B=binary.
```

- Z80LINK is now called by entering:

```
Z80LINK,B=file1,P=file2,N=file3,I=file4,LO=file5.
```

Where:

- | | |
|--------------|--|
| <i>file1</i> | is the file containing the object output from the last Z80 assembly. |
| <i>file2</i> | is the file containing a library of segmented text. |
| <i>file3</i> | is the file containing the object output of the link. |
| <i>file4</i> | is the file containing the directives to be executed. |
| <i>file5</i> | is the file receiving the diagnostics and map. |

The main change to the M6800 product is that the default assembly language output file for M68HMPL has been changed to COMPILE. In addition, there has been a major bug fix in this version.

In the M68000 product, M68KSIM has become a binary file rather than a procedure file. An "REW" parameter has been added to allow the rewinding of all files before the simulation. If not specified, no files are rewound.

Additional details are available in the system HELP files and in the new microcomputer Reference Guides: RF-20.1 INT8080, RF-20.2 Z80, RF-20.3 M6800, and RF-20.4 M68000.

MATHEMATICAL SERVICES

IMSL NEWSLETTER

Issue 26 of IMSL's Numerical Computations Newsletter has been received and can be examined in the Consulting Office at DCL, in the IMSL General Information Manual. The newsletter contains articles on:

- Producing probability plots from data.
- A version of the IMSL Library for the PRIME 300/400/500 and 50 series.
- New packages available through the IMSL distribution service: MINPACK-1 and ITPACK-2A.
- User services provided by IMSL.

If you wish to be on the mailing list for the newsletter, write to IMSL at

Sixth Floor-NBC Building
7500 Bellaire Blvd.
Houston, TX. 77036

and indicate that you belong to a subscribing organization, or tell Stan Kerr (175 DCL, 333-4715, or TELL,UN=MATHLIB).

DOCUMENTATION

JANUARY-FEBRUARY ISSUES COMBINED

I am sure all of our users are aware of the many moves and changes being made within CSO. During the semester break, the PDP 11/50 and the phototypesetter used to produce *OFF-LINE* were moved from the Astronomy Building to DCL. Since this movement of equipment necessitated a prolonged period of downtime, it was decided that we would combine the two issues rather than produce an issue using a different format on another machine.

REVISED CSO DOCUMENTATION

Revised Manuals

Introduction to the CYBER 175

Free

An introductory manual for persons using the CYBER 175 for the first time. This is a completely new version of the manual; it has been reorganized, reformatted, and rewritten.

Fortran Conversion Guide

Free

A manual for FORTRAN users who wish to convert from IBM system FORTRAN to CDC CYBER 175 FORTRAN Extended. Revisions have been made on pages 17-19 (CONVPRC procedure changed to MIMI) and pages 27-29 (TIDYPRC procedure changed to TIDY).

RNF Tutorial

Free

A working document currently used for the RNF short course. This working document temporarily replaces the RNF Users Guide. A new system version of RNF is currently being worked on and will be announced along with updated documentation at a later date.

Archive Reference Manual

Free

A manual for users who wish to keep copies of permanent files on tape. Revisions include: RESOURC statement on pages 4, 5, 19, and 20; AD parameter on page 11; and DV parameter on page 12.

Reference Guides

RF-1.4 Creating CYBER File From Card Deck -- has been revised to reflect removal of the CYBER card reader.

RF-1.2 CYBER Rates -- has been revised to reflect the new plotting charges.

RF-5.2 GCS Library -- examples of programs and a plot have been added. Also, commands for accessing version 3-D have been corrected.

RF-11.2 4341 Rate/Charge Estimator -- has been revised to reflect the new plotting charges and the new rate for terminal repair.

Four new microcomputer Reference Guides have been added:

RF-20.1 INT8080

RF-20.2 Z80

RF-20.3 M6800

RF-20.4 M68000

MISCELLANEOUS

GRAPHICS PRESENTATION

Representatives from Tektronix will be giving a presentation from 2:00 to 3:45 PM on Tuesday, February 10, 1981 in the Coordinated Sciences Lab (CSL) auditorium. Slightly less than half this period will be spent in a discussion of graphics in general with emphasis on Tektronix equipment. A Tektronix 4052 Graphic Computing System and a new hardcopy unit will be shown. This will be followed by a presentation of Tektronix' Interactive Graphics Library (IGL) software. This is a powerful language which can be individually tailored to the needs of an application.

CENTRAL ILLINOIS USERS GROUP MEETINGS (DEC)

The following meetings of the Central Illinois Local Users Group (Mainly planned for users or potential users of DEC machines) have been scheduled. Unless otherwise noted, the meetings will be at 4 PM in the Auditorium at the Coordinated Science Laboratory (CSL).

- | | |
|-------------|---|
| February 10 | Graphics terminals. Al Tuchman from CSO will share some of his impressions of the wide variety of graphics terminals on the market today. (See announcement of Tektronics demonstration elsewhere in this issue.) |
| March 10 | Panel discussion on "word processing". What you should look for and expect in a word processing system, whether it is based on a PDP-11, PDP-8 or some other system. (Tentative) |

April 14

Technical description of VAX by DEC representatives. (Time and place to be announced.)

HELP WANTED

RESEARCH ASSOCIATE AND/OR CO-AUTHOR WANTED FOR COMPUTER WORK

Any graduate student or other person who would like to earn over \$5.00 an hour doing some interesting computer work with Professor Stuart Nagel of the Political Science Department should phone him at 359-8541. Total hours per week are about 10 hours at the convenience of the person doing the work.

The work mainly involves running research data through SPSS or SOUPAC statistical programs and through some mathematical optimizing routines. The subject matter of the data generally deals with a causal or evaluative analysis of alternative public policies.

Previous experience with statistical computer work or related work is expected. No programming will be involved, but the person should have a knowledge of how to write control cards for a statistical software package and possibly experience with mathematical software.

This work was formerly performed partly by a graduate student named Marian Neef before she received her Ph.D. In doing the work, she became the co-author of numerous articles, book chapters, and books. This could be an excellent publishing opportunity for another graduate student.

If you are interested or if you desire further information, phone 359-8541.

SPECIAL TEAR-OFF SHEETS

MATH SHORT COURSE SURVEY

In the Spring Semester, as part of our Short Course series, there will be a Math Libraries course giving a general survey of mathematical/numerical software available. We would like to offer at least two or three additional courses on specific numerical or software topics. Please help us decide what these should be by circling your preferences below and returning this sheet to Stan Kerr, 175 DCL.

Curve Fitting

Differential Equations

APEX

Nonlinear Least Squares

ACSL

Nonlinear Programming

Simulation

General Linear Programming

EISPACK

Eigenvalue Problems

Splines

Partial Differential Equations

MPOS

Solving Nonlinear Equations

GASP

SLAM

LINPACK

Symbolic Manipulation -- doing formal algebra by computer

Large Linear Problems -- sparse matrices

Name _____

Address/Phone _____

RETURN TO:

**Stan Kerr
175 Digital Computer Lab
Campus**

REQUEST FOR INFORMATION--TEKTRONIX GRAPHIC TERMINALS

Quite often staff members specify Tektronix Graphic Terminals as hardware items in proposals or in requests for purchase orders. Because of this some effort is being made to obtain an agreement with Tektronix for a quantity reduction in cost.

One item of data is needed from you in order to open the negotiations. Tektronix needs to know an approximate number of terminals planned for acquisition during the next 18 months. If any apply to you, please enter a number in the appropriate blanks below and return to C.E. Carter, 195 DCL.

Tektronix Computer Graphic Terminal

	<i>Purchase</i>	<i>Propose</i>	<i>Plan</i>
4006-1	_____	_____	_____
4010-1	_____	_____	_____
4012	_____	_____	_____
4014-1/4015-1	_____	_____	_____
4016-1	_____	_____	_____
4027	_____	_____	_____
4024	_____	_____	_____
4025	_____	_____	_____
4051	_____	_____	_____
4052	_____	_____	_____
4054	_____	_____	_____
4662	_____	_____	_____
4663	_____	_____	_____
4631	_____	_____	_____
4632	_____	_____	_____

Explanation

The ***purchase*** column means that funds are available and requests are going to be made.

The ***propose*** column means that funds are not available but graphic terminals have been included as budget items in proposals.

The ***plan*** column means neither of the above but a Tektronix terminal will be included when you do propose or purchase.

Name _____

Address/Phone _____

RETURN TO:

Cliff Carter
195 Digital Computer Lab
Campus

OFF-LINE's Mailing List

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

Check one: ☐ New subscriber
☐ Removal request
☐ Address correction

Name: _____

Address: _____

CAMPUS or Zip Code _____

(If address correction, give old address and zip code below.)

Comments:

RETURN TO: **OFF-LINE**
150 Digital Computer Laboratory
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

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COLLECTION DEV DEPT
111 MAIN LIBRARY
CAMPUS

EDITOR: Lynn Bilger
PHONE: (217) 333-6236
139 Astronomy Building
1011 W. Springfield
Urbana, Illinois 61801

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OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of February 24, 1981.

CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

SYSTEM NOTES

JANUARY RELIABILITY REPORTS

CYBER 175

28 recoverable interruptions
27 non-recoverable interruptions
40 of these were for more than 15 minutes

Mean Time Between Failures = 10 hours
Mean Time to Repair = 20 minutes
Availability: 96.6% of scheduled uptime

Major cause of downtime was related to hardware and disk problems.

CYBER 174

9 recoverable interruptions
2 non-recoverable interruptions
4 of these were for more than 15 minutes

Mean Time Between Failures = 30 hours
Mean Time to Repair = 16 minutes
Availability: 99.2% of scheduled uptime

Major cause of downtime was related to hardware and disk problems.

IBM 4341:

10 interruptions
4 of these were for more than 15 minutes

Mean Time Between Failures = 74 hours
Mean Time To Repair = 86.9 minutes
Availability: 99% of scheduled uptime

Major cause of downtime was hardware problems.

CYBER

A PROCEDURE FILE FOR THE BILL COMMAND

From time to time, CYBER users request that additional information be provided at logon. Since users vary widely in what they'd like to see, we suggest that you create a procedure to be invoked at logon to generate the desired information.

As a simple example, suppose that you have created a permanent indirect access file named PROCFIL which contains the following record. (In the simplest case, this would mean that file PROCFIL contains only the following lines.)

```
.PROC,START.
$BILL,chg,prj.
$IF(.NOT.FILE(OPTION,LO))GET,OPTION/NA.
$FETCH.
$HEARYE/F/S=3.
$REVERT.
```

Where chg,prj is your charge and project number respectively. You can then invoke this procedure file at logon instead of issuing the usual BILL or CHARGE command. When invoked, the procedure will supply your BILL command, get your option file if you have one and it's not already a local file, list the names of any files you might have in the FETCH queue, and list the titles of any HEARYE bulletins generated during the last three days. To invoke this procedure, use the command

BEGIN,START.

If you are using time-sharing this command can be abbreviated to

—START.

If the proc above is the first (or only) record in file PROCFIL and if PROCFIL is either rewound or is not a local file, the word START need not be specified on the above commands. In this case, logon to a time-sharing terminal at its briefest would look like:

SIGNON: 123456789

PASSWORD:

RECOVER/CHARGE: —

CCL provides more elaborate facilities you might want to investigate. You can, for instance, have more than one proc in PROCFIL and can pass parameters to procs at the time they are invoked. There are CCL statements which can make use of passed parameters to govern the sequence of commands to be executed. CCL is documented in the *NOS Reference Manual*, Volume 1, chapter 4.

NEW EASY GRAPHING SOFTWARE

In early March, CSO will install Tektronix' PLOT-10 Easy Graphing plotting program. No programming knowledge is necessary for a user to produce plots, bar charts, or pie charts using Easy Graphing. Although this program is intended to be used on the Tektronix graphics 4010 family of terminals, we have modified Easy Graphing to also produce plots on the ZETA plotters. The April issue of *OFFLINE* will contain a more detailed description of Easy Graphing, its capabilities, and examples of its use. A user's pocket reference guide for Easy Graphing may be purchased for \$1.00 at the Distribution Center, 1208 W. Springfield. The complete users manual is expected to be in stock very soon. We plan to offer a short course for Easy Graphing later this semester.

MATHEMATICAL SERVICES

TRANSACTIONS ON MATHEMATICAL SOFTWARE

Two articles appeared in the December 1980 issue of *Transactions on Mathematical Software* which may be of special interest to our users:

- **A Survey of Software for Partial Differential Equations** by Marek Machura and Roland A. Sweet. This article describes a number of known PDE packages.
- **PERUSE: An Interactive System for Mathematical Programs** by William Kurator and Richard O'Neill. This article describes a system for interactively examining the data and solutions of large linear programs.

We now have on tape all TOMS algorithms through December 1980. For information about this tape, enter the following:

```
GET,TOMS/UN=MATHLIB.
PRINT,TOMS.
```

MATH NOTES

A series of informal writeups on various math software topics, prepared by Stan Kerr, is available on the CYBER. These writeups are accessed through a procedure file called MNOTES in user number MATHLIB, and identified by number (currently 0-10). MNOTES is accessed by the command:

```
GET,MNOTES/UN=MATHLIB.
```

Then, to print note number 6, for example, you would enter:

```
MNOTES,6,OUT=lfm.
PRINT,lfm/AS/CC.
```

Where *lfm* is any valid file name. If you omit the parameter *OUT=lfm*, the default file OUT is used for *lfm*, so you can enter:

```
MNOTES,6.
PRINT,OUT/AS/CC.
```

To print all current notes, enter the following:

```
MNOTES,ALL.
PRINT,OUT/AS/CC.
```

If you enter just the command

```
MNOTES.
```

you will receive on your terminal a directory of currently available notes.

As of this writing, the current notes are:

- 0 A description of MNOTES.
- 1 A brief outline of math software available on the CYBER.
- 2 A description of procedure CAT/UN=MATHLIB, which gives an annotated directory of MATHLIB.
- 3 (unused at present)
- 4 Summary of math libraries with descriptions.
- 5 Description of IMSL products and services.
- 6 Description of TOMS (*Transactions on Mathematical Software*).
- 7 Summary of simulation languages and programs.
- 8 A list of possible sources of software, if you are searching for something.
- 9 Routines for ordinary differential equations.
- 10 A *nice* writeup on LSODE, the latest version of the Gear algorithm for ordinary differential equations.

We stress that these notes are informal and will certainly change with time, as new information is added. Your comments and suggestions are welcome. Please direct any questions to Stan Kerr, 175 DCL (333-4715), or TELL,UN=MATHLIB.

NEW MATH SOFTWARE

CSO has recently acquired the following software. Although this software is on the system and can be accessed and used, it is not currently available via the GRAB command. If you wish to use any of the new software, or have questions, please contact Stan Kerr, 175 DCL (333-4715).

- Algorithms from the December 1980 issue of TOMS (*Transactions on Mathematical Software*):
 - 563 A program for linearly constrained discrete l_1 problems.
 - 564 A test problem generator for discrete linear l_1 approximation problems. (As received, this one is incomplete, but a correction is forthcoming.)
- NL2S0L, an adaptive nonlinear least squares algorithm by J. E. Dennis, D. M. Gay and R. E. Welch of the University of Wisconsin at Madison, distributed by IMSL.
- Algorithms for integer goal programming, using branch-and-bound and implicit enumeration, by Sang M. Lee of the University of Nebraska.

- ARSTEC, an adaptive random search ("Monte Carlo") technique for nonlinear optimization problems, from Argonne National Laboratory.
- ADBASE, a multi-objective function linear programming package by Ralph Steuer of the University of Kentucky. This was purchased by Dave Whitford of Finance and donated for public use.

XMP UPDATES

Updates for the linear programming library XMP have been installed and are available by entering:

GRAB,XMP/F.

If no problems arise, this version will become the default XMP by May 1, 1981. The updates include:

- Faster versions of XCAND and XDCHQ. The calling sequence for these has changed.
- Generalized upper bounding (GUB) routines.
- A parametric routine XPARAB.

See Stan Kerr, 175 DCL (333-4715) or TELL,UN=MATHLIB for documentation on the updates.

TEXT PROCESSING

DIABLO SERVICES

We have been getting quite a few questions about the Diablo Service and felt that a repeat of the information published earlier in *OFF-LINE* may be of help to our users.

All RNF source files must contain the .LPT command in the first line of the file, and must be processed through RNF into an output file. Users unfamiliar with RNF are referred to the *RNF User's Guide* or the *RNF Reference Manual* (available in the Distribution Center, 1208 W. Springfield). All non-RNF source files must have carriage control and begin with a page eject. The RNF output file or the non-RNF source file can then be submitted to the Diablo queue via a CYBER CCL procedure called DIABLO.

After you have prepared your file for submission, you should access and execute the DIABLO procedure by issuing the following commands from time-sharing on the CYBER:

GRAB,DIABLO.
DIABLO.

The procedure prompts you for your surname and whether or not you wish to charge the printing to a UOI account number. Costs for printing can only be charged to "real money" UOI accounts; class accounts or research board accounts are not allowed.

If you choose to pay by UOI account number, you will be prompted for the account number and title at the time the procedure is running. If you choose to pay by check, you will not be prompted for an account number or title. You will also be prompted for a choice of the pica or elite font and you will be asked for the name of your local file containing your RNF output.

NOTE: The procedure will not perform a GET if it cannot find a local file by the name given.

Finally, at the conclusion of the procedure, you will be told the number of PRUs (one PRU equals 640 upper case characters, 320 lower case characters) and the dollar cost associated with its printing. The charge is \$0.05 per PRU. All charges continue to be rounded up to the nearest dollar.

You will be sent a message on the CYBER once your file has been printed on the Diablo. You may pick up your printout at room 123 DCL. If you chose to pay by check, you should make out a check at that time to the University of Illinois for the amount indicated on the billing sheet you receive with your printout. If you chose to pay by UOI account number, your account will automatically be billed for the cost indicated on the billing sheet.

It should be pointed out that once something has been submitted to the queue it will be printed and you will be charged! Please take every precaution to print your RNF output on an upper and lower case line printer or DECwriter prior to submission to the Diablo queue. Refunds will not be given for printouts submitted by mistake.

The following conventions have been established for files printed on the Diablo:

- The top of the form (page) will be set to one line below the horizontal perforation in the paper.
- Plain white 20-lb. paper, 14 7/8" wide by 11" long, will be used.
- If the pica font is selected, the printing will be done with 10 characters and 6 lines per inch.
- If the elite font is selected, the printing will be done with 12 characters and 6 lines per inch.

On-line help is available by entering the command

HELP

and then by entering DIABLO (the name of the procedure) after the question mark prompt.

If you have any questions concerning this service, please call the operator at 333-8150.

MISCELLANEOUS

FROM PLUG-BOARD TO PASCAL

This article is a reprint from *INTERFACE* (volume 7, no. 10, May 1980), the newsletter of Arizona State University Computer Services. The author, Billy G. Wood, is an Associate Professor in the College of Engineering, Department of Technology at Arizona State University.

From plug-board to PASCAL and from sticks and stones to silicon chips, we can trace the development of the present day microcomputer. Man has built and used mechanical aids to computing since long before the present number system was fully developed. Probably one of the first such aids used was a quantity of sticks or stones which acted as a tally and represented an early herdsman's wealth. Today, that same wealth is represented by tiny, invisible, magnetized spots on a roll of magnetic tape stored in a bank vault. Most of us are familiar with the computational aids which were popular in the earlier part of our century; specifically, the mechanical calculator and the slide rule. The mechanical calculator and adding machine had their beginning in the toothed wheel devices used as tallying or adding machines in the nineteenth century. The slide rule which was the badge of the science or engineering student on campus in the late forties began with Napier,¹ who also invented tables of logarithms. Most of us have used those to aid in computing numbers to a high degree of precision. Here we see examples of two methods of mechanical computing, one discrete, or digital, and the other linear, or analog. The adding machine or mechanical calculator represents the relatively simple counting or tallying method of computing, and the slide rule represents analog computing.

World War II furnished much of the early impetus to improve mechanical computing of all types. Accurate tables of trigonometric and logarithmic values were needed for better maps and navigation. More complete ballistic tables were needed to do accurate gun aiming, and as weapons became more and more sophisticated, including automatic weapon directing by radar and other complex detectors, electronic methods of computing had to be improved to match the capabilities of the rest of the weaponry. Analog computing reached a high level of perfection shortly after the war. Aerospace companies such as Boeing and Goodyear Aerospace built, used, and sold vacuum tube analog computers whose accuracy was limited only by the accuracy of the components built to program them. This limitation proved to be fatal to the analog computer, since it meant that a physical limit would be reached beyond which more and more money and effort would be required to make the computer only slightly more accurate. In the case of even the early digital computers, however, designers could easily see that no limit to the precision of the result would be reached, provided more and more steps were accomplished in the program.

Two devices were developed in 1946 which were to culminate in the present microcomputer. One of these was the transistor, and the second was ENIAC.² The transistor received some publicity from Bell Laboratories, but the first digital computer, ENIAC, could not even generate support from venture capital to finance its own successor, until the Bureau of Census decided it needed a computer.

ENIAC contained 18,000 vacuum tubes and had to operate with a 1 in 10¹⁴ probability of malfunction to keep it going for 12 error-free hours.³ The first transistor was a crude, delicate, and low bandwidth device. However, even at its beginning, it was already much more efficient than a vacuum tube because it did not require any filament power. In addition, and ultimately just as important, it was much smaller than a vacuum tube.

Vacuum tubes were first used as the active devices for the first generation of computers - from 1946 to 1956 and beyond. Machines of that time like the IBM 407 were unit record machines usually capable of one or two simple operations like reading a deck of time cards, multiplying them individually times a deck of personnel cards, and thus producing a set of paychecks. The programmer was a mysterious

individual schooled in the black art of how to plug a huge bundle of wires into a plug-board and store a program which would do that week's payroll.

The IBM 650* was many present-day computer manager's introduction into digital computing. It had a drum memory as the basic storage device for both program and data (just as John Von Neumann had suggested),⁴ and thus had the important capability of modifying and testing its own program as it was executing it.

With the introduction of the core memory and a read-modify-write cycle time reduced to less than a microsecond, the digital computer began to take on the architecture which we recognize today. Operating systems were invented to aid in program development, and high-level languages like FORTRAN were written to simplify the tedious coding and debugging of long programs. The IBM 709* and the SAGE air defense computer were examples of machines of this, the most advanced of tube-type computers.

By 1959, the alloy junction transistor was well perfected and being produced in sufficient quantities to be used in one of the first mass-produced second-generation computers, the IBM 1401*. This machine usually cost about \$250,000. It used transistors as the active devices and other discrete parts with which to build individual flipflops or gates on single-sided print circuit cards. The cards were then assembled like building blocks into the complete machine. These features made possible an important facet of the manufacturing of this machine; that is, automatic production methods. The printed circuit boards used were all produced by an automatic assembly line and, more importantly, the back-plane intermodular wiring between printed circuit boards was done by automatic wire-wrapping machines not subject to human error. All of the interconnections were stored in a computer and the wiring diagrams which accompanied the 1401* in the field were then printed on an IBM 1403* line printer which was in turn controlled by a 1401 computer. This must certainly rank as a machine lifting itself by its bootstraps!

By 1964, the term "integrated" circuits was established, and several devices of these types were available in the marketplace. They were expensive and consisted of just 20 to 25 active devices (transistors) on each silicon chip less than 1/8" square, but they were the seed which would grow in the next decade to the present microcomputer industry.

In the 1960's another type of computing system was introduced, called the minicomputer. This type of computer is usually defined as costing less than an arbitrary number of dollars; \$50,000 was one such limit. One of the first to be manufactured in large numbers was the Digital Equipment Corporation PDP-8.** Because minicomputers cost much less than any previous large-scale system, schools and government labs were able to justify the purchase of a computer much more easily, and more and more students and teachers were able to see the value of computers in business and schools.

Users groups began to trade universal programs which any laboratory could use in research or teaching. Although the systems were relatively low cost, they had sufficient computing power so that extensive operating systems were developed including time sharing one machine between several simultaneous users; something which had previously been done only when using large systems.

It is readily apparent that as time went on more and more computing capability was being bought for less and less money. For example, the IBM 1401* costing \$250,000 had less arithmetic capability and memory than the simple DEC PDP-8,** just discussed at less than \$50,000.

The economic pressure which was causing this came largely from the semiconductor industry. If a plot against time,⁵ was made of the number of active transistors constructed on each silicon chip, it was startlingly evident that semiconductor density was increasing at a geometric rate. Since a given process used to make these devices took the same number of manufacturing steps regardless of the ultimate complexity of the chip, the consumer was getting more and more transistors for the same money.

Thus, the cost of computing capability was steadily decreasing. In addition, the semiconductor manufacturers were faced with a kind of unprecedented problem for any industry. What does one build, given the ability to put literally thousands of decision-making devices in one piece of equipment? The finished device would be less than 1/4 inch on a side and would cost less than \$5.00 to \$10.00 when mass produced, and must appeal to hundreds of thousands of people in order to support a production run. The natural evolution of computing capability provided the answer; first with the scientific calculator, and finally in the microcomputer.

The Motorola 6800 and INTEL 8080 were first produced about a year apart in 1973 and 1974. Each contained about six thousand transistors within their integrated circuits. On the front cover of Popular Electronics magazine in January 1975, another era of computing was ushered on the world's stage. Using the INTEL 8080, MITS, Incorporated of Albuquerque, New Mexico, made the first personal computer, the Altair 8800.*** Shortly after, they followed it with the Altair 680,*** using the Motorola 6800. It was now possible for anyone to buy a computer for less than \$1000, containing more arithmetic capability and memory than the IBM 1401* of less than 10 years previous.

The pace of increasing circuit density has yet to slacken. Today (1980), Motorola is beginning to build the 68000 with over 70,000 active devices in one integrated circuit, and designers are projecting chips with 1,000,000 devices in the immediate future.

It is now routine to build an entire computing system using only one circuit. Memory, input/output, and arithmetic capability, all are simultaneously manufactured ready to plug in, turn on, and operate.

In the memory space of a microcomputer, a program is usually permanently recorded within a type of memory designated as "read only memory" or ROM where it cannot be erased or changed. This program will execute as one of the high-level languages, such as BASIC.† A complete computer system has recently been manufactured which executes the relatively new high-level language, PASCAL. Thus, we have now come full circle from the plug-board with its semipermanent memory or "ROM" executing each step of an early program to the new semiconductor ROM containing an entire language in permanent memory ready to operate as soon as power is supplied.

At a local department store before Christmas, 1978, for less than \$50, a machine could have been purchased which could have given this address without it having to be spoken by a human being. Texas Instruments is presently selling a teaching aid or game called "Speak and Spell" † † which synthesizes human speech without it being prerecorded, or spoken. Again, surely an unprecedented example of a machine lifting itself by its own bootstraps. It would have been an address spoken by a computer, about the history of how it came to exist. Since writing this article, another earth-changing development has come upon the scene. In November of last year (1979), a company offered a board for less than \$2000 which can be taught to recognize from 40 to 100 spoken words. Now the machine can listen, understand, and then use the voice mentioned above to reply. Before long, will we be able to tell the difference between the machine and people?

FOOTNOTES

* Registered trademarks, IBM Corporation, Armonk, New York.

** Registered trademarks, Digital Equipment Corporation, Maynard, Massachusetts.

*** Registered trademark, MITS Incorporated, Albuquerque, New Mexico.

† Beginners All-Purpose Symbolic Instruction Code, Dartmouth College, Dartmouth, Pennsylvania.

† † Registered trademark, Texas Instruments, Dallas, Texas.

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1. *A History of Mathematics*, J. F. Scott, Taylor and Francis, London. 1975.
2. *Implementing the ENIAC*, John W. Mauchly. CHEMTECH, December 1975. pp. 722-727.
3. Ibid.
4. Von Neumann, J., Goldstine, H., *On the Principles of Large Scale Computing Machines*, Vol. 5., A.H. Tanb, Editor. Macmillan, New York, New York. 1963.
5. *Microprocessor Interfacing Techniques*, Austin Lesea and Rodney Azks, Sybex. 1977. p. 17.

SALES - EXCHANGES - HELP WANTED**TEKTRONIX GRAPHICS DISPLAY**

I have a Tektronix Graphics Display Terminal (4010-1) and Hard Copy Unit (4610) that I would like to exchange for other terminal equipment. Anyone interested in obtaining these at a significant discount over the manufacturer's price, please contact Jim Karr, 102a Vivarium, 333-1633 before March 12 (or after March 31).

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CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

RESEARCH BOARD ANNOUNCEMENT:
NEW COMPUTER ALLOCATION MODE (SARA)

The following article explains a new option to be used by the Research Board for computer allocations. A new form, Form X, will be used in submitting requests for these funds. This form will be included in the package that the departments will receive from the Research Board. The second article contains the deadline dates for submission of all requests.

General Description

With this round of allocations, an experiment will be initiated to reduce the paperwork involved in making occasional use of campus computing facilities. For those faculty and dissertation students whose use is less than about 1000 service units per year, an automatic and recurring allocation will be offered as an alternative to the present semiannual allocation request procedure.

The effect of this change will be to exempt those users electing this option from the standard allocation review process. Based on current usage patterns, a significant reduction in administrative work should result if qualifying users accept this alternative. It should be emphasized that the main purpose of this change is to simplify the campus allocation procedures. It does not increase the total resources provided by CSO. The total computer allocations must continue to follow the managed rate of growth established in the last three years.

The success and continuation of this experiment will depend on user reaction. The new allocation alternative assumes that small users will continue to use the computer according to the present pattern. Under these circumstances, the new alternative should prove much more convenient for smaller users as well as for their departmental units. However, CSO remains responsible for protecting the general quality of available computer services and for maintaining the financial integrity of the system. If either of these requirements is jeopardized by this experiment, it will be necessary to make compensating adjustments.

How It Works

For concise identification, the new allocation mode will be referred to as SARA (Small Automatic Recurring Allocation). Under the SARA alternative, any faculty member may simply sign up (see next section); all processing from that point on will occur automatically. An initial allocation of 100 service units will be given and each week 30 service units will be added. Accumulation will be limited to 200 service units, but will carry forward continuously without expiration as long as the account is used.

Users whose patterns of computer use are incompatible with this allocation mode should make a specific request for computer time through their departments. The weekly allocation schedule described here will not be modified for individuals.

How to Apply

To start this new system off, the department may list any faculty members who wish to elect this alternative on Form X, but exclude them from the departmental request on Forms A and B. No justification form (Form A) is necessary for those choosing this option. No further action is needed in future periods unless the user wishes to convert to the standard allocation system and be included in the departmental request.

Rules for Users

The SARA alternative is intended as a substitute for, rather than a supplement to, the departmental allocation process. Thus, there are several conditions on its use.

- For those who choose to use SARA, no other campus allocation will be given (i.e., a user can't be in both the departmental pool and the SARA pool).
- SARA allocations are for individuals and are not transferable to other users.
- Use of SARA allocations will not be charged against departmental allocations.
- SARA allocations will become available on June 28, 1981.
- User status under SARA will be inactivated after six months of no use.

Graduate students, at the time when they are working on their thesis or dissertation research, will also be eligible for SARA allocation, although they cannot be on both this and the "free student" account (PS3445). (CSO will remove any user from PS3445 who is given an allocation of this type.) To include a

dissertation or thesis student user, please identify both the dissertation/thesis committee chairman and the student on Form X.

After this initial group of faculty and students is activated (June 28, 1981), other qualifying users may request this allocation mode by simply filling in a request form and presenting it to CSO.

One potential problem raised by this easier access to campus support is that it might divert available grant and contract funds of small users from paying for CSO services. This income is absolutely essential to CSO. Therefore, SARA usage will be closely monitored to determine whether levels of support from departments as a whole decline. Additional steps to encourage users to use external funds in partial support of CSO service charges will be announced soon.

RESEARCH BOARD DEADLINE FOR DEPARTMENTAL ALLOCATION REQUESTS

The Research Board has established an April 15, 1981 deadline for the submission of all departmental requests for research computer allocations and for submission of requests for SARA allocations. This deadline affects allocations for the period June 28, 1981 through December 22, 1981.

Research Board allocations are expected to support faculty research, thesis and dissertation research. Departmental requests and the allocations they subsequently receive are based on individual user requests. Those persons who will need research computer time for this allocation period should be sure to submit their requests to their department via the Research Board forms. These forms and further instructions are available through the University departments.

CSO SHORT COURSES

CSO is offering the following short courses during the remainder of the 1981 spring semester to acquaint people with our facilities and the Control Data Corporation (CDC) CYBER 174 and CYBER 175 computer systems. To register for a course, either come in person to Room 150 DCL or call 333-6630.

Registration is free and limited to 30 people in some classes. If all available classes on a topic are full, leave your name on our waiting list. We will call you if an opening occurs. The courses being offered are as follows:

1. INTRODUCTION TO THE CYBER COMPUTER SYSTEM

This course is intended for the first-time user of the CYBER computer system. One class (3 sessions) is being offered:

April 6, 8, 10 11-12 AM, Room 239 DCL

2. NCAR PLOT PACKAGE

This class is an overview of the facilities and general use of the NCAR plotting package. NCAR allows 3-D plotting, contour plots and world map projections. Familiarity with FORTRAN and the CYBER is assumed. One class (1 session) is being offered:

April 9 2-3 PM, Room 239 DCL

3. EASY GRAPHING

This is a high-level interactive plotting program for X-Y plots, bar charts and pie charts. Its English-like commands require no programming experience to generate plots. Familiarity with the CYBER is assumed. One class (2 sessions) is being offered:

April 21, 23 2-3 PM, Room 239 DCL

4. INTRODUCTION TO RNF

This is a beginning-level introduction to using the RNF text formatter, used for preparation of letters, manuals and other documents. Topics will include tabbing, underlining, margins, spacing, paragraphing, and justification. Familiarity with the CYBER is assumed. One class (3 sessions) is being offered:

April 6, 8, 10 3-4 PM, Room 239 DCL

5. INTERMEDIATE RNF

This class assumes basic knowledge from the RNF introduction. Topics will include macros, variables, arrays and applications. One class (3 sessions) is being offered:

April 13, 15, 17 3-4 PM, Room 239 DCL

6. CURVE FITTING

This class will cover the mathematical software available to do curve fitting. One class (3 sessions) is being offered:

April 6, 8, 10 10-11 AM, Room 239 DCL

7. SOLVING LARGE LINEAR PROBLEMS

This class will cover the mathematical software used to tackle such large problems. One class (3 sessions) will be offered:

April 27, 29, May 1 3-4 PM, Room 239 DCL

8. SAS

This is an introductory course on the SAS statistical package. Course topics will include:

- Preparation of data for input
- The SAS 'DATA' step
- Manipulating the input data: modifying variables, creating new variables, deleting observations or variables
- Sorting data
- Obtaining basic statistics, frequencies, plots
- Analysis of variance, correlation, regression

One class (3 2-hour sessions) is being offered:

April 6, 8, 13 7-9 PM, Room 241 Comm West

SYSTEM NOTES

FEBRUARY RELIABILITY REPORTS

CYBER 175

16 recoverable interruptions
8 non-recoverable interruptions
9 of these were for more than
15 minutes

MTBF = 21 hours
MTR = 21 minutes
Availability: 97.2% of scheduled uptime

Major cause of downtime related to ECS and disk problems.

CYBER 174

11 recoverable interruptions
3 non-recoverable interruptions
9 of these were for more than
15 minutes

MTBF = 36 hours
MTR = 36 minutes
Availability: 98.2% of scheduled uptime

Major cause of downtime related to ECS and disk problems.

IBM 4341

10 interruptions
 5 of these were for more than 15 minutes

MTBF = 63 hours
 MTR = 58.9 minutes
 Availability: 98.2% of scheduled uptime

Major cause of downtime was related to
 software problems.

MTBF = Mean Time Between Failures
 MTR = Mean Time to Repair

PAGE PRINTING SYSTEM (PPS) NOW AVAILABLE

CSO has made arrangements to print users' output on the Honeywell Page Printing System (PPS) installed at the campus office of Administrative Information Systems and Services (AISS). This machine uses an electrostatic printing process to produce output on 8.5 by 11.5 inch sheets of paper at a rate of 90 pages per minute. Lines are oriented along the 11.5 axis. The top of each sheet is punched to fit a standard three-ring binder. The character set used is identical to that on the IBM printers at DCL. Print quality is very good.

IBM users can request that their output be printed on the PPS by including the ID card

`/*ID FORMS=PPS`

in their job. CYBERS users can direct a file to the PPS by using the `/FORMS=PPS/RJE=LOCAL` options on the `PRINT` command. For example:

`PRINT/FORMS=PPS/RJE=LOCAL,local file name.`

The usual paper-saving measures are applied to PPS output. Users wishing to have page ejects inserted in their output rather than the normal substitute of three blank lines must specifically request this processing. To request this, IBM users should include the ID card

`/*ID EJECT=YES`

in their job. CYBER users should use the `/EJECT` option on the `PRINT` command.

Users requesting PPS printing should be aware of several limitations:

- ◆ The PPS can print at most 64 lines/page. Pages containing more than 64 lines will overflow onto a second page.
- ◆ Only the following carriage control characters will be honored:

single space (blank)
page eject (1)
double space (0)
triple space (-)

other carriage control characters will cause unexpected results. In particular, note that overprinting is not possible.

Jobs to be printed on the PPS are dumped to tapes which are carried to AISS for processing according to the following schedule (Monday through Friday only):

Jobs dumped to tape	Output available for pickup at the DCL Routing Room
8:00 AM	2:00 PM same day
9:30 PM	9:00 AM following day

The charge for using the PPS is identical to the charge for using the line printer.

CYBER

UPDATE ON LOW-COST WEEKEND RATES

Based on the utilization between January 20, 1981 and February 28, 1981, the effect of low-cost computing on the weekends was a little better than expected. About 19 percent of the work was billed at the low-cost rates. The largest benefit went to users of Research Board allocations. This benefit more than offset the decreases in allocations made in anticipation of the effect.

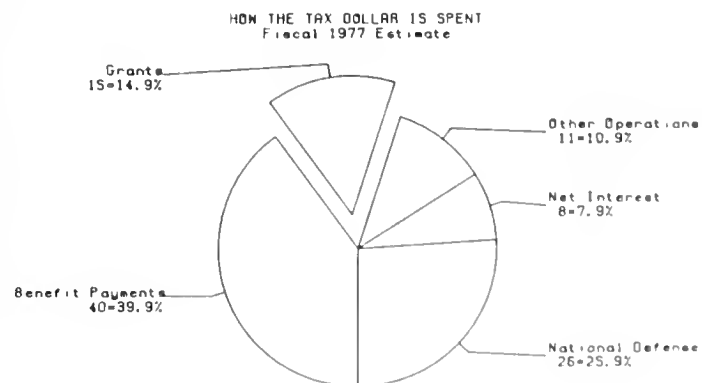
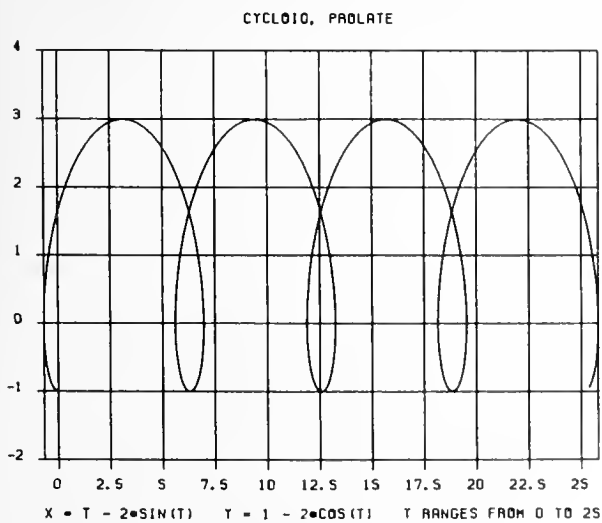
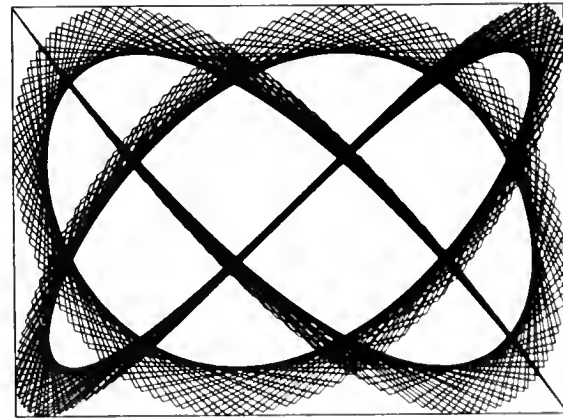
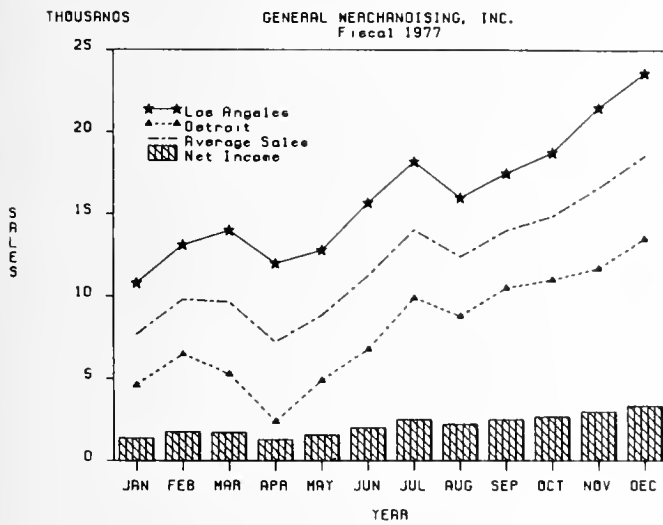
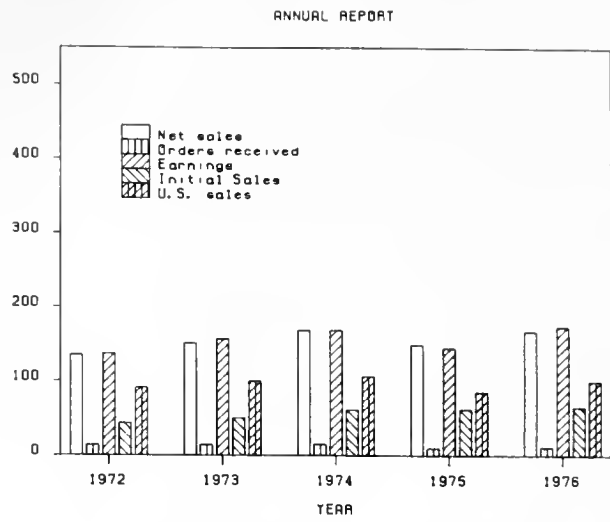
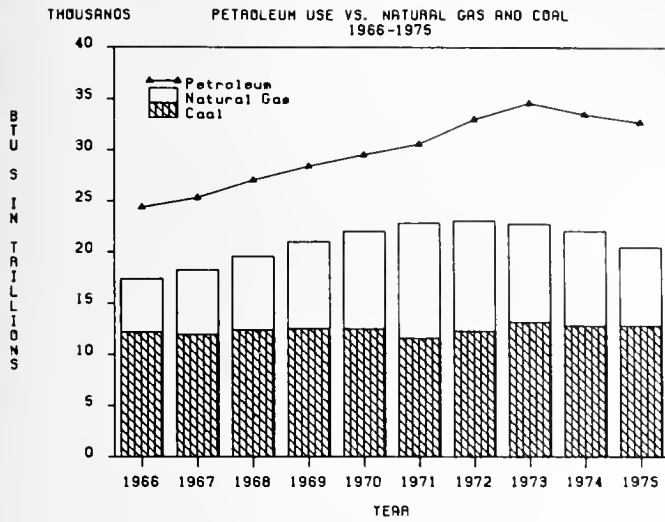
EASY GRAPHING

Easy Graphing is here! It is running on the CYBER 174 and CYBER 175. The English-like commands used in the Easy Graphing package require no programming knowledge and allow the user to produce plots, bar charts and pie charts with little effort. Some experience with the CYBER system is helpful, however. Experienced users and programmers will also find Easy Graphing a useful tool for producing plots because of its easy-to-use commands and its interactive nature.

The program, as purchased from Tektronix, supports the Tektronix 4006, 4010 and 4014 graphics terminals. Locally we have modified Easy Graphing so it can produce a hard copy of the plot on our ZETA plotters. Figure 1, on the following page, shows some sample plots which were produced using the Easy Graphing package. These plots illustrate the typical format of Easy Graphing's output.

This article describes the production of a simple plot. For details describing the use of Easy Graphing, the Plot-10 Easy Graphing Users Manual is available for purchase at the CSO Distribution Center, 1208 W. Springfield. A copy of this manual is available for inspection in the Systems Consulting Office, Room 166 DCL. The manual is tutorial in style, and is strongly recommended for those users who have little experience with graphing. A summary of the Easy Graphing commands can be found in the Easy Graphing User's Reference Guide, also available for purchase at the Distribution Center. This pocket-sized manual may be sufficient documentation for those users more experienced with computer graphics software. The guide is quite handy to have during a terminal session.

FIGURE 1



Let us follow Professor Terri Scalare, an ichthyologist, as she plots some of her experimental data. Professor Scalare has been breeding and raising fish, *Tropheus moorii* and *Tropheus duboisi*, from Lake Tanganyika. Every few days the fry (newly hatched fish) are measured and their size recorded. The data collected is shown in Table 1.

TABLE 1

Growth of *Tropheus* fry*

T. moorii		T. duboisi	
day	size (cm)	day	size (cm)
1	1.5	7	1.5
4	1.8	11	1.8
7	2.0	17	2.1
11	2.3	23	2.4
17	2.7	28	2.6
23	3.0	34	2.8
28	3.1		
34	3.2		

* Data from Scheuermann, Heinrich, "The Genus *Tropheus*", in Buntbarsche Bulletin, The Journal of the American Cichlid Association, No. 71, April 1979.

Professor Scalare now logs onto the CYBER at a graphics terminal, and issues the following control statements:

```
GRAB,EZGRAPH.
EZGRAPH.
```

Easy Graphing begins, and prompts for input with an asterisk (*). Now Terri enters her first set of data into Easy Graphing variables. She types the command ENTER, the variable name, and the values:

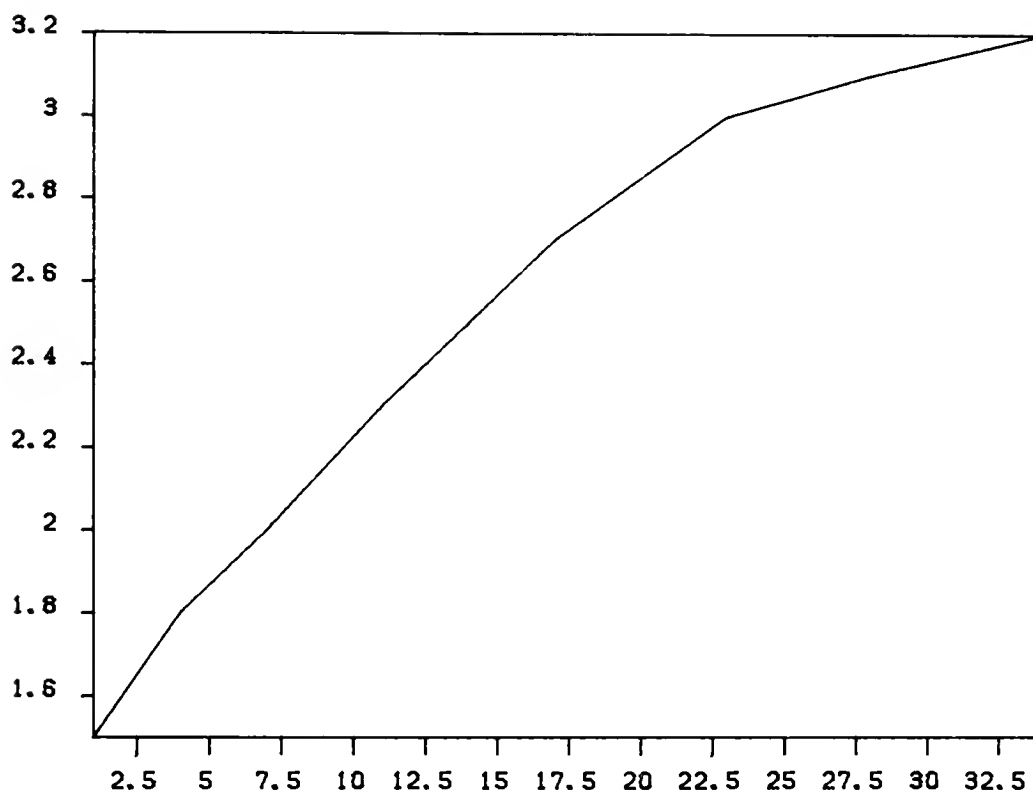
```
ENTER DAY1 1 4 7 11 17 23 28 34
ENTER MOORII 1.5 1.8 2.0 2.3 2.7 3.0 3.1 3.2
```

Then she types the GRAPH command, choosing the X and Y variable names:

```
GRAPH DAY1 MOORII
```

She is rewarded with a plot on her screen that looks like Figure 2.

FIGURE 2



Excited by the simplicity of use, Terri decides to refine the format of the graph. For example, she prefers that the range of the X axis extend from 0 to 35 days and that of the Y axis from 0 to 4 cm. She also wants the plot labelled with a title, subtitle (Easy Graphing calls this a date) and axis titles on each axis, so she enters:

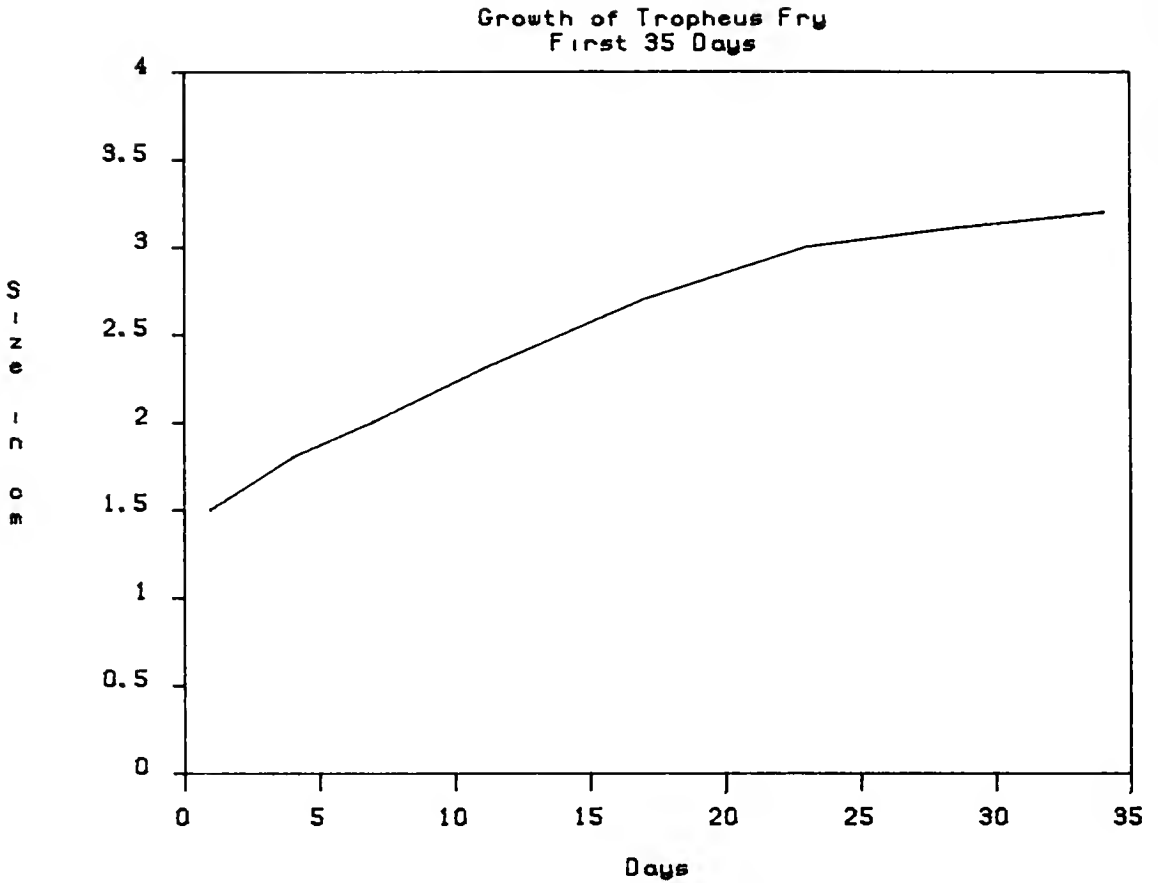
```

XRange 0 35
YRange 0 4
Title 'Growth of Tropheus fry'
Date 'First 35 Days'
XTitle 'Days'
YTitle 'Size in cm'
GRAPH

```

Terri now sees Figure 3.

FIGURE 3



Note that the command GRAPH always causes a new graph to be generated. This form, given without variable names, redisplayes the previous graph, but with all the newly chosen options included. For example, to now change the X axis title, Terri enters:

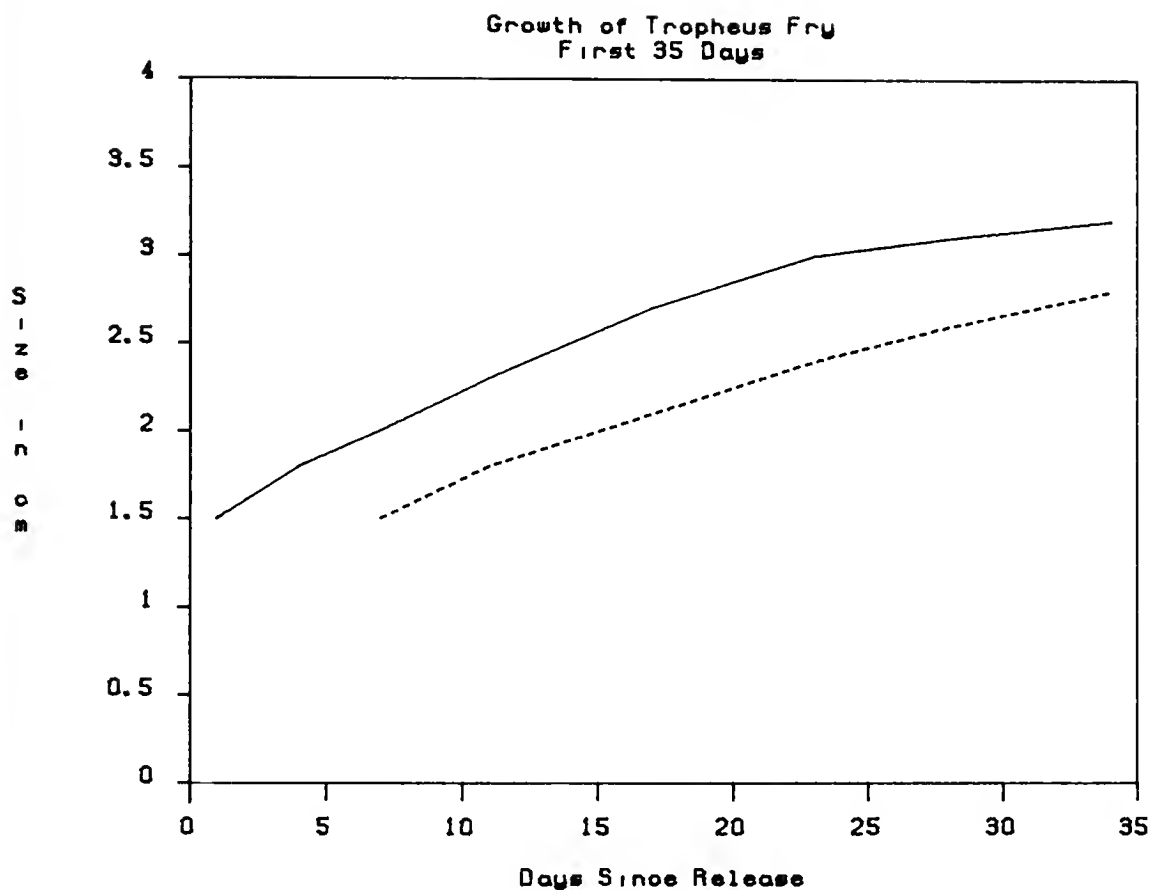
```
XTITLE 'Days Since Release'
```

The next time a GRAPH command is entered, this X axis title will be used. Terri would like to add the second set of data to this existing graph, so she types:

```
ENTER DAY2 7 11 17 23 28 34
ENTER DUBOISI 1.5 1.8 2.1 2.4 2.6 2.8
ADD DAY2 DUBOISI
GRAPH
```

She now sees Figure 4.

FIGURE 4



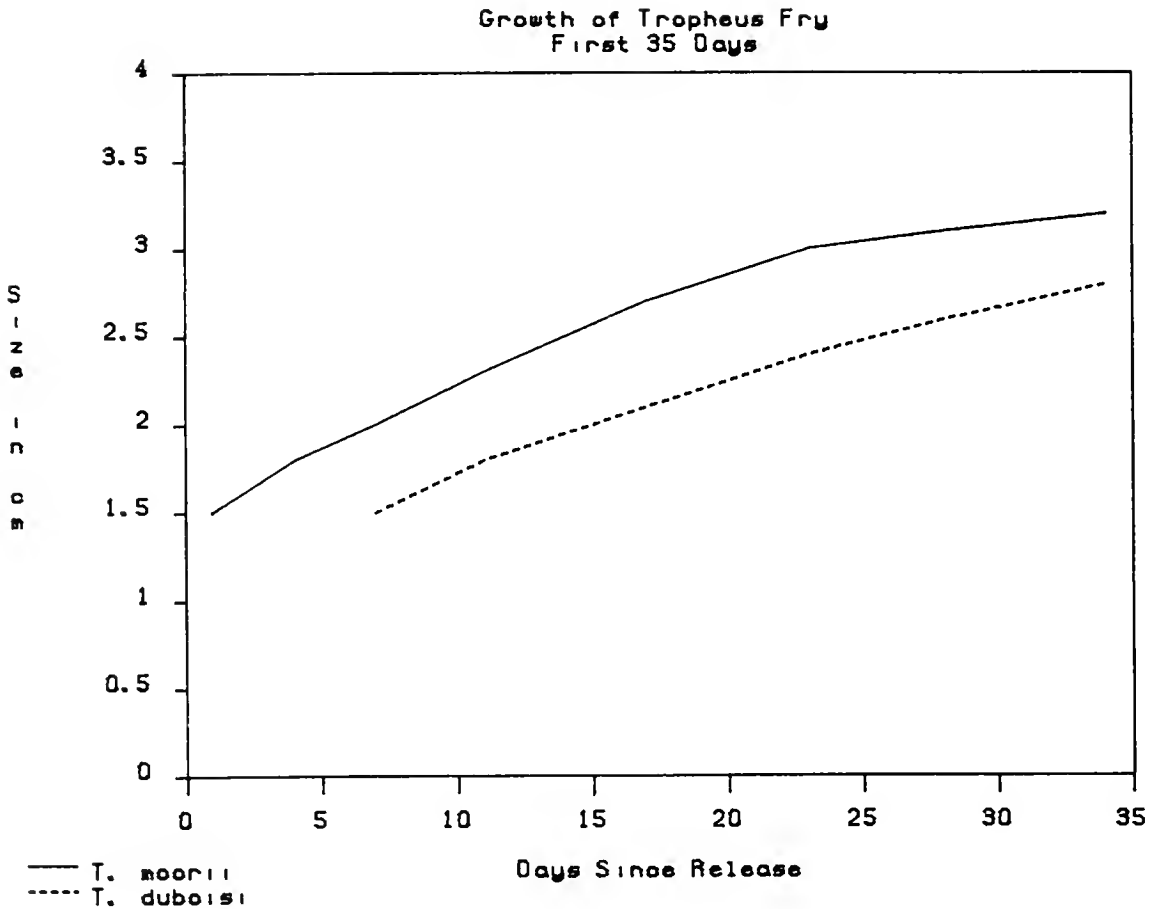
Easy Graphing automatically chooses a different line type (dash) to distinguish between curves (Figure 4), but our experimenter wants a legend to identify the curves. Curve 1 is for *T. moorii*, and curve 2 for *T. duboisi*, so the commands are:

```

LEGEND 1 'T. moorii'
LEGEND 2 'T. duboisi'
GRAPH
  
```

This produces Figure 5.

FIGURE 5



Terri wants a small symbol to mark each data point on each curve. Checking her Reference Guide she notes that a diamond is symbol number 3 and a circle is symbol number 5. As a final touch, the legend is repositioned to make it more prominent (see the manual for an explanation of the legend positioning). To produce this final plot, Terri enters:

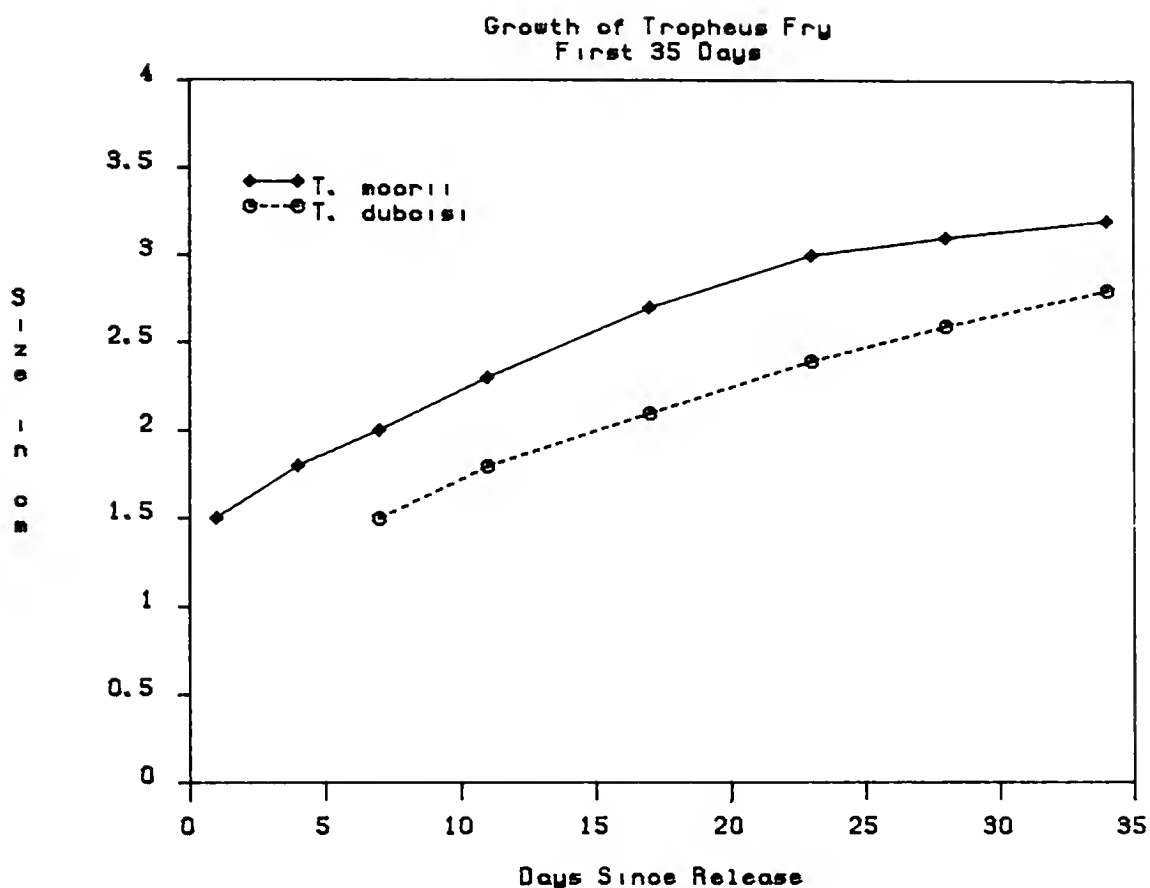
```

SYMBOL 1 3
SYMBOL 2 5
LEGEND 25 80
GRAPH

```

The final plot then looks like Figure 6.

FIGURE 6



The Easy Graphing session is terminated with the command:

BYE

This exits Easy Graphing and returns to the CYBER monitor level. Note that it does not log off the terminal.

Terri Scalare's sample session demonstrates the basic use and interactive nature of Easy Graphing. Other features include:

- Reading data from files
- Bar and pie graphs (shown in Figure 1)
- Ability to change an incorrectly entered value
- Arithmetic expression to define a variable as a function of other variables

- Abbreviated form of data entry
- Listing the values of a variable
- Listing a summary of the last graph displayed
- Saving a graph definition in a local file
- Running "procedure" files of Easy Graphing commands
- Log X and/or Y axes
- Axis labelling in months
- Axis labelling using user specified labels
- ZETA plot output
- Multiple commands can be entered on a single line
- Commands can be broken across many input lines

These features are described in the Plot-10 Easy Graphing Users Manual.

IBM

REDUCTION IN 2314 DISK DRIVE SERVICE

The 2314 drives attached to the IBM 4341 have become obsolete and, thus, are becoming more difficult and expensive to maintain. CSO plans to remove them from service before they become an embarrassment.

Known users of 2314 packs will be contacted to make arrangements for converting their data to other media. If you have any 2314 packs and have not yet been contacted, or want to ensure that your data is being converted, please write or call:

Mike Randal
120 DCL
333-9772

After July 1, 1981 only those users who have demonstrated a good reason for continued use of the 2314 drives will be permitted to use them. More definite plans will be made about removal of the equipment after a review of our users' needs.

UPDATES FOR IBM 3101 OPERATOR MANUAL

If you have purchased an IBM 3101 Display Terminal, updates for your Operator Reference Manual are available at the Systems Consulting Office, Room 166 DCL.

DOCUMENTATION

REVISED CSO DOCUMENTATION

Reference Guides

RF-0.1 REFERENCE GUIDE LIST -- updated; new guides.

RF-0.2 DOCUMENTATION LIST -- updated; revisions and new manuals.

RF-0.3 Job Entry Sites (RJE) -- revised to reflect locations of terminals dedicated to the CYBER 174 and 175, and the switchable terminals.

SALES - EXCHANGES - HELP WANTED

HALF-TIME RESEARCH ASSISTANT

CSO has an opening for a half-time Research Assistant to work as a system consultant. The primary job function is to aid users experiencing difficulty in using CSO's services. The position offers a good opportunity to learn a variety of software packages and languages.

The applicant should be a knowledgeable user of the CYBER system and must have a working knowledge of FORTRAN. Familiarity with CSO's IBM services or expertise in areas such as the use of mathematical libraries or graphics software is desirable.

This position will be available in early summer. If you would like to discuss it further, contact Robert Penka, Assistant Director for User Services, 173 DCL (333-4709).

RESEARCH PROGRAMMER - TEMPORARY

A consortium of departments is starting an image processing and graphics facility.

A programmer is needed for one year to do initial software acquisition and installation. In addition to image and graphics equipment, this project involves a small dedicated computer (LSI-11/23) and will probably acquire a VAX.

Emphasis is on physical science applications and experience with digitized data is valuable.

The position is available immediately and must be filled by May 15, 1981. Salary up to \$22,000. Anyone interested should contact George Badger, 150 DCL (333-4104).

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MAY
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JOURNAL OF COMPUTING

CSO DIRECTORY - STAFF AND SERVICES

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Director	George Badger	150	DCL	333-4103
Business Manager	Stanley Rankin	150	DCL	333-6530
Secretary	Joyce McCabe	150	DCL	333-1637

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User Accounting		1208	W Springfield	333-7752
Distribution Center		1208	W Springfield	333-6760
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Statistical Services Consulting		65	Comm West	333-2170
Text Processing Consulting		207	Astronomy	333-7318
Terminal Repair Service		150	DCL	333-0969

CYBER Dial-up Numbers	CYBER 175	110-300	baud	333-4000
	CYBER 175	1200	baud	333-4001
	CYBER 174	110-300	baud	333-4004

Asst Dir User Services	Robert Penka	173	DCL	333-4709
Asst Dir Systems and Operations	Sandra Moy	177	DCL	333-4703
Asst Dir Statistical Services and UNIX System	Larry Sautter	91	Comm West	333-2170
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Asst Dir Engineering and Hardware Selection	Cliff Carter	195	DCL	333-3723
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CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

CYBER SHARED-FILE SYSTEM

At the time of the installation of the CYBER 174 a decision had to be made about the relationship between the 174 and the 175. In particular, the issue of a shared-file system was the most critical item from the standpoint of ease of use.

Now that we have used a shared-file system for several months it's worth reviewing what has been gained and what has been lost. In a shared-file system, such as we have been running, a single file system is common to both machines so that for most purposes, a user can be completely indifferent as to which machine he is logged into.

The advantages of a shared-file system fall into several categories. First, the fact that all files are common to both systems makes it very easy for instructors to deal with files they wish to share with their students, and to avoid duplication or transfer of files between systems. A second benefit is that when only one of the systems is in operation, either because of scheduled activities or unscheduled difficulties, all users can be allowed on a single system without the necessity of moving files around. This benefit is enhanced since many terminals are now on a switch which allows access to either system. A third benefit is that software is common and there is no problem with coordinating the updating of information on two systems; changes appear on both systems simultaneously as do new files and a variety of other pieces of information. The final benefit is that the accounting system which is already extremely complex has no further complexities introduced by running two systems. Current balances in accounts for instance, appear the same on both systems as do passwords, a list of eligible users, and all of the many details which could get out of synchronization on two different systems.

The above advantages are offset by a few problems which are introduced by closely coupling the systems rather than having them run more or less autonomously. The most significant of these is that some classes of reliability problems automatically involve both systems. Generally, the most time consuming reliability problems are those related to the file system, and the majority of the extended periods of downtime have been related to preserving the integrity of the file system. This has meant that both CYBER systems were out of service simultaneously. It is worth noting, however, that only one of these problems was caused by the running of a shared-file system.

A second area with some problems caused by the close coupling is performance. The way in which the file systems are intertwined from a hardware point of view does introduce contention in scheduling of disk and table updates and provides a more difficult environment in which to optimize system performance. During the initial stages of installation it is clear that two systems operating independently could support more users than two systems operating in a closely coupled fashion. Over a period of time this disadvantage will be reduced but there are inherent difficulties that cannot be completely removed. In general, it is true that a shared-file system is more complex for operators, engineers, and programmers than two similar but separate systems. On the other hand it is far simpler for users.

Up to the present time, no serious efforts have been made to balance the load between the two systems and the emphasis has been on isolating the instructional from the research loads. Since these do not always peak at identical times, and since vacation periods have a different impact on the two communities, we will have to look at some questions of load balancing in the future. The closely coupled systems present a far better environment in which to do this than an environment which depends on the user making guesses as to which machine is most attractive at a given time.

It is our assessment that the advantages of close coupling, particularly as they can be exploited in the future, and as they present simplicity to the user, out-weigh the disadvantages.

DIAL-UP USAGE CONTROL

Earlier this semester, we encountered a substantial amount of difficulty with the peak loading on the dial-up facilities on both the CYBER 174 and CYBER 175. A number of steps were taken to make short-term corrections to the situation as well as looking at the problem for the longer run. A brief review of the steps which have been taken and an assessment of the situation for the future is presented here.

To reduce the demand for dial-up services, a number of facilities which made use of dial-ups were converted to hardwired connections through the recently installed switch. Included in this conversion were a number of terminals at Mechanical Engineering, several of the dormitory sites and a few other sites. This removed the demand from the sites that could almost be guaranteed to be using dial-up service during peak periods.

As a temporary measure, the "hello" facility was removed simply to keep lines circulating as rapidly as possible. This facility, however, was restored recently both because the change was not deemed to be needed currently and because sufficient ways around it have been found so that it presents an inequitable change.

A number of the heavy users of dial-ups were contacted. They cooperated by releasing lines whenever possible and, in general, trying to be good users. In addition, some of the CSO staff use during peak times was reduced.

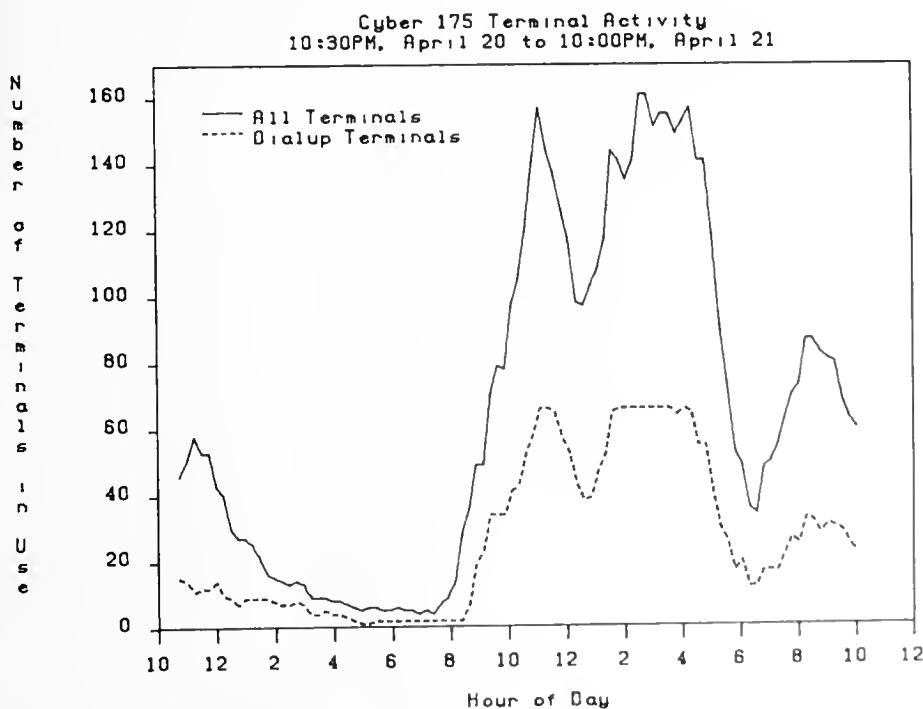
Finally, at the end of March there was a 15% increase in the number of lines installed. As the result of these combined efforts, the situation seems to be in a tolerable balance at the present time. While there are still occasional periods when all lines are busy, it is unusual to need to make very many attempts before getting a line and it is only for relatively short periods that this high traffic is in effect.

For the longer run, we are very concerned about the problem. We have recently learned that during the first nine months of this fiscal year approximately 250 terminals and 150 acoustical couplers were acquired on campus and we would expect that the majority of these are related to the use of CSO facilities. In addition to this, while most of these new terminals are probably aimed at the 300 baud facility, there is a recognition that most of the terminals are capable at running at higher speed and that people will, at the first opportunity, acquire 1200 baud

dial-up modems. We would hope that the increased demand for 1200 baud can be met largely by converting existing 300 baud lines. If this is not the case, the problem will be quite serious because the expense of adding many additional lines is very substantial. We are caught in the situation where anyone with a few hundred dollars to invest in a terminal expects several thousand dollars worth of equipment at the other end to be ready and waiting for their call. Since we are largely an allocation based rather than a hard money economy this increased traffic does not bring with it any of the money required to increase the facilities.

There are two other approaches which will be necessary in order to address the problem sufficiently. In the following article, the offering of dedicated lines for private facilities is presented. In this case the dedicated lines are available on a hard money only basis and generate the capital required to provide the service. It does this in a way that is financially attractive to those with hard money. We recognize that this does present a discrimination between users of the allocation system and those with hard money, but we feel it is not substantially different than their ability to get private terminals and other more desirable access to computing.

The graph presented below represents the time-of-day pattern of utilization on our systems on a busy working day. As you can see, there are extreme swings in the amount of loading both in total users and in those accessing the system through dial-up terminals. At the present time, the number of lines available at 300 baud are 66 lines for the CYBER 175 and 16 lines for the CYBER 174. The system-wide limit of dial-ups plus hardwired is approximately 250 on the CYBER 175 and 112 on the CYBER 174, and these limits generally are not being approached. Since the peak traffic is far in excess of the average traffic, there is a great deal of room for smoothing out usage patterns without going beyond reasonable working hours for faculty and students, to the extent that the number of dial-ups is a rationing mechanism at smoothing this demand out. We must find ways of introducing fairness into the system so that the available lines are not dominated unreasonably by a few users. If we are able to reduce the costs of increasing the number of ports, this too will contribute to allowing growth within the dial-up user group.



The treatment of a problem like this, both in terms of policies for allocating the resource and policies for determining how much of our budget is devoted to handling the peak load, is under continuous discussion. We appreciate any comments from the users who are affected by these policies on how these problems can best be resolved.

DEDICATED LINES FOR PRIVATE FACILITIES

CSO is now offering a cost saving alternative to departments utilizing large amounts of connect time paid for with contract money or departmental funds. For a fee of \$1800 per port you can purchase a dedicated connection to either a specific computer or the switch which allows access to any of our systems on which you have an account. For an additional fee of \$1200 per port (minimum of 4) CSO will provide the communications link between your building and DCL with all associated communications equipment. In either case, there will be a reduction of charges for connect time to a constant \$0.50 per hour. It is possible that a minimum charge per connect hour will be instituted in the future. If so, the minimum charge on these terminals will reflect the reduction in connect time. All initial installation and maintenance charges until June 30, 1984 will be paid by CSO. All equipment will be selected by CSO, but will belong to the department paying the initial fee. A trade-in program will be maintained so far as is practical to allow for departmental growth.

The \$0.50 per hour fee will not be increased before July 1, 1984 but will be subject to increase then to no more than 70 percent of the connect time charge to other users.

An analysis of the total cost for this approach versus the cost of normal connect time is presented here along with a diagram (page 6) illustrating possible paths of connection to the computers.

Dedicated Port Only

You provide:

- Terminal
- Line to CSO
- Modems (as needed) at each end
- Maintenance on above

We provide:

- Computer ports
- Switching (if requested)
- Reduction in connect charge to \$0.50 per hour
- Up to 1200 baud
- No busy signal

Dedicated Port With Communications

(minimum of 4 terminals) in a single location

You provide:

Terminal and its maintenance

We provide:

Lines, multiplexors, Modems

Computer ports

Switching (if requested)

Reduction in connect charge to \$0.50 per hour

Up to 1200 baud

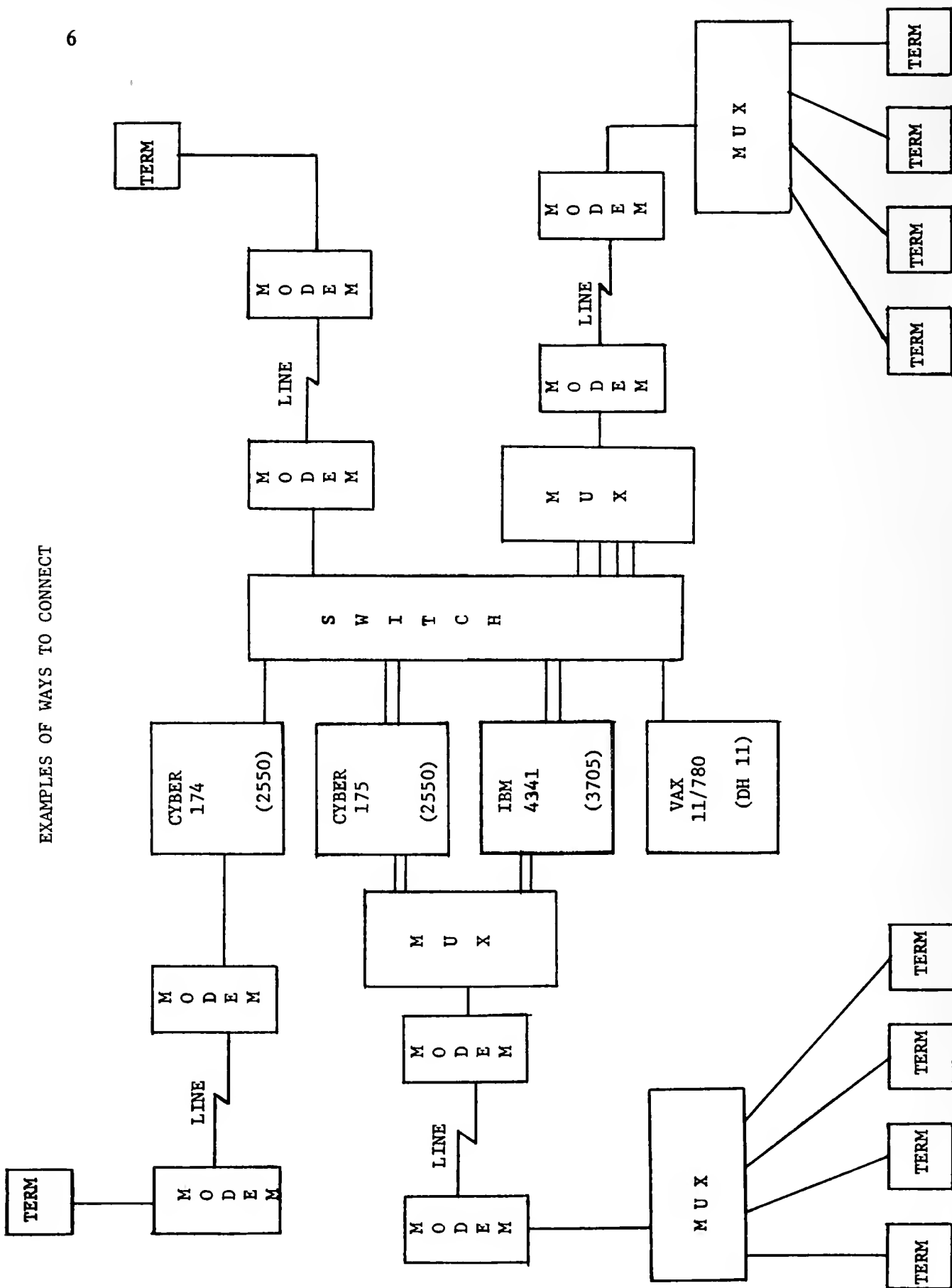
No busy signal

(A separate pool of computer ports will be maintained for switched terminals, with sufficient numbers to avoid busy signals (or their equivalent).)

<i>Connect Hours Per Month Per Port</i>	<i>Connect Hours July 1, 1981 to June 30, 1984</i>	<i>Charges without dedicated port*</i>	<i>Charges with dedicated port incl. \$3,000 fee</i>
50	1800	2250	3900
100	3600	4500	4800
150	5400	6750	5700
200	7200	9000	6600
250	9000	11250	7500
300	10800	13500	8400
350	12600	15750	9300

*Assumes average rate of \$1.25 per connect hour. We do not expect weekday connect rates to go below this level.

EXAMPLES OF WAYS TO CONNECT



NEW ACCOUNTING FORMS

Due to the new accounting structure of the University, all PS and account forms now in use for CSO accounts will be obsolete on July 1, 1981. All departments should discard these forms by this date and start using the new CSO forms. The new forms may be picked up at the CSO Accounting Office, 1208 W. Springfield.

SYSTEM NOTES

MARCH RELIABILITY REPORTS

CYBER 175

6 recoverable interruptions
21 non-recoverable interruptions
13 of these were for more than 15 minutes

MTBF = 25 hours
MTR = 18 minutes
Availability: 98.4% of scheduled uptime

Major cause of downtime was related to mainframe errors and disk problems.

CYBER 174

1 recoverable interruption
13 non-recoverable interruptions
8 of these were for more than 15 minutes

MTBF = 48 hours
MTR = 14 minutes
Availability: 99.0% of scheduled uptime

Major cause of downtime was related to channel and disk problems.

IBM 4341:

26 interruptions
8 of these were for more than 15 minutes

MTBF = 28 hours
MTR = 11 minutes
Availability: 98.1% of scheduled uptime

Major cause of downtime was related to disk problems.

MTBF = Mean Time Between Failures
MTR = Mean Time to Repair

CYBER

PPS OUTPUT

As noted in last month's *OFF-LINE*, CSO has made arrangements to print users' output on the Honeywell Page Printing System (PPS) installed at the campus office of the Administrative Informations Systems and Services (AISS). Since that article was written the internal handling of PPS output has been streamlined and early problems centered around tape compatibility between CSO and the PPS printer appear to be resolved. We now feel free to expand use of the PPS printer. We would like to offload the present printing equipment to reduce print backlogs and extend the useful life of the printing equipment owned by CSO.

Since the PPS printer is so fast (approximately 90 pages per minute) it is ideally suited to printing large jobs. Starting June 1 we plan to default the printing of all large jobs to the PPS printer. Since some users may need to continue using the line printer, an override of this default will be possible. As of this writing the final details surrounding this change have not been settled. Complete details will be announced in a HEARYE and an RJE bulletin. The purpose of this article is to give you advance warning of this upcoming change and to urge you to try the PPS before June 1. For your convenience the following information is repeated from last month's *OFF-LINE*.

The PPS uses an electrostatic printing process to produce output on 8.5 by 11.5 inch sheets of paper. Lines are oriented along the 11.5 axis. The top of each sheet is punched to fit a standard three-ring binder. The character set used is identical to that on the IBM printers at DCL. Print quality is very good.

IBM users can request that their output be printed on the PPS by including the ID card

```
/*ID FORMS=PPS
```

in their job. CYBERS users can direct a file to the PPS by using the /FORMS=PPS options on the PRINT command. For example:

```
PRINT/FORMS=PPS,local file name.
```

The usual paper-saving measures are applied to PPS output. Users wishing to have page ejects inserted in their output rather than the normal substitute of three blank lines must specifically request this processing. To request this, IBM users should include the ID card

```
/*ID EJECT=YES
```

in their job. CYBER users should use the /EJECT option on the PRINT command.

Users requesting PPS printing should be aware of several limitations:

- The PPS can print at most 64 lines/page. Pages containing more than 64 lines will overflow onto a second page.
- Only the following carriage control characters will be honored:

single space (blank)
 page eject (1)
 double space (0)
 triple space (-)

Other carriage control characters will cause unexpected results. In particular, note that overprinting is not possible. Jobs to be printed on the PPS are dumped to tapes which are carried to AISS for processing according to the following schedule (Monday through Friday only):

Jobs dumped to tape	Output available for pickup at the DCL Routing Room
8:00 AM	2:00 PM same day
9:30 PM	9:00 AM following day

The charge for using the PPS is identical to the charge for using the line printer.

SELF SERVICE-PRINTER

A new self-service printer has been installed in room 131 DCL. This printer is intended for use by individuals wanting to get a small listing printed quickly and willing to fetch their own output off the printer. The printer is not tended by an operator. The system will print jobs on this printer only if print lines number 1000 or fewer. Larger jobs directed toward this printer are simply held by the system.

The printer is attached to the IBM system through an RJE station and is identical to other printers in use on the RJE network. It prints both upper and lower case and is rated at 600 lines per minute. Output generated on the IBM system may be directed to this printer by including the following ID cards:

`/*ID PRINT=SELSV`

CYBER output may be directed to this printer by including the switch `/RJE=SELSV` of the PRINT command, e.g.,

`PRINT/RJE=SELSV,local file name.`

IBM

NEW RELEASE OF SAS ON IBM

SAS 79.5, a statistical package, has been installed on the IBM 4341 and replaces the 79.3 version. The new release is the optimizing version and mainly fixes "bugs" found in the last release. One difference that users may notice is that the minimum core requirement has increased from 140K to 170K.

Questions concerning use of the SAS package should be directed to the CSO Statistical Consultants in Room 65 Commerce West (333-2170).

STATISTICAL SERVICES

EFAP STATISTICAL PACKAGE REMOVED

Due to the lack of use over the past few years, the EFAP (Exploratory Factor Analysis Package) will be removed from the CYBER systems on May 14, 1981. If its removal from the system will cause you any problem, please contact the Statistical Consultants in Room 65 Commerce West (333-2170) immediately.

DOCUMENTATION

OFF-LINE MAILING LIST

Once again, it is time to update our mailing list.

If you are graduating or leaving campus permanently and wish to be deleted from the mailing list or have *OFF-LINE* sent to your new address, please fill out the form on the back of this issue and return to us.

If you plan to be gone for the summer but return in the fall you have two options. We can flag your name on the list with a HOLD which means no issues will be sent until you return in the fall, or we can change your address to your summer address. Please let us know which you desire.

If you will be on campus, but your address will change due to dorm closings, please send us your new address.

ORDERING CSO DOCUMENTATION

The CSO Distribution Center tries to maintain well-stocked shelves of all documentation for the user community. In the past, these supplies often were drastically depleted when a faculty member decided to distribute copies of a certain manual or guide to his entire class. Since reprinting of a document requires at least three to four weeks, we can no longer permit more than five copies of a document to be taken by any individual unless we have received prior notification.

We will be happy to make arrangements to provide a ready supply of our documents for classes. If you plan to use one of our documents for a class, please notify Lynn Bilger (Room 139 Astronomy Building, 333-6236) at least one month in advance and indicate the name of the document and the number of copies you will need.

SALES - EXCHANGES - HELP WANTED

PDP-8 COMPONENTS, ACCESSORIES, AND DOCUMENTATION

Wanted: Surplus PDP-8 components and accessories. Documentation is also sorely needed. Please contact Mike Berger, 252 ERL, 333-7452.

DECSYSTEM-10 FOR SALE

I have a DECsystem-10 for sale which will be available in September 1981. A partial listing of the system includes:

- 1 KI-10 processor
- 4 MF10G memory modules
- 4 RP04 disk drives
- 1 LP02 line printer
- 2 TU10 tape drives
- 1 DC10 32 line communications control subsystem

The system is under DEC maintenance contract.

For further information and system description contact:

Harold Ravlin
Coordinated Science Laboratory
1101 West Springfield Avenue
Urbana, Illinois 61801
(217) 333-0267

TAPES FOR SALE

CSO has several boxes of tapes for sale at \$50.00 per box of 10 tapes (\$5.00 a tape). These are tapes which have been used once for CSO dumps. Tapes are all 1600 bpi and 2400-foot reels. This special will be run only until these boxes of tapes are gone. No returns on purchased tapes. Tapes can be purchased at the CSO Accounting Office, 1208 W. Springfield. Contact Jack Knott at 333-6562 for further details.

HALF-TIME RESEARCH ASSISTANT

Half-time research assistant needed for statistical programming using SPSS and SAS. Also, management of several large social science datasets stored on tapes. Ability to keep track of lots of data and to document carefully.

Half-time for the Summer 1981, with the possibility of continuing during the academic year.

Work is for an economist studying the impact of education and federal policies on the status of women (compared to men) in the labor market.

Contact Prof. A Beller, 333-7257 or 333-2412 (leave message).

PROGRAMMER WANTED

Must have knowledge of PASCAL, FORTRAN, and SPSS. Work to be on an hourly basis during the summer with a 1/4 research assistantship for the fall and spring semesters. If interested, please contact Barbara Tinsley at 333-6371 between the hours of 12 noon to 4PM.

***OFF-LINE's* Mailing List**

If you wish to be placed on our mailing list for future issues of *OFF-LINE*, if you wish to be removed from the list, or if you wish to enter an address correction, please complete and return this page. (Current subscribers are kept on the mailing list until a specific request for removal is received, or until a mailing is returned as undeliverable.)

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POLICY

MODIFICATIONS TO THE ACCOUNTING PRACTICES

Much has been said recently about the revisions to overhead rates related to Federal Government contracts. While it is not entirely clear what will be happening, the following is our impression of how it relates to computing.

On July 1 1981, the University will be converting from an overhead rate based on salary and wages, approximately 68%, to a lower rate based on "modified total direct cost". The rate on this will be somewhere in the low 40s but it will apply to things beyond salary and wages.

Another part of the change which has occurred is a requirement imposed by the Federal Government, that specialized research facilities which have a noticeable impact on the derivation of the overhead rate must be removed and have separate rates established. For this reason although Computing Services would be one of the direct costs, it will not be billed with the overhead of approximately 40%, but an overhead figure will be included in the rate. Our indications are that this will be approximately 8% applied to the computer charges as presently defined. Thus, unlike normal overhead, it will not be calculated automatically and identified as a separate charge, but will appear within the rate with no separate identification. It will not show up as a separate line in monthly statements from the business office.

While the addition of a factor to our rates at first appears painful, the realization that it could have been a 40% addition rather than 8% makes it somewhat more palatable.

Given the level of confusion regarding these modifications to the accounting practices, specified by Bureau of the Budget Circular A-21, it is quite possible that this is not the entire story and we will keep you informed as we get more information.

SYSTEM NOTES

APRIL RELIABILITY REPORTS

CYBER 175

20 recoverable interruptions
15 non-recoverable interruptions
18 of these were for more than 15 minutes

MTBF = 20 hours
MTR = 32 minutes
Availability: 96.4% of scheduled uptime

Major cause of downtime was related to power, console, telex, and disk problems.

CYBER 174

12 recoverable interruption
8 non-recoverable interruptions
10 of these were for more than 15 minutes

MTBF = 28 hours
MTR = 52 minutes
Availability: 96.1% of scheduled uptime

Major cause of downtime was related to power, telex, humidity and disk problems.

IBM 4341:

15 interruptions
7 of these were for more than 15 minutes

MTBF = 46 hours
MTR = 20 minutes
Availability: 96.0% of scheduled uptime

Major cause of downtime was related to software problems.

MTBF = Mean Time Between Failures
MTR = Mean Time to Repair

CYBER

CHANGES TO THE P COMAMND

On May 26, 1981, the P command was converted from KCL to CCL. The P command allows terminal users to enter multiple control statements on one line. This is done by typing

P.

followed by control statements which are separated by semicolons. The program P reads the remainder of the command line, puts the control statements it finds into a local CCL procedure file called PDOT with the separating semicolons changed to end-of-lines, and causes this file to be executed.

If there is no period, right parenthesis, or colon in the command, P places a period at the end of the command line in the PDOT file. Blanks, semicolons, and commas before a statement are skipped. Empty or blank statements are ignored. Two semicolons in a row in a statement are converted into a single semicolon in the file PDOT rather than to a new line. This is how a user can have embedded semicolons in a command line. If a statement begins with a minus sign, it is assumed to be a procedure call and the minus is replaced by \$BEGIN, in PDOT.

Once the entire comment field (the portion of the line after P.) has been written to PDOT in this manner, the command

REVERT. PDOT

is placed at the end of the procedure file and the control statement

\$BEGIN,,PDOT.

is issued to execute the control statements in PDOT.

Until the user executes another P command, he can execute the same sequence of commands as often as required by "name calling" the procedure file PDOT. As shown in the examples below, "name calling" simply involves using the name by itself as the call to the procedure.

If desired, the name of the procedure file can be changed from PDOT to any other valid file name. This is accomplished by invoking P with the desired names as the first control card argument.

For example, the control statement

P.GET,PROG,DATA1;R;FTN,I=PROG,L=0;LGO,DATA1,OFL;TYPE,OFL

writes the following statements to the file PDOT

```
.PROC,PDOT.
GET,PROG,DATA1.
R.
FTN,I=PROG,L=0.
LGO,DATA1,OFL.
TYPE,OFL.
$REVERT. PDOT
```

The procedure file PDOT is then executed.

This procedure file can subsequently be reexecuted by issuing the following command:

```
PDOT.
```

For a second example, the control statement

```
P(Q) LDSET,USE=$RTN;;;$,LIB=LIB1/LIB2; LOAD,LGO; NOGO,BIN
```

writes the following statements to the file Q:

```
.PROC,Q.
LDSET,USE=$RTN;;;$,LIB=LIB1/LIB2.
LOAD,LGO.
NOGO,BIN.
$REVERT. Q
```

The procedure file Q is then executed. This procedure file can be re-executed by issuing the command:

```
Q.
```

For a third example, the control statement

```
P,G.MODIFY,P=SYSOPL,LO=E,Z./*CREATE SS/*EDIT SS;-,COMPILE
```

writes the following statements to the file G:

```
.PROC,G.
MODIFY,P=SYSOPL,LO=E,Z./*CREATE SS/*EDIT SS
$BEGIN,,COMPILE.
$REVERT. G
```

The procedure file G is then executed.

The P command also allows for continuations both when it is invoked from a procedure file or batch job and when it is entered directly as a command. A line ending in a comma indicates that the following line is to be taken as a continuation. If P is invoked from a procedure file or batch job, the next line in the procedure file or command file is taken as the continuation. If the P command is invoked directly from time-sharing (by far the most common case),

CONTINUATION: is written at the terminal. The continuation line is entered in response. Note that since leading commas on a line are deleted a ";;" on the end of a **P** command line will cause the current command to be terminated and the input on the continuation line to be treated as a new command.

An example of continuations from time-sharing is as follows:

```
P,G,R.MODIFY,P=ASSOPL,LO=B,I=ASSMODS,C=ASSCOMP;,
CONTINUATION: COMPASS,I=ASSCOMP,L=LIST,B=BINASS,S=NOSTEXT
```

This would produce and execute the following file:

```
.PROC,G.
R.MODIFY,P=ASSOPL,LO=E,I=ASSMODS,C=ASSCOMP.
COMPASS,I=ASSCOMP,L=LIST,B=BINASS,S=NOSTEXT.
$REVERT. G
```

MATHEMATICAL SERVICES

ITPACK

ITPACK is a collection of routines on the CYBER for the iterative solution of large, sparse symmetric and positive definite systems of linear equations. It was developed at the Center for Numerical Analysis at the University of Texas at Austin, initially for systems arising from partial differential equations and later for general systems. We have a User's Guide which may be examined in the Systems Consulting Office, 166 DCL.

ITPACK is set up as a library and is accessed by entering:

```
GRAB,ITPACK.
```

Following this, you can compile and run a FORTRAN program which calls ITPACK routines.

There are seven major routines in ITPACK:

JCG	Jacobi conjugate gradient method
JSI	Jacobi method with semi-iteration (or Chebychev acceleration)
SOR	Successive overrelaxation
SSORCG	Symmetric SOR with conjugate gradient acceleration
SSORSI	Symmetric SOR with semi-iteration

RSCG	Reduced system method with conjugate gradient acceleration
RSSI	Reduced system method with semi-iteration

The matrix must be stored in a special sparse form. This requires three vectors: a vector of the non-zero coefficients of the upper triangle of the matrix, with all coefficients for a given row being together; an integer vector giving the column indices for each coefficient in the first vector; and an integer vector giving the indices in the first vector where each row begins. ITPACK includes routines to help you set up the matrix in this form.

Routine MA31A in the Harwell library also covers this class of problems. You may wish to look at this also.

The MATH procedure can be used to obtain a catalog of ITPACK routines, or the source of a particular routine.

IMSL - NEW NEWSLETTER

We have received a new issue of IMSL User News (formerly their Numerical Computations Newsletter). It contains an article on "Confidence Intervals for Predicted Response in Regression Analysis" explaining the use of IMSL routines for this problem, and includes the announcement of a package called STPLAN for interactive study planning. STPLAN has been developed at the University of Texas System Cancer Center in Houston and will be distributed by IMSL at a price of \$100. According to the announcement, "STPLAN is an interactive computer program which performs sample size and power related calculations necessary to plan research studies requiring statistical analysis."

If you are interested in obtaining STPLAN, you can contact IMSL directly at

IMSL
Sixth Floor, NBC Building
7500 Bellaire Blvd.
Houston, Texas 77036
ph. (713) 772-1927

or see Stan Kerr (175 DCL, 333-4715).

A copy of the newsletter is on view in the Systems Consulting Office in 166 DCL, in the gray IMSL General Information Manual. Some extra copies are available from Stan Kerr. If you want to be added to the mailing list for the newsletter, tell Stan Kerr, or write to IMSL and tell them you are a member of a subscribing organization (since we lease their library).

MISCELLANEOUS

CURRENT WEATHER DATA AVAILABLE THROUGH COMPUTER ACCESS

CSO was recently informed of this weather information program and thought some of our users might be interested in it. The information in this article was furnished to us by Steven J. Troester from the Illinois Institute of Natural Resources, Section of Economic Entomology.

Current weather data for approximately 25 Illinois locations is being obtained weekly through the National Weather Service and a computer file is being maintained for public access on the University Of Illinois CYBER 175 computer. The file is updated every Tuesday noon, and consists of current temperatures to date, 10-day forecasts, and deviated 30-year normals for the remainder of the year. In addition to maximum and minimum temperatures, 4" soil temperatures, precipitation, dew, and relative humidity are available for several locations. A similar file consisting of 1980 weather observations is also available.

A full description of the files and instructions for accessing them are contained in the text-edited file obtained by issuing the following CYBER 175 command:

```
GET,TEXT1/UN=3NHSNHS
```

and then printed using the following command:

```
PRINT,TEXT1/CC/EJ/ASCII.
```

Computer programs have been developed which use these weather files as follows: (1) to calculate and sum 'heat units' for estimating crop and insect development and (2) to project development of the black cutworm and predict when cutworm damage will occur (Black Cutworm Event Simulator). A description of these programs is contained in the text-edited file 'TEXT2' and can be accessed and printed similarly.

For further information, contact Steven Troester at 333-2359.

SALES - EXCHANGES - HELP WANTED

ERROR IN DECSYSTEM-10 AD

In the DECSYSTEM-10 FOR SALE ad that appeared in the May issue, we erroneously listed Mr. Ravlin as being the person interested in selling the system. Actually, the Coordinated Science Laboratory is the department interested in selling the system, and Mr. Ravlin is the person at CSL to contact if you are interested. His phone number is 333-0267.

GRAD ASSISTANT

The Department of Physical Education is looking for a half-time Graduate Assistant to work 20 hours/week over 11 months. Experience with PDP 11/03 (LSI 11), Fortran and Assembler languages, also Graphics. Background in A-D conversion and data manipulation. Some electronics helpful.

Salary - \$5,500. plus proportional increase for next year.

Submit credentials to:

Terry Ward
212D Freer
Campus

GRAD RESEARCH ASSISTANT

A one-third time graduate research assistantship is available for the period September 1981 - May 1982 for work in digital-analog conversion of audio signals with CSO's UNIX/PDP11/50 system. It is desirable that the applicant have experience with and interest in logic circuits (particularly, interface circuits), I/O programming, and a higher level structured programming language. The application area is musical sound synthesis and analysis. the pay is approximately \$3400 for nine months including tuition and fee waiver. For information, contact Prof. James Beauchamp (333-1089 or 344-3307) or Mr. Pat Kane (333-7886).

SPSS PROGRAMMER - PART TIME

A graduate student is looking for someone with knowledge of statistical programming using SPSS on CYBER IMMEDIATELY. Work will take approximately 20 hours and the salary is negotiable. Call Patty at 1-489-2921 anytime.

***OFF-LINE's* Mailing List**

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OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of June 26, 1981.

CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

CS COURSES NOW USING TERMINALS

At the close of the spring semester, the campus reached an important milestone in the use of computers. For the last time, the introductory courses in Computer Science were taught using punch cards. Beginning this summer, all of those courses will have been converted to the use of terminals, some on the IBM and some on the CYBER systems. This represents a major investment in terminals and other support because of the very large number of students involved.

With this changeover we will be drastically reducing the number of keypunches at our public sites. Since a large percentage, well above half, of all the cards read this past year were involved with the elementary courses, the availability of keypunches for those who still need them should be adequate. Initially we will be leaving a few keypunches at each of our RJE sites although this may be adjusted as the traffic indicates.

In order to keep the problem due dates in these elementary courses from seriously impacting facilities, the terminals related to elementary computer science will be separate and identified. These terminals will not be usable by other customers but on the other hand, the general collection of public terminals will not be usable by these students. We expect utilization on these terminals to be extremely high and also to be controlled through a reservation system to insure that all students get fair access. Terminals to support these courses will be located in Mechanical Engineering, Commerce, and the Snack Bar, with a few terminals at other locations.

FURTHER CSO MOVES

Over the past few years CSO has been rearranging the locations of a number of its activities and attempting to consolidate its professional staff in DCL. As you are aware, we share the building with the department of Computer Science and the pressure for space in the building has constantly increased as the programs of the two departments have expanded. By the opening of school in the fall, a number of further changes will have occurred. Most notable among these will be the movement of the consulting office to 1208 W. Springfield where it will be located with manual and supplies distribution and user accounting. We think that when the repairs to this building are complete that most of the user services for which you have had to visit DCL will be in a single location with a good operating environment.

Another change which will affect a few of you is that the terminal repair service will be located in Room 209 of the Astronomy building. This should affect only those who are bringing in terminal equipment to be repaired or who are picking it up.

We will be continuing the trend for user terminals and other services to be provided at sites other than DCL. Because of the requirement for physical proximity of our high speed printers the bulk printing capacity will remain in DCL at this time, although it will be moving

into room 16 in the basement. Also the public terminal room will be placed adjacent to it in the basement and the number of terminals at this location will be somewhat reduced. We anticipate that the personal computers which have been available in the DCL terminal room will be located somewhere else by fall but will continue to be available. The hours of service will continue as they are at the present time.

The precise timing of these changes is not known because of the need for some remodeling at both Astronomy and 1208 W. Springfield and then after areas in DCL have been vacated there will be some repair work here. We hope to have it all completed within the next three to four months and to have those services which affect the users not be disrupted.

SYSTEM NOTES

MAY RELIABILITY REPORTS

CYBER 175

20 recoverable interruptions
6 non-recoverable interruptions
9 of these were for more than 15 minutes

MTBF = 25 hours
MTR = 10 minutes
Availability: 98.4% of scheduled uptime

Major cause of downtime was related to telex, mass storage and disc problems.

CYBER 174

11 recoverable interruption
5 non-recoverable interruptions
10 of these were for more than 15 minutes

MTBF = 42 hours
MTR = 13 minutes
Availability: 98.9% of scheduled uptime

Major cause of downtime was related to telex, humidity and disc problems.

IBM 4341:

24 interruptions
12 of these were for more than 15 minutes

MTBF = 30 hours
MTR = 25 minutes
Availability: 97.9% of scheduled uptime

Major cause of downtime was related to disk problems.

MTBF = Mean Time Between Failures
MTR = Mean Time to Repair

CYBER

CSO VIDEOTAPES AVAILABLE

CSO has produced a series of eight videotapes which introduce the novice to the CYBER System. A viewing guide containing the major pictorials used in the series is available and can be used to facilitate note taking.

The title and a brief synopsis of each of the videotapes is given below. Running time is 10-15 minutes for each videotape.

Introduction to Computing at CSO

A brief look at the steps required to solve a problem using a computer and some of the hardware used.

Using a Terminal

A description of the physical operation of a terminal and some of the keys that have a special meaning to the CYBER.

Introduction to CYBER Time-Sharing

A tutorial on the logging on and off of the CYBER.

File Usage - Local Files and Indirect Access to Permanent Files

An introduction to CYBER files and the commands used to manipulate them.

Introduction to ICE Text Editing

A tutorial on entering and modifying files with ICE.

Running a FORTRAN Program - Concepts

A discussion of the concepts of compilation, loading and execution.

Running a FORTRAN Program - The PROGRAM Statement

A discussion of the PROGRAM statement and its relation to files accessed by the program.

Running a FORTRAN Program - Control Statement

A discussion of the control statements used to compile, load, and execute a FORTRAN program.

Anyone can view these videotapes by going to the Undergraduate Library in person to make a reservation for use of the videotape equipment. Ask for a copy of the viewing guide when you checkout the videotape for viewing.

Copies (Betamax format) of these videotapes are available for loan from CSO to any instructor wishing to use them in class. They were effectively used in this environment several times in the past with the instructor stopping the playback equipment whenever he/she wished to elaborate further or questions arose from the class.

To borrow a videotape for classroom use and obtain copies of the viewing guide for classroom distribution, call Scott Lathrop (333-6618). If you do not already have access to the required videotape equipment, Betamax viewing equipment can be borrowed from the Office of Instructional Resources (333-3690).

FORTRAN CALLING PASCAL PROCEDURE ADDED TO UOILIB

PASCLL, a routine which allows a FORTRAN routine or program to call a PASCAL procedure or function has been added to UOILIB. This routine allows those who wish to use the programming capabilities of PASCAL (including the recursive and the dynamic structure capabilities) to also use the I/O capabilities of FORTRAN. This can be accomplished by having a FORTRAN main program call a PASCAL routine via PASCLL which in turn does *all* of its I/O through external FORTRAN routines which it calls. This, in effect, allows a PASCAL user to use the GCS routines. PASCLL is called as follows:

```
CALL PASCLL(proc, arr, arrsize, arg1, arg2, ..., argn)
```

where:

<i>proc</i>	PASCAL routine to be called.
<i>arr</i>	Storage area set aside for PASCAL's stack and heap.
<i>arrsize</i>	Integer size of <i>arr</i> .
<i>arg1, ..., argn</i>	Parameters of call.

proc must be a PASCAL procedure or function (i.e., not a main program) and must be compiled with the E+ option. The E+ option can be obtained by using either a /E+ on the end of the PASCAL control card or with (*\$E+ *) in the PASCAL program before the occurrence of the routine. The name of the PASCAL procedure (signified *proc* above) must be in an "EXTERNAL" statement in the FORTRAN calling routine.

arr needs to be dimensioned to be at least *arrsize* words long.

arrsize must be at least $85 + \text{number of words used by the PASCAL program's stack and heap}$. The number of words used in the stack is the sum of:

- the space used by the declared variables for that routine and any routines it calls,
- one word for every argument of an external FORTRAN routine called (+ 1),
- three words for every additional level of procedure call nesting (i.e., run time nesting rather than compile time nesting).

The parameters in the procedure declaration need to be counted as local variables -- VAR, FUNCTION, and PROCEDURE parameters being one word each and call by value whatever their storage size is. Remember to take into account recursive calls when calculating stack size.

The size of the heap can be calculated as the sum of the number of words in an object created with a NEW statement (+2) for each object created.

Any parameters you may wish to pass to or from the PASCAL routine must have been declared VAR in the PASCAL routine called. The PASCAL routine can be compiled with any Xn option.

PASCLL may be used to call functions also. The function must return a one word value. In order to use PASCLL to call a PASCAL function, call PASCLL as a FORTRAN function and include the PASCAL function name as the subroutine argument.

If you are desiring to do FORTRAN I/O (this includes GCS calls), the last main program loaded must be a FORTRAN main program. If you are desiring to do PASCAL I/O, it must be a PASCAL main program. So, you can not do both FORTRAN and PASCAL I/O from the same program. All of this (i.e., a FORTRAN main program loaded last to allow FORTRAN I/O) could be accomplished with the following sequence of control statements:

```
GRAB,UOILIB.
PASCAL,pascal source,listing/E+.
FTN,I=fortran source,l=listing.
LGO.
```

There is a distinct disadvantage to calling PASCAL as a subroutine from FORTRAN. That is that there is no error post-mortem dump facilities available to issue diagnostics in case some problem occurs during the execution of the PASCAL routine. Modular programming and testing of the PASCAL routines can eliminate many of the problems along this line, though.

It should also be clearly noted that in future releases of either FORTRAN or PASCAL, it may no longer be possible to interface PASCAL and FORTRAN through a routine such as PASCLL. Currently PASCLL interfaces FTN 4.8 and FTN 5.1 to PASCAL 3.2.0. So, we discourage the development of long term programs with PASCLL.

The following is an example of a FORTRAN main program, set of PASCAL subroutines and control statements to generate a Sierpinski curve using GCS.

The FORTRAN main program:

```

        PROGRAM FORSIER(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
        EXTERNAL SIERP
        INTEGER N,STACK(400),STCKSIZ
        WRITE(6,900)
900    FORMAT(" ENTER RECURSION LEVEL:K")
        READ (5,*)N
        STCKSIZ = 400
        CALL USTART
        CALL PASCLL(SIERP,STACK,STCKSIZ,N)
        CALL UFLUSH
        CALL UPAUSE
        CALL UEND
        RETURN
        END

```

The PASCAL routines in their main program:

```

PROGRAM MAIN(INPUT,OUTPUT);
(*$E+*)

PROCEDURE MOVE(VAR X,Y : REAL); FORTRAN;

PROCEDURE UDRAW(VAR X,Y : REAL); FORTRAN;

PROCEDURE SIERP(VAR N : INTEGER);
(* PLOT A SIERPINSKI CURVE OF ORDER N *)
CONST H0 = 100.0;
VAR I,J : INTEGER;
    HI,H,X,Y,X0,Y0 : REAL;

    PROCEDURE A(I : INTEGER); FORWARD;

    PROCEDURE B(I : INTEGER); FORWARD;

    PROCEDURE C(I : INTEGER); FORWARD;

    PROCEDURE D(I : INTEGER); FORWARD;

    PROCEDURE A;
    BEGIN IF I > 0 THEN
        BEGIN A(I-1); X := X+H; Y := Y-H; UDRAW(X,Y);
            B(I-1); X := X+2*H; UDRAW(X,Y);
            D(I-1); X := X+H; Y := Y+H; UDRAW(X,Y);
            A(I-1);
        END;
    END;
END;

```



```

PROCEDURE B;
BEGIN IF I > 0 THEN
  BEGIN B(I-1); X := X-H; Y := Y-H; UDRAW(X,Y);
    C(I-1); Y := Y-2*H; UDRAW(X,Y);
    A(I-1); X := X+H; Y := Y-H; UDRAW(X,Y);
    B(I-1);
  END;
END;

PROCEDURE C;
BEGIN IF I > 0 THEN
  BEGIN C(I-1); X := X-H; Y := Y+H; UDRAW(X,Y);
    D(I-1); X := X-2*H; UDRAW(X,Y);
    B(I-1); X := X-H; Y := Y-H; UDRAW(X,Y);
    C(I-1);
  END;
END;

PROCEDURE D;
BEGIN IF I > 0 THEN
  BEGIN D(I-1); X := X+H; Y := Y+H; UDRAW(X,Y);
    A(I-1); Y := Y+2*H; UDRAW(X,Y);
    C(I-1); X := X-H; Y := Y+H; UDRAW(X,Y);
    D(I-1);
  END;
END;

BEGIN (* SIERP *)
  I := N;
  HI := 4.0; FOR J := 1 TO N DO HI := HI*2.0;
  H := H0/HI;
  X0 := 2*H; Y0 := H0-H;
  X := X0; Y := Y0;
  UMOVE(X,Y);
  A(I); X := X+H; Y := Y-H; UDRAW(X,Y);
  B(I); X := X-H; Y := Y-H; UDRAW(X,Y);
  C(I); X := X-H; Y := Y+H; UDRAW(X,Y);
  D(I); X := X+H; Y := Y+H; UDRAW(X,Y);
END;
BEGIN
END.

```

The CYBER control statements to compile, load, and execute this:

```

REWIND,FORSIER,SIERPIN,LGO.
GRAB,UOILIB.
GRAB,GCSTEKT.
PASCAL,SIERPIN,LIST.
FTN,I=FORSIER,L=LIST.
LGO.

```

It is assumed that the FORTRAN source is in FORSIER and the PASCAL source is in SIER-PIN.

The control cards to obtain an assembly listing of PASCLL are:

```
GRAB,MATH.
MATH,UOILIB,PASCLL.
REWIND,SOURCE.
COMPASS,I=SOURCE,L=LIST.
PRINT,LIST/CC/EJ.
```

PASCLL also allows for easy and clean access of low memory by means of global variables. If you are interested in this, see Daniel Pommert at 179 DCL.

FORTRAN FUTURES

Part 1 - A Brief History Lesson

The first FORTRAN compiler was delivered nearly 25 years ago. It was predicted that "FORTRAN should virtually eliminate coding and debugging," since there would now be an obvious correspondence between mathematical formulas and the numerical programs that used them. As we all know, this didn't happen. Instead, higher level languages such as FORTRAN have expanded our horizons, allowing us to program more complex problems and commit more sophisticated errors.

As FORTRAN replaced machine language in numerical computations, it became possible for the first time to write programs which could be run on a variety of machines without reprogramming. The value of this portability was limited by the fact that each manufacturer provided a FORTRAN that was slightly different, thus making it difficult for a programmer to insure that his FORTRAN program would be accepted and interpreted the same way on each machine. As time went by, these portability problems became increasingly severe. To combat them, a standard for FORTRAN was adopted in 1966, specifying the form and interpretation of those features of FORTRAN which a programmer could expect to be available on all FORTRAN processors. Most of the FORTRAN compilers available today were designed to meet this standard, although most also provide significant extensions to the language beyond the 1966 standard.

As more time passed, it became clear that the 1966 standard had serious deficiencies. It was written so tersely that even the people that wrote it could not agree on exactly what parts of it meant. It contained many restrictions which were based on what could be easily interpreted when FORTRAN was originally developed and which were no longer necessary. As a result, most FORTRAN processors offered many more features than were guaranteed to be portable by the standard, and the standard was losing effectiveness as a portability tool. A revision undertaken to correct these problems proved to be time-consuming and was not completed until 1977, with formal adoption of the standard taking place in 1978. Most manufacturers have revised or rewritten their FORTRAN compilers to bring them into compliance with FORTRAN 77 (e.g., FTN5 and M77 support the FORTRAN 77 standard), but since this is also a time-consuming process, such compilers are only beginning to be generally available and most programmers have yet to feel the impact or benefits of the new standard.

In completing FORTRAN 77, there were some areas of possible revision to FORTRAN which were not considered because it was felt that to consider them thoroughly would have resulted in significant further delays in completing the revision. Once FORTRAN 77 was adopted, X3J3 (the FORTRAN standards committee) immediately began work on a further revision to be adopted in the mid to late 1980's, including consideration of these previously ignored areas. The changes between this revision and FORTRAN 77 are expected to be at least as extensive as those between FORTRAN 77 and the original 1966 standard, so if you expect to be programming in FORTRAN in the 1990's, the work being done now may have a significant affect on you.

This article is the first of a series intended to help make you aware of the actions of X3J3 and the directions their work is taking. If you are elated or appalled by material appearing in them, or simply interested in learning more details, please feel free to talk with Kurt Hirschert, a member of the CSO consulting staff who has been participating in the work of X3J3 for more than two years. He will be happy to answer your questions and assist you in making your opinions heard by X3J3.

Part 2 - The Shape of Things to Come

Early in its work on the 198X revision of the FORTRAN standard, X3J3 was faced with a dilemma. On the one hand, FORTRAN could not be allowed to grow much larger without seriously affecting the likelihood that it could be fully implemented on small computers. On the other hand, there was great pressure to extend FORTRAN in some very extensive ways, such as including array expressions and other more advanced array processing facilities. If X3J3 were to ignore these pressures, it seemed likely that, at least on some larger computers, these facilities would be implemented anyway in nonstandard and nonportable ways. X3J3's response to this dilemma was to adopt the "core+modules" model for the next revision. Under this model, the standard would be partitioned into core language features. Thus, implementors wishing to provide advanced facilities would allow programs using them to be portable, at least among processors willing to support such facilities, but implementors on smaller machines or machines aimed at other markets would not be burdened with the requirement of supporting these facilities. The key features of this "core+modules" model are described in the following paragraphs.

The Core -- It is hoped that the core language will be slightly smaller than FORTRAN 77, but with comparable or even greater power for expressing general programming applications. This will be accomplished by eliminating some of the redundant capabilities in FORTRAN 77 and by replacing some of its more peculiar features with more regular features which provide the same functions, but are easier to describe and implement. In the long run, this regularization of FORTRAN should make it an easier language to learn and use.

Language Extension Modules -- Features of an experimental nature or of interest to only a limited portion of the FORTRAN user community would be described in language extension modules. The availability of language extension modules isolates the decision to standardize the use of a particular facility in FORTRAN from arguments that it is too expensive or specialized for general implementation, thus extending the portability benefits of standardization to subcommunities of the users of FORTRAN.

Obsolete Features Module(s) -- One of the major problems in producing a revision of a language standard is that such revisions are rarely 100% upwards compatible with their predecessors. Thus, users of the language must be concerned with questions of how and whether programs conforming to the old standard can be made to run properly under processors supporting the revised standard. Most vendors provide some combination of conversion programs and support for the old facilities to simplify such transitions, but the portability of such transitional programs is often poor. In future revisions of the FORTRAN standard, the obsolete features module(s) will describe features that when added to those of the core language will be sufficient to properly execute programs written in conformance to the previous version's core (which for this revision will be taken to be all of FORTRAN 77). The availability of processors supporting the obsolete features module(s) should eliminate the need for "instantaneous" transitions from one standard to the next and should allow transition periods comparable to the revision cycle of the language (typically 5 to 7 years or more).

Application Facilities Modules -- Standards specifying the interface between FORTRAN and externally defined applications facilities are becoming increasingly common. For example, the graphics standards committee is in the process of developing a standard for the names and arguments of subprograms providing standard graphics services to FORTRAN 77 programs. The concept of application facilities modules provides a formal recognition of the relation between such standards and the FORTRAN standard. X3J3 will also provide language features and administrative control to help resolve situations, such as the use of identical procedure names for different purposes in different application facilities modules, that would otherwise interfere with the usage of multiple application facilities modules in the same program.

Part 3 - Recent X3J3 Actions

The 78th meeting of X3J3 took place May 11-15, 1981 in Toronto Ontario. Actions at that meeting included the following:

- Further work was done on a facility to specify the representation of real and complex numbers in terms of minimum precision requirements rather than in machine dependent terms like single and double precision.
- The criteria to be used for determining which language features are part of the core language were revised.
- The interaction between array processing facilities and data structuring facilities was discussed. Special attention was given to the interpretation of a construct which could be described as representing an array of arrays.
- Further extensions to the array processing facilities were discussed, especially in the areas of array valued procedure arguments and array valued functions.
- Additional work was done on an internal procedures facility intended to replace and extend the statement function.

- Additional work was done on an enhanced procedure interface facility that would allow such things as arguments specified by keyword, compile-time checking of the number and type of arguments to a procedure, and the provision of default values for omitted arguments.
- Exploratory work was done on a name-directed input/output facility which would provide functionality similar to NAMELISTs (a non-standard facility), but in a more regular form.
- There was also discussion of providing a standard input/output form that would offer the useful functionality provided by the non-standard BUFFER IN/ BUFFER OUT facility.
- A facility was adopted for using compile-time variables and compile-time control constructs to effect conditional compilation and variant subprogram source.
- There was discussion of the issues to be resolved in order to provide a means of specifying all attributes of a FORTRAN entity in a single declaration, as opposed to the current FORTRAN specification statements, which specify only a single attribute, but may include several entities.
- As an economy measure, X3J3 has reduced its meeting schedule from five to four meetings per year, starting in 1982. As a result of this change and several other factors, the projected schedule for revision of the standard has been updated. It is now expected that the revision will be in its final form in mid 1983, with final adoption of the revision taking place in late 1986.

The next meeting of X3J3 will take place August 10-14, 1981 in Los Alamos, New Mexico.

MATHEMATICAL SERVICES

SOFTWARE FOR SPARSE MATRICES

We now have a number of routines on the CYBER for solving large sparse systems of linear equations $Ax=b$, for both real and complex A . (A is "sparse" if most of its elements are zero, typically up to 95% or more.)

For general nonsymmetric A , the routines we have are NSPIV (in UOILIB), a package called Y12M consisting of several routines (in UOILIB), the Yale sparse matrix package (in UOILIB), and several routines in the Harwell library (GRAB, HARWELL/S) : MA28A/MA28B/MA28C for general real matrices, ME28A/ME28B/ME28C for general complex matrices, and an as-yet-unconverted routine MA32AD for applying the frontal method using disk storage.

For symmetric positive definite matrices A , there is MA31A in Harwell, a library of iterative routines called ITPACK (GRAB,ITPACK), and several routines in the Yale package in UOILIB.

Codes that deal with sparse matrices usually use a special data structure, to avoid having to store a large number of zero elements. For the routines that we have there are four storage schemes (except for MA32AD, which uses a scheme specially designed for the frontal method):

- 1a. Store all the nonzero elements of A in one long vector and use two integer arrays to contain the corresponding row and column indices.

This scheme is used by MA28A/B/C, ME28A/B/C, Y12M, and several other Harwell routines, and is used for convenient input rather than internal operation : each routine converts the input to a scheme more like 2a or 2b below for internal use.

- 1b. For a symmetric A , use scheme 1a, but store only the upper triangle of A .

This is used by MA31A.

- 2a. Store all the nonzero elements of A in a big vector VA , ordered so that the elements of row i precede those of $i+1$; then use two integer vectors IA and JA so that $JA(I)$ is the column number of the element in $VA(I)$ and $IA(K)$ gives the position in VA where the elements of row K begin (or equals $IA(K-1)$ if the row is all zeros).

This scheme is used by NSPIV and by the Yale routines for nonsymmetric matrices.

- 2b. For a symmetric matrix A , use scheme 2a but store only the upper triangle of A .

This scheme is used by ITPACK and by the Yale routines for symmetric positive definite matrices.

An important fact of life about these data structures is that -- except for the iterative methods which use them -- they "grow" during the solution process. That is, the arrays you use must be dimensioned larger than what is necessary to store the initial matrix itself, to allow room for "fill-in" during elimination. Unfortunately, unless you have analyzed the matrix beforehand, it is not possible to say just how large the arrays should be, since you don't know how much fill-in there will be. You can use a similar matrix which you have run before, or do a "benchmark" on a matrix of smaller size with a similar pattern of elements, to gauge the amount of storage that may be necessary. If neither of these is possible, proceed with care; it is possible to have a matrix which, though very sparse, results in huge amounts of fill-in and requires more memory to solve than you can get.

Following are brief descriptions of each piece of software mentioned above, and how to get documentation on them.

NSPIV was published in *Transactions on Mathematical Software (TOMS)* volume 4 number 3 (December 1978); the same issue contains a paper by Andrew Sherman explaining the technique it uses. It is oriented toward solving one system $Ax=b$ and preserves no information which can be used to solve other systems with the same or a similar matrix. A brief description of NSPIV parameters can be obtained on-line as follows:

```
GRAB,MATH.
MATH,UOILIB,NSPIV.
PRINT,DOC.
```

To actually use NSPIV, you must access the UOILIB library, as follows:

```
GRAB,UOILIB.
```

Following this, you would compile and run a FORTRAN program which calls NSPIV.

Y12M (in UOILIB) is a package of routines developed at the Regional Computing Center at the University of Copenhagen in Denmark. The core of the package consists of three routines : Y12MBE, Y12MCE, and Y12MDE. (These are the names of the single precision versions; those of the double precision version are Y12MBF, Y12MCF, and Y12MDF. The documentation of Y12M often refers to routines generically -- Y12MB, for instance, refers to Y12MBE or Y12MBF, whichever is appropriate.) Y12MB re-orders your matrix information (entered according to scheme 1a above) to a more convenient form for internal operations; Y12MC performs the actual reduction, using a special "partial pivoting" strategy designed to minimize fill-in without sacrificing accuracy (which is not easy!), and saving information as it goes; and Y12MD uses the saved information from Y12MC to solve for a given right-hand-side vector. This division of functions makes it easy to reduce a matrix once and then solve for a whole series of different right-hand-sides. Y12M uses a new idea as part of its reduction algorithm -- the "drop tolerance". This is a number which you can select, such that new matrix elements which are generated during elimination, and which are smaller than the drop-tolerance, are ignored (dropped, not stored, thrown away!). This results in an inaccurate reduction, but the accuracy can usually be regained during solution of $Ax=b$ by doing "iterative refinement" : the residual vector $b-Ax$ is used as a new right-hand-side to get a solution which is an incremental improvement to the previous one; an updated solution is formed, and the process repeated until the solution stabilizes. A special driver routine, Y12MFE (sorry, no double precision version for this one) is provided which inputs your problem information, including the drop tolerance, calls Y12MBE and Y12MCE to reduce the matrix, then calls Y12MDE repetitively for the iterative refinement process. If you don't wish to use the drop-tolerance, there is a driver Y12MAE (double precision version Y12MAF) which inputs your problem information, makes default assumptions about all internal tolerances to be used, and calls Y12MBE, Y12MCE and Y12MDE to solve the problem. Y12MAE is very short, since all it does is call the other routines; the authors of Y12M intend that you should modify your own source copy of Y12MAE (or Y12MAF) to suit your exact needs.

To obtain the source or an on-line writeup for any of the Y12M routines, enter the following CYBER commands:

```
GRAB,MATH.  
GRAB,UOILIB,Y12Mxx.
```

where xx represents which one you want (AE, AF, BE, BF, etc.). You will be provided with a local file SOURCE containing complete source code for that routine, and a file called DOC containing just the writeup portion of the source code. Y12MAE, Y12MCE, Y12MDE, and Y12MFE contain extensive writeups, derived from the user manual for them written at Copenhagen. A copy of this manual, is on view at the DCL Consulting Office or can be borrowed from Stan Kerr (175 DCL, 333-4715). A research report, *Direct Methods for Sparse Matrices*, by Ole Osterby (who brought the package here) and Zahari Zlatev, can also be borrowed.

The **Harwell Library** contains one principal package -- MA28 -- for solving sparse real systems (ME28 is a complex version of MA28). This package consists of three routines, MA28A, MA28B, MA28C which divide the work somewhat the same way Y12M does. MA28A analyzes and factors a given matrix, MA28B factors another matrix of the same or a similar pattern of nonzero elements as was last handled by MA28A, and MA28C solves $Ax=b$ for a given b, using information saved by MA28A or MA28B. The technique used is to try re-ordering the rows and columns of the matrix so as to obtain a block lower triangular matrix, then use gaussian elimination on the diagonal blocks thus formed. Besides the MA28 and ME28 routines themselves, there is a scaling routine MC19A which can (and should) be used when the matrix elements differ widely in magnitude.

For a symmetric positive definite matrix A, Harwell routine MA31A can be used. It uses a method of "pre-conditioned conjugate gradients" rather than a direct elimination method.

Writeups on the Harwell routines can be found at the Consulting Office in 166 DCL. The library is accessed by the command

```
GRAB,HARWELL/S.
```

The /S means HARWELL is a public, shared entity but is not presently a fully supported product. Not all Harwell routines are available on the CYBER, because of the necessity of conversion from their original IBM FORTRAN. Moreover, the library has been compiled with the new FTN5 compiler (mainly because conversion of many of the routines to FTN5 is much easier than to the current FTN), so you may need to compile your program with FTN5 or take special measures to make sure everything hangs together correctly (see the consultants!). Source of the available Harwell routines can be had by entering

```
GRAB,MATH.  
MATH,HARWELL,xxx.
```

where xxx is the name of a Harwell routine. The source is put in a local file called SOURCE. Some routines -- MA28A, ME28A, MC19A, and MA31A in particular -- have had extensive internal writeups added to their source decks (most Harwell routines have no writeups inside them, so you usually have to consult the printed manual at the consulting office for instructions on a particular routine).

Two papers relating to the Harwell routines are:

"Some Design Features of a Sparse Matrix Code"

by I.S. Duff and J.K. Reid

Transactions on Mathematical Software, March 1979

(This describes the design of MA28.)

"Solving Sparse Symmetric Set of Linear Equations by Pre-Conditioned Conjugate Gradients"

by N. Munksgaard

Transactions on Mathematical Software, June 1980

(This discusses the MA31A algorithm.)

The **Yale sparse matrix** package consists of a set of routines for symmetric and nonsymmetric matrices, with 5 principal driver routines which are used to access them. The routines have suffered some name changes to make them easily distinguishable from other UOILIB routines; the drivers are named YALEC, YALEN, YALEO, YALES, and YALET. YALEO and YALES are the drivers for symmetric problems: YALEO attempts to re-order the matrix rows and columns to ensure reasonably low fill-in when YALES does the actual elimination. YALEC, YALEN, and YALET are the drivers for nonsymmetric problems. YALEN and YALEC are two versions of the elimination algorithm, the former using "uncompressed pointer storage" and the latter using "compressed pointer storage"; YALEN is faster than YALEC but uses more memory. YALET is a version which can be used to efficiently solve for additional right-hand-sides, whereas YALEN and YALEC save such information.

Writeups on the Yale routines can be obtained as follows:

GRAB,MATH.

MATH,UOILIB,YALEO.

MATH,UOILIB,YALES.

MATH,UOILIB,YALEN.

MATH,UOILIB,YALEC.

MATH,UOILIB,YALET.

This will produce one local file called DOC containing writeups on all 5 routines; this file can then be PRINTed. If you only need one writeup, just do one call to MATH for that routine. Two reports from Yale describing the routines can be viewed at the DCL Consulting Office, or borrowed from Stan Kerr; in reading these reports you must take account of the name changes of the routines.

We are interested in knowing of your particular requirements in solving large sparse systems, and of your experience with any of the routines mentioned here. If you have any remarks or suggestions, please send them to Stan Kerr (175 DCL, 333-4715, or TELL,UN=MATHLIB on the CYBER).

MISCELLANEOUS

CILLILUG MEETING

The next meeting of the campus DEC Local Users Group will be July 14 at 3 PM in room 158 of Loomis Laboratory of Physics. There will be at least one floppy/winchester disk system available for a demonstration. Walt Schneider will give a brief description of his experiences with some of the available systems at 3:30. (Also, see information about demonstration of Tektronix equipment in the same building the same day.)

DEMONSTRATION OF TEKTRONIX EQUIPMENT

Jim Stallings will demonstrate the 4114 and 4112 models of the Tektronix 4100 series on July 14 in Room 420, Loomis Laboratory of Physics. Demonstrations are scheduled during the hours: 10:30 AM - noon and 1:30 - 5:00 PM.

SALES - EXCHANGES - HELP WANTED

HALF-TIME PROGRAMMING POSITION

The High Energy Physics Group, Department of Physics is looking for an advanced undergraduate or graduate student to work approximately 20 hours per week. Previous programming experience is required and experience with FORTRAN and Assembler languages is desirable. (Students who have completed the 200 level sequence in Computer Science may be able to substitute courses for the experience requirement.)

Computers used by the group include a DEC KI10 running the TOPS-10 monitor and DEC LSI-11/2's and LSI-11/23's. Members of the programming staff maintain monitors, system programs and libraries for these computers, do consulting with the users and are also involved with some microcoded special hardware for the data taking activities of the group.

Applicants should be able to commit to at least 18 months in the position.

Submit resume (it may be an informal one) to:

Jerald Wray
487 Loomis Lab
333-4922

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CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 131K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

CHANGES IN IBM DISK POLICY

In the past, datasets residing on CSO's public disk packs which satisfied any of several criteria were dumped to tape and purged from disk. To have a purged file restored, a user had to contact the Systems Consultants. With the installation of a disk management package on the IBM-4341, a dataset purged from disk after August 1, 1981 may be restored to disk with the RESTORE proc, eliminating the need to contact the Systems Consultants. The RESTORE proc may be used in the following manner:

```
//jobname JOB
/*ID      (necessary ID card parameters)
// EXEC RESTORE
//SYSIN DD *
    RESTORE DSNAME=name [,NEWNAME=newname]
```

where

name is the name of the dataset to be restored

newname is the dataset name to be assigned to the restored dataset. If the NEWNAME parameter is omitted, the data set will be restored with its original name.

More details on the RESTORE proc are available in Reference Guide RF-17.8, available at any RJE site.

For the present, the dataset purging policy will be unchanged. Once each week datasets which satisfy any of the following criteria will be archived to tape and purged from disk. Such datasets:

- have not been accessed for more than 30 days,
- belong to cancelled PS numbers,
- belong to PS numbers which have been inactive for more than 30 days,
- are not cataloged (PUBLIC only), or
- have names which do not conform to the standard naming conventions at CSO.

With the termination of 2314 setup disk service, there will be a significant increase in the number of datasets competing for residence on the public disks. To offset this load, more public disk space will be made available. The above policy will be changed as necessary to maintain sufficient space on the public packs.

CONVERSION TO NEW UNIVERSITY ACCOUNTING

Our conversion to the new eleven-digit university account number has caused some confusion for users who must specify an account number when dealing with CSO's Accounting and Distribution Office. If you pay for computer use through an invoice number you are not affected by this change. If you deal with account numbers as a computer user there are a number of facts you should know:

- All new account numbers contain eleven digits, a seven-digit root followed by a four-digit "object code". Roughly, the first seven digits identify a pool of money and the object code identifies the type of income or expenditure. Use of the object code is mandatory.
- Each account number of the kind in use before July 1 has been assigned a seven-digit root under the new accounting system. The University Accounting Division sent each departmental office a list of account numbers used by the department and the corresponding new seven-digit roots to be used under the new system. The departmental business office must choose the object codes to be appended to these seven-digit numbers to form the new account numbers. The Office of Business Affairs sent each departmental business office a list of recognized object codes and their definitions.
- Account numbers used to fund computer time at CSO must have one of the following object codes:

Account numbers representing a research board allocation of computing service units must have an object code of 5571.

Account numbers representing a campus allocation of computing service units for class use must have an object code of 5573.

Any other account number must have an object code of 556x where x is chosen by the department and may be any digit.

- If an account number is to be used to pay for manuals or terminal rental, the department must decide how the expense is to be classified and choose the appropriate object code.

We automatically converted all account numbers in our database to the new format using a conversion table supplied by AISS on June 25. We used 5560 as the object code for any account number which was not a research board or class account. If your department wants to use a different final digit for the object code, you must fill out the necessary account and PS forms at the CSO Accounting Office to make the change.

If you have any questions relating to the account number conversion, please contact your department's business office. Our correspondence table between old and new account numbers is no longer current. Furthermore, with the exception of research board and class accounts, the departmental office must choose one or more digits of the object code.

UPDATES ON PAGE PRINTING SYSTEM

We are now automatically routing some large print jobs to the Page Printing System (PPS). Only jobs which run on the local CPUs and which would normally print on standard forms are affected. Jobs which run at UIC, jobs requesting special forms, and jobs which are routed to an RJE other than DCL are not affected.

For IBM jobs "large" is defined as more than 30,000 lines of output. For CYBER jobs it is defined as 4000 or more PRUs of disk space. Both definitions approximate 500 pages of output.

Users can override this default and force a large job to print on the usual line printer by using the FORMS=NOPPS parameter. For IBM jobs the parameter appears on the ID card. For example:

/*ID FORMS=NOPPS

For CYBER jobs the parameter appears on the PRINT command. For example:

PRINT/FORMS=NOPPS.

Users generating large printouts should be aware of the following limitations of the PPS and specify FORMS=NOPPS if they are a problem:

- The PPS can print at most 64 lines/page. Pages containing more than 64 lines will overflow to a second page.
- The only carriage control characters honored by the PPS are single space (blank), page eject (1), double space (0), and triple space (-). Any other carriage control character will cause unexpected results. Note that overprinting is not supported.

We are now dumping PPS output to tape for subsequent printing three times each day. The schedule is as follows (Monday through Friday only):

Jobs Dumped to Tape Output available for pickup at DCL

8:00 AM	2:00 PM same day
12:00 Noon	5:00 PM same day
9:30 PM	9:30 AM next day

Depending on the backlog of PPS work and the amount of output to be printed for CSO, it may be impossible for AISS to produce output in time for the 5 PM pickup noted above. In this event the output will be available for pickup the following morning at 9:30.

NEW CHARGE RATE FOR TERMINAL REPAIRS

Effective July 1, 1981, CSO will charge \$24.00 per hour for terminal repairs with a minimum of 1 hour. This will not include parts.

SYSTEM NOTES

JUNE RELIABILITY REPORTS

CYBER 175

11 recoverable interruptions
18 non-recoverable interruptions
13 of these were for more than 15 minutes

MTBF = 22.4 hours
MTR = 8.2 minutes
Availability: 98.8% of scheduled uptime

Major cause of downtime was related to
TELEX, disk, and software problems.

CYBER 174

4 recoverable interruption
12 non-recoverable interruptions
10 of these were for more than 15 minutes

MTBF = 41.3 hours
MTR = 18.6 minutes
Availability: 94.2% of scheduled uptime

Major cause of downtime was related to
TELEX, upgrade of core and disk problems.

IBM 4341:

20 interruptions
7 of these were for more than 15 minutes

MTBF = 33.6 hours
MTR = 14.6 minutes
Availability: 93.5% of scheduled uptime

Major cause of downtime was related to
software and disk problems.

MTBF = Mean Time Between Failures
MTR = Mean Time to Repair

CYBER

FETCH COMMAND UPDATED

The FETCH command now allows you to fetch multiple files with one command and to specify the local file name to be assigned to a fetched file. Command format is:

FETCH, *filename1, filename2, ..., filename_n*.

where *filename1, filename2*, etc. have any of the following forms:

local file name to be assigned = fetch file name
 local file name to be assigned = FNT ordinal of file in the FETCH queue
 fetch file name
 FNT ordinal of file in the FETCH queue

For example, suppose that you have four jobs awaiting fetch and that a QUERY command results in:

#	JOBNAME	QUEUE	
123	ABCDFFJ	FETCH	OUTPUTX
234	ABCDAAAB	FETCH	MODEL
345	ABCDEEK	FETCH	LISTING
456	ABCDEFI	FETCH	RESULTS

Note that the first column gives the FNT ordinal of each file while the last column gives the fetch file name. Then the command

FETCH,OUT=OUTPUTX.

would retrieve the first file in the list above and give it the local file name OUT.

FETCH,MODEL2=234.

would retrieve the second file in the list above giving the resulting local file the name MODEL2. Note that file to be fetched has been identified by its FNT ordinal.

FETCH,LISTING.

would retrieve the third file in the list above, giving the resulting local file the same name (LISTING) as the file had in the FETCH queue.

FETCH,456.

would retrieve the fourth file in the list above. Note that the FNT ordinal has once again been used to identify the file to be fetched. In this case the resulting local file is given the file's jobname ABCDEFI, not its fetch file name. (Note: FETCH will consider any number used as a fetch file identifier to be an FNT ordinal. This means that you cannot use a number as a fetch file name.)

Finally, all of this could have been accomplished with the single command

```
FETCH,OUT=OUTPUTX,MODEL2=234,LISTING,456.
```

If a FETCH command produces a local file with a name which is already in use, the existing local file is first returned. Similarly, if a single FETCH command produces several local files, all with the same name, only the last file fetched will exist at completion of the command.

QUERY COMMAND UPDATED

The QUERY command has been changed to optionally report approximate queue positions and to optionally eliminate any empty queue from the report of queue lengths.

When QUERY is used with the switch /P, the output generated will include the approximate queue position for any job reported which is in the TIELINE or INPUT queue. For example:

```
/QUERY/P.
```

#	JOBNAME	QUEUE
125	ABCDCFG	TAPE MOUNT
146	ABCD345	PPS
34	ABCDABC	# 2 TIELINE PRT
731	ABCD212	# 89 TIELINE PUN
12	ABCDFGH	# 2 INPUT

In this example, the queue position is reported in the optional third column. Here the job named ABCDABC is the second job in the TIELINE PRINT queue, i.e., one job will be processed before it. Similarly, job ABCD212 is the 89th job in the TIELINE PUNCH queue, and job ABCDFGH is the second job in the INPUT queue.

When used with the switch /F QUERY will generate a report of queue lengths but will omit any empty queue. For example:

```
QUERY/F.
```

QUEUE TOTALS	LENGTH
TIELINE	57
FETCH	103

The absence of the TAPE MOUNT, INPUT, PLOT, UNIX, PPS, and IBM INPUT queues from this report indicate that these queues are empty.

Finally, any report which shows a job in a TIELINE PRINT or PUNCH queue will also report the number of IBM jobs awaiting transmission to the IBM system for execution if there are any. This number is of interest since TIELINE will transmit all such jobs before processing any job in the TIELINE PRINT or PUNCH queue.

NEW VERSION OF ICE

On Monday, August 10, 1981 CSO will install Version 2.7 of ICE. ALthough most of the changes in Version 2.7 involve internal performance enhancements, the following three changes will affect our users:

- Entering the control statement

ICE, *filename*

when *filename* is either non-existent or not a local file, will result in the message

CREATE: *filename*

being displayed immediately after the ICE 2.7.0 banner. This is being done as a warning to users who have forgotten to do a GET on a file they are trying to ICE.

- Files which are not needed by ICE will not be created. Currently, if a user either does not have an OPTION file or tries to ICE a non-existent file and immediately exits, both the OPTION file and the source file will be created, but empty. In the new version, these files will not be created.
- A group-oriented command (e.g., PG) will not cause dropping out of the loop if the group reaches the bottom of the window.

WARNING: ICEWORK files will not be compatible between the current ICE (Version 2.6) and Version 2.7. Upon trying to use an old ICEWORK file, ICE 2.7 will abort with the message:

OBSOLETE WRKFIL VERSION

The current version will continue to be available for those who need it and can be accessed by entering:

GRAB,ICE26/PAST.

FEATURE ARTICLES

ED PELG RETIRES

Ed Pelg, a longtime employee of CSO will be retiring at the end of August. If you've ever used CSO's terminal repair service, you probably recognize him.

Ed began work with the University in the Fall of 1954. Computing was still in its infancy. The Digital Computer Laboratory, a separate entity under the graduate college, had just completed ILLIAC I and declared it ready for full time (24 hour) service.



Ed's first job was in the construction shop operated by the Digital Computer Laboratory. The shop was located on the ground floor of CERL (formerly ERL), a space that is now filled with Plato terminals. The construction shop was responsible for maintaining ILLIAC I and for building peripherals for it. ILLIAC I was at the frontier of computing hardware and its designers envisioned peripherals which were not commercially available. Construction and maintenance used vacuum tube technology. ILLIAC I continued in service until 1961.

In the early sixties Ed moved to the new Digital Computer Laboratory building to work with transistors and their applications in ILLIAC III. For nearly ten years he produced printed circuits and custom assemblies for the new Department of Computer Science. If you used PLORTS, the time-sharing system on the IBM 360/75, you were utilizing channel interfacing equipment Ed helped build.

In the early seventies Ed joined the newly formed Computing Services Office as an engineer for construction and repair. Here he continued, in part, to build electronic equipment, including a hardware monitor locally referred to as the "heart lung machine".

The heart lung machine was the key element used to tune the IBM operating system for its final measure of performance during the early to mid seventies. If you were computing then, you benefited from his work.

During the major part of the last ten years Ed's reliability served CSO well. He was responsible for testing communications equipment used by time-sharing users for problems on an ongoing basis. He spent the bulk of his time repairing terminals which belong to CSO, to people on campus, or to people at about a dozen other schools in Illinois. His helpfulness made him a goodwill ambassador for CSO in this capacity.

Ed's plans include travel and pursuit of his hobbies of fishing and golf. We all thank him for his service to CSO and the University and wish him well.

SPECIAL PLOTTER OUTPUT SERVICE

Increasing numbers of both CYBER and IBM users are taking advantage of CSO's graphics capabilities. Since many of these users intend to use the graphics output in reports, theses, or other printed material, it is essential that the output be of high quality.

To meet the needs of these users, CSO offers a Special Plotter Output Service. This article provides information about the service, briefly describes some of the available options, and suggests several ways to get high-quality output. If you require quick turnaround or only need "proof" type plots, you should use the general plotting facilities provided at the CSO Routing Room rather than the special plotting service.

The Special Plotter Output Service is located in Room 123 DCL. Special plots are run on a 1453b ZETA plotter or a 3653sx ZETA plotter. The 1453b plotter is a "tabletop" device, designed to use 11-inch wide paper. The 3653sx plotter is much larger and is contained in a free-standing cabinet. It is designed to use 34-inch wide paper. Paper selection is the only difference between the two special plotters; all other options are the same.

Users may request special plotting by using the appropriate parameters (options) on the CYBER PLOTZ command or the appropriate IBM procedure. CYBER users should obtain a copy of Reference Guide RF-7.31 PLOTZ for command format and a full list of options. IBM users should obtain a copy of Reference Guide RF-15.1. Both of these Reference Guides are available at the RJE sites. It is also recommended that persons planning to use the plotting facilities should obtain other plotting documentation from the CSO Accounting and Distribution Center, 1208 W. Springfield.

The options presented below are available *only* through the Special Plotter Output Service. If any of these special options are selected, even though you may have included the PLOT=NORMAL option, your job will automatically be queued for the special plotters. It is possible, however, to select only non-special or default options and still request special plotting by using the PLOTTER=SPECIAL option.

Special Paper Options

There are three types of paper available for the small special plotter: FANFOLD, ROLL, and ACETATE. Only one type of paper, WIDE, is available for the large plotter.

FANFOLD paper is the default. It is white, unlined, 11-inch wide paper, with perforations dividing the paper every 8 1/2 inches (at the fold). If you are using fanfold, you must remember to begin each plot on a new page to avoid crossing the perforations. Pens crossing the perforations may skip, tear the paper, or even jam the plotter. It is also available through the general plotting service with standard pen options.

ROLL paper is the same as fanfold except it has no perforations; it is a continuous roll of paper. It is also available through the general plotting service with standard pen options.

ACETATE is a roll of 11-inch wide, clear, thin plastic. If you select acetate, you *must* use nylon pens because ink pens smear and ball-point pens will not draw on the plastic.

The WIDE paper used on the large plotter is the same as the roll paper on the small plotter except it is 34 inches wide.

See the FORMS option in Reference Guide RF-7.31 or RF-15.1 for further details.

Special Pen Options

All of the ZETA plotters have four holders for pens, referred to in CSO documentation as Pen 1 through Pen 4. The user has the option of using the defaults or of selecting a different pen style and/or color for each pen. The user also has the option of using only one pen, any combination of pens, or all four pens.

There are four pen styles available: ROLLING, BALL, INK, and NYLON.

ROLLING refers to a rolling writer pen which produces a thin, dark line. This is the default for Pen 1.

BALL refers to a ball-point pen which produces a thin, light line. This is the default for Pen 2, Pen 3 and Pen 4.

INK refers to a cartridge pen which holds liquid ink. This type of pen produces a dark line and is often the optimal selection if the plot is to be photographically reproduced. The thickness of the line is determined by the size of the cartridge tip (specified by the user). The default line size is approximately 0.35mm thick, but the user may select cartridge tip sizes to create lines ranging from 0.30mm to 1.00mm in thickness.

NYLON refers to a pen which has a hard, nylon tip and produces a medium-bold line. Use of the nylon pen is mandatory if you select acetate for plotting.

All of the above pen styles are available in four colors: BLACK, BLUE, GREEN and RED. The shade of each color varies slightly according to the pen style. Also, the intensity of a color is affected by the density of the line.

See the P, S, and C options in Reference Guide RF-7.31 or RF-15.1 for further details.

Length and Time Options

The LENGTH option is used to specify the maximum length of your plot in inches. The TIME option is used to specify the maximum amount of time, in minutes, needed to run your plot. Please note that incorrect specification of time or length will abort your plot, even if it has not completed. For this reason, we recommend proofing your plots on the Routing Room plotter before sending them to the special plotters.

If you are using ink pens to produce your plots, you should increase your time specification by at least 50 percent. This is necessary because the operator must reduce the plotter's speed for ink plots.

We have found that plot jobs which need more than 90 minutes, or those which are longer than 300 inches, often require a number of operator restarts before an acceptable final output is produced. For example, a complicated plot might need the default length, and might take 180 minutes on the plotter; or, a large number of plots might be combined into one job such that the job requires over 300 inches but can be plotted in a reasonable amount of time. In either case, any number of unavoidable problems could ruin a portion of the plot. The operator must restart the job from its beginning each time a problem occurs. We often reproduce a lot of output that is mostly acceptable, but has to be done over because of a small portion that is not acceptable. Jobs such as these greatly reduce special plot turnaround time.

However, we are hesitant to enforce maximum time and length restrictions. Instead, we ask that you consider these problems and avoid submitting such jobs whenever possible.

Choosing Appropriate Combinations

Because the density of plotted lines can range from very fine to very bold, you have to consider a number of factors when choosing your pen style. For instance:

- Do you need to photographically reproduce the plot?
- What is the overall size of the plot, and does that impose a particular range of line densities?
- How complex is your plot? If the distinction of white space between the plotted lines is important for clarity, are your lines fine enough to achieve that effect?

If your main requirement is defined by the Graduate College thesis specifications, remember that those specifications were devised to maintain document consistency and clarity of reproduction. In general, masters theses are photocopied; doctoral theses are photocopied and microfilmed. Most plots produced with ink pens, rolling writer pens, or nylon-tip pens can be photocopied without a significant loss of quality.

To maintain optimal quality for plots being microfilmed, the original plot should be drawn with sharply-defined, dark lines. This is often best achieved by using an ink pen with the appropriate tip size and color combination most suitable for your plot. Also remember that any color other than black is less likely to produce high-quality results when the plot is photocopied or microfilmed.

If you have chosen to use ink pens in more than one position, keep in mind that liquid inks dries out rapidly when not in use. In general, if an ink pen has not been used for a while, it should be primed before use. If it is not primed, the next time it is selected there will probably be either a pen skip or an ink smudge at the beginning of the line. Substitute nylon pens or prime the ink pen before using it by moving outside the plot margins and drawing a short line.

If you have questions about using CSO graphics programs and utilities, contact the Systems Consultants, 166 DCL (333-6133). If you have problems, questions or suggestions about CSO's Special Plot Output Service, contact Debbie Weller, 171 DCL (333-8150).

GENERAL PLOTTING SERVICE DCL ROUTING ROOM

Currently, the General Plotting Service in the DCL Routing Room handles only those plots using the default or standard options and fanfold paper. Effective August 17, 1981, they will also handle plots using default options, but roll paper.

In other words, after August 17, if you use default options and either fanfold or roll paper, your plot will automatically be sent to the plotter in the Routing Room. If you specify roll paper and still want your job to be processed on the special plotter, you must specify this by using the option:

PLOT=SPECIAL

FORTRAN FUTURES

This article is part of a series on the work of the FORTRAN Standards Committee X3J3 in producing the next revision of the FORTRAN standard. The reader is reminded that the features described in this article are not a part of any FORTRAN compiler currently available, but rather are proposed requirements for FORTRAN processors produced in the late 1980's through the mid 1990's. Although every effort has been made to accurately describe the current position of X3J3 on these matters, the development of a revision to the FORTRAN standard is an evolutionary process, and these proposals may be subject to refinement, revision, or even retraction. Comments on these proposals may be given to Kurt Hirschert of the CSO Systems Consulting staff, who is a member of X3J3.

In order to write programs in a language, one of the first things one must learn is its source form, that is, the rules for expressing its statements. X3J3 has passed a number of proposals modifying the source form of FORTRAN.

One commonly heard complaint about FORTRAN is that six characters are not enough to produce meaningful variable names. X3J3's answer to this complaint has been to increase the limit on symbolic names to thirty-one characters. In order to keep such names readable, the underscore or break character (`_`) has been made a permissible character in symbolic names.

The current FORTRAN standard, known as FORTRAN 77, added a number of features such as CHARACTER variables and constants and the option to use them in place of the FORMAT statement label in an input/output statement. Since formats often contain quoted strings, these quotes must be represented by two quotes. If such quoted strings are, in turn, to contain quotes, these quotes must be represented by sets of four quotes. For example,

```
WRITE(6,'(' C='''',A,'''''')')C
```

As you can see, the quotes quickly become so numerous that they are difficult to read. To help control these difficulties, X3J3 has voted to make the double quote character an alternative for delimiting character constants. The previous example could then be written

```
WRITE(6,"(' C=''',A,'''')")C
```

This reduces the proliferation of quotes to the same level as would occur in a normal unquoted FORMAT statement.

The features of the FORTRAN 77 standard are available to CSO users through the FNT5 and M77 compilers.

Because of the extensive nature of some of the proposals for adding to FORTRAN, X3J3 has voted to add to the set of characters which can be used to write FORTRAN programs. The special characters common to EBCDIC, ASCII, and all of the international variations on ASCII were added. These are exclamation point (!), double quote ("), percent (%), ampersand (&), semicolon (;), less than (<), greater than (>), question mark (?), and underscore (`_`). Other proposals have specified uses for some, but not all, of these characters.

As terminals supplant keypunches as the typical source of computer input, the handling of lower case letters becomes an increasingly important issue. Although no requirement has been made that a FORTRAN processor support lower case letters, X3J3 has approved rules for handling lower case letters in processors where they are available. Briefly, these rules call for lower case letters to differ from their upper case counterparts in character constants and other similar contexts, but to be equivalent in all other syntactic uses. For example, xyz denotes the same variable as XYZ, and a FORMAT statement could also be a format statement, a Format statement, or even a fOrMaT statement.

The most extensive source form proposals X3J3 has passed concern the elimination of restrictions on the columns in which the various FORTRAN source elements may appear. All cases where the interpretation of a syntactic element was dependent on the column in which it appeared have been eliminated and source may now extend beyond 72 columns. Some of the associated changes are relatively straightforward. For example, a statement label is now simply a contiguous string of digits at the beginning of a statement. On the other hand, other changes are more drastic. For example, a C in column 1 can no longer denote a comment, since statements can begin with C and may begin in column 1. In the proposed revised source form, the exclamation point (!) begins a comment. In fact, any exclamation point not in a character string or similar context turns the remainder of the input record into a comment, thus allowing comments on the same lines as statements, but only on the right hand end. As with FORTRAN 77, blank lines and lines containing nothing but comments are ignored. Since column 6 can no longer be used to indicate continuations, a different continuation convention has been adopted. The continuation mark must appear on the end (except for comments and/or blanks) of the line to be continued, rather than the continuation line. The continuation mark is an ampersand (&). In the special case of continuing a character constant or similar item, there can be no comments following the continuation mark, since these would be indistinguishable from characters intended to be part of the character constant, and there must be a confirming continuation mark as the first nonblank character of the continuation line. Neither the continuation mark nor the confirming continuation mark are part of the character constant value. Finally, because there are cases where readability would be enhanced rather than reduced by the appearance of more than one statement on an input line, the character semicolon (;) has been designated to separate statements in such cases.

Example:

```
! A PROGRAM TO CONVERT CARTESIAN COORDINATES TO POLAR
PROGRAM MAIN
```

```
REAL X,Y      ! THE INPUT CARTESIAN COORDINATES
REAL R,THETA ! THE OUTPUT POLAR COORDINATES
```

```
10 PRINT *, ' ENTER DESIRED CARTESIAN COORDINATES'
READ(*,*,END=99) X,Y
```

```
! CHECK FOR INDETERMINANT CASE
IF(X.EQ.0.AND.Y.EQ.0) THEN; PRINT *, ' POLAR COORD&
    &INATE VALUES ARE INDETERMINANT'
ELSE
    R=SQRT(X**2+Y**2); THETA=ATAN2(Y,X)
```

```

PRINT *, 'POLAR COORDINATE VALUES ARE ', &
  R, THETA
END IF
GO TO 10
99 END

```

Ironically, one of the most controversial of the changes made by X3J3 will have little effect on most programmers. Blanks, which are currently ignored in interpreting FORTRAN statements, are to become a significant part of FORTRAN syntax. Much of the controversy concerning this change results from a misunderstanding of what is implied. Most of the places where blanks will be required are places where most programmers would have written a blank anyway. Similarly, most of the places where blanks will be prohibited are places where programmers would not normally write blanks. Programmers will still be free to use multiple blanks to space their programs as they wish. What is being eliminated is the ability to use blanks in unusual ways that are more often confusing than helpful. For example, do you recognize these FORTRAN statements?

```

REALM X,Y,Z
READY, SET, GO
GOT ONE

```

If not, perhaps they will be more familiar when spaced conventionally.

```

REAL MX,Y,Z
READ Y, SET,GO
GO TO NE

```

On the other hand, X3J3 is not in the habit of restricting or eliminating features simply because they can be misused. What benefits are to be gained by making blanks significant? This change will certainly make FORTRAN more like other languages, thus making it easier for the users of other languages to learn FORTRAN and vice versa. Significant blanks will also make error detection easier. Consider the following:

```

DO 10 I=1.10

```

Most FORTRAN programmers would recognize that this is an erroneously written DO statement (most likely the result of accidentally replacing a comma by a period). FORTRAN compilers, on the other hand, would take this to be a valid assignment statement that assigns the value 1.10 to the variable DO10I. This is just one example of the way the current insignificance of blanks makes it impossible for a compiler to use visual spacing clues to recognize errors. A more serious concern in terms of the current revision effort is the problem that if blanks are not used to delimit the various elements of a FORTRAN statement, then other punctuation characters must be used. This tends to result in an overpunctuated language that is less convenient to use.

For example, consider the `PARAMETER` statement added to FORTRAN 77:

```
PARAMETER (NDIM=100)
```

In early proposals for this statement and most early implementations, the parentheses were not required.

```
PARAMETER NDIM=100
```

Unfortunately, with insignificant blanks and an extension to longer variable names (such as is proposed for this revision), this statement would be indistinguishable from the assignment statement

```
PARAMETERNDIM=100
```

X3J3 was thus forced to add the parentheses to avoid ambiguity. Making blanks significant will help avoid such overpunctuation in the coming revision.

SALES - EXCHANGES - HELP WANTED

GRADUATE RESEARCH ASSISTANT

One-quarter time graduate research assistant needed beginning August 21, 1981 for statistical programming and data management. Knowledge of SPSS and SAS desirable. Ability to keep track of and document carefully a number of large social science datasets stored on tape.

Work is for an economist studying the impact of federal policy on sex differentials in the labor market.

Contact Prof. A. Beller after August 17 at 333-7257, or leave a message at 333-2412.

***OFF-LINE's* Mailing List**

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Social Science	202	Lincoln Hall	333-0309

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CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 196K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

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Text Processing Consulting		207	Astronomy	333-7318
Terminal Repair Service		150	DCL	333-0969

CYBER Dial-up Numbers	CYBER 175	110-300	baud	333-4000
	CYBER 175	1200	baud	333-4001
	CYBER 174	110-300	baud	333-4004

Asst Dir User Services	Robert Penka	173	DCL	333-4709
Asst Dir Systems and Operations	Sandra Moy	177	DCL	333-4703
Asst Dir Statistical Services	Larry Sautter	91	Comm West	333-2170
and UNIX System				
Asst Dir Development	J. M. Randal	120	DCL	333-9772
Asst Dir Engineering and	Cliff Carter	195	DCL	333-3723
Hardware Selection				
Documentation	Lynn Bilger	139	Astronomy	333-6236
CYBER-IBM Operations	Jack Knott	194a	DCL	333-6562
UNIX Operations	Debbie Weller	123	DCL	333-8150
Telecommunications	Tom Kerkering	164	DCL	333-0816
Laboratory Support Project	Mike Gardner	164	DCL	333-7904
RJE Operations North	Rex Duzan	162	DCL	333-6285
RJE Operations South	Don McCabe	1208	W Springfield	333-2171
				333-7752

RJE Sites

Agriculture	M103	Turner Hall	333-8170
Chemistry	153	Noyes Lab	333-1728
Commerce West	70	Comm West	333-4500
CRH Snack Bar	120	Snack Bar	333-1851
DCL Routing Room	129	DCL	333-6203
Electrical Engineering	146	EEB	333-4936
Florida Ave Res Hall		FAR	333-2695
Illinois St Res Hall		ISR	333-0307
Mechanical Engineering	65	MEB	333-1430
Psychology	453	Psych Bldg.	333-7531
Social Science	202	Lincoln Hall	333-0309

OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of August 31, 1981.

CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 196K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

CSO SHORT COURSES - FALL SEMESTER

CSO is offering the following short courses during the fall semester 1981 to acquaint people with our facilities and the Control Data Corporation's (CDC) CYBER 175 and CYBER 174 computer systems.

To register for a course:

please come in person to Room 150 DCL, or
phone 333-6630.

Registration is free and limited to 30 people in some classes. If you find that all of the available classes on a topic are full, please leave your name on our waiting list. We will call you if someone drops a class.

***PLEASE NOTE THAT YOU MAY NOT REGISTER FOR A CLASS
UNTIL THE WEEK PRECEDING THE WEEK THE CLASS IS TO BE
TAUGHT!***

We are enforcing this new policy in an attempt to reduce the number of no-shows we have had. Just this past semester, only 8 people showed up for a class in which over 20 people were registered. Reminders of upcoming classes will be published in each issue of *OFF-LINE*.

The classes offered are as follows:

INTRODUCTION TO THE CYBER COMPUTER SYSTEM

This course is intended for the first-time CYBER computer user. The emphasis is on time-sharing usage with discussions on the ICE text editor and card batch usage. Three classes will be offered:

Sept. 14, 16, 18, 21	12 noon - 1 PM	115 DCL
Oct. 6, 8, 13, 15	12 noon - 1 PM	115 DCL
Nov. 2, 4, 6, 9	12 noon - 1 PM	115 DCL

INTRODUCTION TO GRAPHICS AT CSO

This class will be an overview of the various hardware devices and software packages available at CSO. One class is being offered:

Sept. 17	2 PM - 3 PM	201 Astronomy
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NCAR PLOT PACKAGE

This class will be an overview of the facilities and general usage of the NCAR plotting package. This package allows for 3-D plotting, contour plots and world map projections. Familiarity with FORTRAN and the CYBER is assumed. One class is offered:

Sept. 24	2 PM - 3 PM	201 Astronomy
----------	-------------	---------------

EASY GRAPHING

This is a discussion of a high-level interactive plotting program for X-Y plots, bar charts and pie charts. Its English-like commands require no programming experience to generate plots. Familiarity with the CYBER is assumed. Two classes are offered:

Sept. 28, 30, Oct. 2	12 noon - 1 PM	115 DCL
Nov. 16, 18, 20	12 noon - 1 PM	115 DCL

GRAPHICS COMPATIBILITY SYSTEM (GCS)

This class on GCS will cover plots on various graphics devices. Familiarity with FORTRAN and the CYBER is assumed. One class is offered:

Oct. 5, 7, 9, 12, 14, 16	12 noon - 1 PM	115 DCL
--------------------------	----------------	---------

INTRODUCTION TO RNF

This is a beginning-level discussion of the RNF text formatter used in the preparation of letters, manuals, or other documents. Topics will include tabbing, margins, spacing, paragraphing, and justification. Familiarity with the CYBER is assumed. Three classes are offered:

Sept. 28, 30, Oct. 2	2 PM - 3 PM	201 Astronomy
Oct. 19, 21, 23	2 PM - 3 PM	201 Astronomy
Nov. 16, 18, 20	2 PM - 3 PM	201 Astronomy

INTERMEDIATE RNF

This class is a continuation of the Introduction to RNF. Topics will include macros, variables, arrays and applications. Two classes are offered:

Oct. 5, 7, 9	2 PM - 3 PM	201 Astronomy
Oct. 26, 28, 30	2 PM - 3 PM	201 Astronomy

CYBER MAGNETIC TAPES

This class will cover the use of magnetic tapes on the CYBER. Familiarity with the use of the CYBER is assumed. One class is offered:

Oct. 26, 28, 30	12 noon - 1 PM	115 DCL
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SIMULATION PACKAGES

This class will be an overview of the various simulation packages that are available. One class is offered:

Sept. 21, 23, 25	2 PM - 3 PM	201 Astronomy
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ALGEBRAIC MANIPULATION PACKAGES

This class will be an overview of the various packages that can perform algebraic manipulation. One class is offered:

Nov. 9, 11, 13	2 PM - 3 PM	201 Astronomy
----------------	-------------	---------------

CURVE FITTING ROUTINES

This class will cover the mathematical software available to do curve fitting. One class is offered:

Oct. 12, 14, 16	2 PM - 3 PM	201 Astronomy
-----------------	-------------	---------------

SAS

This is an introductory course on the SAS statistical package. Course topics will include:

- Preparation of data for input
- The SAS 'DATA' step
- Manipulating the input data: modifying variables, creating new variables, deleting observations or variables
- Sorting data
- Obtaining basic statistics, frequencies, plots

The course, consisting of three 2-hour lectures, will be offered once:

Nov. 2, 4, 9	7 PM - 9 PM	115 DCL
--------------	-------------	---------

SOUPAC

A lecture/laboratory will be presented on the SOUPAC statistical package on the CYBER. Handouts and examples will be provided illustrating basic statistics, regression and analysis of variance. Enough general CYBER terminology will be given to facilitate using SOUPAC. In the lab session, the use of keypunches and terminals will be demonstrated, and exercises will be provided on editing, running and modifying SOUPAC programs. Instructors will act as

consultants for solving problems during the lab session. The course, consisting of two 2-hour lectures and one 3-hour lab will be offered once:

Sept. 29, Oct 1	7 PM - 9 PM	243 Comm West
Oct. 3 (lab)	9 AM - 12 noon	243 Comm West

SPSS

This is an introductory course on the SPSS statistical package on the CYBER. The course contents will include:

- Preparation of data for input
- Basic components of the SPSS language
- Running SPSS programs from cards or at a terminal
- Using SPSS to transform the data
- Obtaining basic statistics and crosstabulation tables

The course, consisting of two 3-hour lectures, will be offered twice:

Sept. 22, 24	6:30 PM - 9:30 PM	115 DCL
Oct. 5, 7	6:30 PM - 9:30 PM	115 DCL

CSO VIDEOTAPES AVAILABLE

CSO has produced a series of eight videotapes which introduce the novice to the CYBER Systems. A viewing guide containing the major pictorials used in the series is available and can be used to facilitate note taking.

The title and a brief synopsis of each of the videotapes is given below. Running time is 10-15 minutes for each videotape.

Introduction to Computing at CSO

A brief look at the steps required to solve a problem using a computer and some of the hardware used.

Using a Terminal

A description of the physical operation of a terminal and some of the keys that have a special meaning to the CYBER.

Introduction to CYBER Time-Sharing

A tutorial for logging on and off the CYBER.

File Usage - Local File and Indirect Access to Permanent Files

An introduction to CYBER files and the commands used to manipulate them.

Introduction to ICE Text Editing

A tutorial on entering and modifying files with ICE.

Running a FORTRAN Program - Concepts

The concepts of compilation, loading and execution.

Running a FORTRAN Program - The PROGRAM Statement

The PROGRAM statement and its relationship to files accessed by the program.

Running a FORTRAN Program - Control Statement

The control statements used to compile, load and execute a FORTRAN program.

Anyone can view these videotapes by going to the Undergraduate Library in person to make a reservation for use of the videotape equipment. Ask for a copy of the viewing guide when you check out the videotape for viewing.

SYSTEM NOTES

JULY RELIABILITY REPORTS

CYBER 175

12 recoverable interruptions
13 non-recoverable interruptions
15 of these were for more than 15 minutes

MTBF = 27 hours
MTR = 15.0 minutes
Availability: 98.5% of scheduled uptime

Major cause of downtime was related to
TELEX, disk, and power problems.

CYBER 174

12 recoverable interruptions
22 non-recoverable interruptions
27 of these were for more than 15 minutes

MTBF = 20.1 hours
MTR = 29 minutes
Availability: 97.2% of scheduled uptime

Major cause of downtime was related to
TELEX, disk, and power problems.

IBM 4341:

8 interruptions
 2 of these were for more than 15 minutes

MTBF = 33.6 hours
 MTR = 14.6 minutes
 Availability: 98.2% of scheduled uptime

Major cause of downtime was related to
 power and disk problems.

MTBF = Mean Time Between Failures
 MTR = Mean Time to Repair

CYBER**IDA STATISTICAL PACKAGE INSTALLED ON CYBERS**

The IDA (Interactive Data Analysis) conversational statistical package marketed by SPSS Inc., has been installed on the CDC CYBER 175 and 174. To quote from the *IDA Users's Manual*, Robert F. Ling, McGraw-Hill, 1980:

"IDA is designed with both statistical capabilities and user convenience in mind. Its main emphasis is on statistical tools associated with regression analysis of linear models and related model-building techniques, as well as the high level of man-machine interaction that is typically required to carry out such techniques properly. Thus IDA is designed to emphasize what has come to be called model identification and diagnostic checking ...

Besides its interactive feature in statistical data analysis, the other major feature of the system is its user-convenience capabilities. Elaborate error detection and recovery codes, internal help files and bi-level prompts, and other special features of IDA are all capabilities specifically designed for the convenience of the user."

To access the IDA package use the following sequence of time-sharing commands:

```
GRAB,IDA/FUTURE.
IDA.
```

The manual may be purchased for \$13.00 at the Accounting and Distribution Office, 1208 W. Springfield. Questions concerning the IDA package should be directed to the CSO Statistical Consultants in Room 65 Commerce West (333-2170).

IBM

OSIRIS IV ON THE IBM 4341

OSIRIS IV, a statistical and data management package, has been installed on the IBM 4341. This social science package program has extensive data management capabilities, including the capacity to handle heirarchical files.

OSIRIS IV is invoked by the following EXEC statement:

```
// EXEC OSIRIS4
```

OSIRIS IV uses at least 150K of memory.

Questions concerning the use of the OSIRIS IV package should be directed to the Social Sciences Quantitative Laboratory in Room 208 Lincoln Hall (333-6750). Documentation is also available in Room 208.

PDISK1 AVAILABLE FOR USER DATASETS

The PUBLIC disk pack on the IBM system has been consistently short of free space. To alleviate this situation, on August 14, 1981 another disk, PDISK1, was devoted to user datasets. To place a dataset on this disk, use the JCL parameter

```
VOL=SER=PDISK1
```

instead of the parameter

```
VOL=SER=PUBLIC
```

FEATURE ARTICLES

FORTRAN FUTURES

This article is part of a series on the work of the FORTRAN Standards Committee X3J3 in producing the next revision of the FORTRAN standard. The reader is reminded that the features described in this article are not a part of any FORTRAN compiler currently available, but rather are proposed requirements for FORTRAN processors produced in the late 1980's through the mid 1990's. Although every effort has been made to accurately describe the current position of X3J3 on these matters, the development of a revision to the FORTRAN standard is an evolutionary process, and these proposals may be subject to refinement, revision, or even retraction. Comments on these proposals may be given to Kurt Hirschert of the CSO Systems Consulting staff, who is a member of X3J3.

During the public comment and review period for the 1978 FORTRAN standard, one suggestion frequently given X3J3 was that "structured programming" control structures be added to FORTRAN. In preparing its response to these comments, X3J3 found that although the ideal of structured programming was widely supported, there was much disagreement about how to put this concept into practice. Reaching a consensus on how to add "structured programming" to FORTRAN would have delayed the completion and adoption of the new FORTRAN standard, so X3J3 felt it must delay consideration of "structured programming" to the next revision. One aspect of "structured programming", however, was found to enjoy the necessary consensus, so the block-IF was adopted as a part of FORTRAN 77.

A brief description of the block-IF may be in order for those of you who have not worked with a FORTRAN 77 based compiler such as FTN5 or M77. In its simplest form, the block-IF allows one to replace code such as

```
IF(I.NE.J) GO TO 1318
.
.
.
1318 CONTINUE
```

by code such as the following, which contains no GO TOs or statement labels:

```
IF(I.EQ.J) THEN
.
.
.
END IF
```

An ELSE statement can be inserted preceding a block of statements to be executed when the expression given is false. One or more ELSE IF statements can be inserted to allow a series of expressions to be evaluated until a true one is found (with the ELSE block then being executed only if all the expressions are false). More complicated control structures can be built by nesting block-IFs inside other block-IFs.

Thus the following set of block-IFs

```

IF (M.LT.N) THEN
  IF (X.GT.0) THEN
    .
    .
    .
  ELSE
    .
    .
    .
  END IF
ELSE IF (M.GT.N) THEN
  IF (Y.NE.Z) THEN
    .
    .
    .
  END IF
  .
  .
  .
ELSE
  .
  .
  .
  IF (Y.NE.X) THEN
    .
    .
    .
  ELSE IF (Z.EQ.0) THEN
    .
    .
    .
  END IF
END IF

```

might replace this code written with GO TOs and statement labels

```

      IF (M.GE.N) GO TO 3716
      IF (X.LE.0) GO TO 3715
      .
      .
      .
      GO TO 3720
3715 CONTINUE
      .
      .
      .
      GO TO 3720
3716 IF (M.LE.N) GO TO 3718
      IF (Y.EQ.Z) GOTO 3717
      .
      .

```

```

      .
3717 CONTINUE
      .
      .
      .
      GO TO 3720
3718 CONTINUE
      .
      .
      .
      IF (Y.EQ.X) GO TO 3719
      .
      .
      .
3719 IF (Z.NE.0) GO TO 3720
      .
      .
      .
3720 CONTINUE

```

X3J3 has developed two other "structured programming" constructs to be used with the block-IF in the next revision of the FORTRAN standard. The first of these is the block-DO. In its simplest form

```

DO
.
.
.
REPEAT

```

the block-DO establishes an "infinite" loop which must be terminated by tests contained within the loop. A new statement, EXIT, has been provided for this purpose. The use of EXIT within a loop transfers control to the first statement following the end of the loop. Although the EXIT statement has been provided for the purpose of terminating loops, the programmer is free to use other means, such as GO TOs, for this purpose. This separation of the basic looping mechanism from the means by which it is terminated avoids the controversy about whether the termination condition of a loop should be tested at the top or bottom of a loop by giving the programmer the freedom to explicitly place the termination test wherever it is desired, at the top, at the bottom, or even somewhere in the middle.

An extended form of the block-DO

```

DO(variable=expression,expression[,expression])
.
.
.
REPEAT

```

provides the same function as the current DO loop, but in a form consistent with the rest of the "structured" looping facility. (There are some indications that the array processing facilities being added to FORTRAN will make most of the uses of such loops unnecessary. These array processing facilities will be the subject of a future article in this series.)

A different extend form

```
DO (expression TIMES)
.
.
.
REPEAT
```

will be available when one needs to iterate a known number of times, but access to the counter is not needed. The EXIT statement can also be used before the indicated number of iterations have been executed.

The second new "structured programming" construct planned for the next revision of the FORTRAN standard is a structured alternative to the use of the computed-GO TO statement. Its use can probably be best shown with an example.

```
SELECT CASE(CHAR)
CASE('0':'9','A':'F')
.
.
.
CASE(' ','(',')')
.
.
.
CASE('/')
.
.
.
CASE DEFAULT
.
.
.
END SELECT
```

When the SELECT CASE statement is executed, the expression in parentheses is evaluated (in this case, the value of the character variable CHAR is determined), and the block of statements following the "matching" CASE statement is executed. When the block of statements has been completed, execution continues following the END SELECT statement. In this example, the first block of statements will be executed if CHAR contains a hexadecimal digit, the second if it contains a blank or comma, the third if it contains a slash, and the fourth if it contains any other character. As the example illustrates, more than one possible value of the expression may be associated with a block of statements and lists of consecutive values may be abbreviated with a kind of range notation. Any given value may be specified in at most one CASE statement. The CASE DEFAULT statement is equivalent to a CASE statement specifying all possible values of the selection expression that have not been specified in one of the other CASE statements. As this example illustrates, it is expected that CASE DEFAULT block will typically be placed last, but this is not required. It is not required to have a CASE DEFAULT block. If it is omitted, the possibility may exist that the value of the selection expression "matches" none of the CASE statements. Such a failure to "match" is an error and may result in unpredictable action by the processor.

There is at least a remote possibility that an additional "structured programming" control structure (related to error handling) may be added to the coming revision at a later date.

Recent actions by X3J3

The 79th meeting of X3J3 was held August 10-14, 1981 in Los Alamos, New Mexico. Actions taken at that meeting include the following:

- The basic outlines of a "name-directed" input/output facility were adopted. This facility should offer functionality similar to what is available through NAMELISTs, but in a manner which is more consistent with the existing standard FORTRAN input/output facilities.
- A facility to allow a subprogram to deal with the omission of some of its arguments was adopted. The effects of such an omission could be as simple as the provision of a default value or could extend to more far-reaching modifications in the actions of the subprogram.
- INVERSE and DETERMINANT were deleted from the list of new array processing intrinsics to be provided.
- Action was taken to correct, clarify, or extend previously passed facilities in several areas, including internal procedures, data structures, and numeric precision control.
- There was extensive discussion on the issue of how to handle the interaction between previously passed facilities for data structuring and array subsection referencing.
- Mechanisms for certain classes of array valued functions were discussed.
- Mechanisms for handling errors, exceptions, and other "events" were discussed, including user-defined "events".
- A proposal to determine which language facilities would be part of the "core" language was extensively discussed.
- Suggested responses to several requests for official interpretations of the current (1978) standard were discussed in anticipation of official action to be taken at the 80th meeting.

MISCELLANEOUS

COMPUTER-RELATED DISCOUNTS

IBM

The IBM CRT terminal has changed in price from \$1046 to \$1116.52. For those doing work (such as text editing) that requires heavy keyboard usage, this terminal is recommended.

IBM	Model 3101-10	\$1116.52
	EIA Cable	30.00

The ordering address is:

Illinois Educational Consortium
1306 South Sixth Street
Springfield, IL 62703

Maintenance is provided through warranty ship-back to Chicago depot-repair. The warranty can be renewed for \$70/year.

HAZELTINE

The reason that Hazeltine has so many models listed is due to the number of years they have been in the business and the rather wide customer base they have served.

For Research and Instructional customers the low-end model 1500 or 1410 is quite good enough for use with CYBER. Although, the GT 100A, ADM 3A, MIME 314 will do just as well.

Presently the only one maintained by CSO personnel is the H-1500.

Hazeltine	H-1410	\$615.00
	H-1420	725.00
	H-1500	765.00
	H-1510	895.00
	H-1520	1145.00
	Modular I - Editing	1500.00
	EX 80 - Model 20	1075.00
	EX 80 - Model 30	1345.00
	H-1421	650.00
	H-1552	950.00
	EIA Cable	30.00

The ordering address is:

Hazeltine Corporation
10 E. 53rd Street 22nd Floor
New York City, NY 10022

GENERAL TERMINAL

General Terminal is the name of the company previously known as Infoton, but none of the models available now are like the old ones. The Vistar series has changed to the GT and Visual series. Even though CSO repairs the old Infotons it does not repair any of the new models.

General Terminal	GT 101	\$810.00
	GT 100 A	710.00
	Visual 210	850.00
	Visual 200	785.00
	EIA Cable	30.00

The ordering address is:

Bronson and Bratton Inc.
5161 South Millard Avenue
Chicago, IL 60632
Phone: 312-735-6200 Robert Raatz

LEAR SIEGLER

Lear Siegler makes a series of ADM terminals similar to the Hazeltine, GT, and Mime. The reason for its being included is to provide an inexpensive form of graphics. The ADM 3A with Retrographic 512 gives a TEK 4010 compatible graphics terminal for less than \$1600 (the 4010 costs \$5000).

Lear Siegler	ADM 3A U/L Case	\$695.00
	ADM 3A + U/L Case (replaced by ADM 5)	705.00
	ADM 5 U/L Case	725.00
	ADM 31 U/L Case	825.00
	ADM 42 U/L Case	1565.00
	Retrographic Card (512) for ADM 3A or 5	840.00
	EIA Cable	30.00

The ordering address is:

Dytec/South Inc.
11657 Adie Road
Maryland Heights, MO 63043
Phone: 314-569-2990 Robert Finnegan

MICROTERM

Microterm is located in the St. Louis area and makes a line of terminals that mimic other manufacturers' terminals. The Mime 314 can operate as a Hazeltine 1500, an ADM 3A, or an ACT IV. The warranty is for two years and ship-back is to the factory.

Microterm	MIME 314	\$622.00
	EIA Cable	30.00

The ordering address is:

Technical Representative
502 Earth City Plaza
Suite 201
Earth City, MO 63045
Phone: 314-291-0001

TEXAS INSTRUMENTS

The Texas Instrument's Silent 700 series and the Dot Matrix 800 series are available. The 700 series is the thermal printer type which includes the lightweight portable. The 800 series models are meant to be competitive with the Digital Equipment Corporation's DECwriter.

Texas Instrument	Silent	743 U	\$890.00
		743 U/L	970.00
		745 U	1280.00
		745 U/L	1350.00
	Dot Matrix	810 RO	1430.00
		820 RO	1508.00
		820 KSP	1636.00
		840 RO	895.00
		840 KSR	1016.00

The ordering address is:

The David Jamison Carlyle Corporation
704 North Wells Street
Chicago, IL 60610
Phone: 312-975-1500

DIGITAL EQUIPMENT CORPORATION

The Digital Equipment Corporation's DECwriter is available in three models. The LS34DA and AA differ only in the way the paper is handled. The LA120 is a 1200 baud version of the original LA36.

Digital Equipment Corporation	DECwriter	LA 34 DA	\$857.00
		LA 34 AA	857.00
		LA 120	2015.00
	VT-100		1310.00

The ordering address is:

The David Jamison Carlyle Corporation
704 North Wells Street
Chicago, IL 60610
Phone: 312-975-1500

TELETYPE CORPORATION

The Teletype Corporation builds a Decwriter-type device called a Teletype 43. Some like the appearance of the resulting characters and also the smaller size. Otherwise, the 43 is similar to the LA34.

Teletype Corporation	4320 AAA (TTL)	\$955.00
	4320 AAK (EIA)	1025.00
	4320 AAB	1235.00

The ordering address is:

Bronson and Bratton Inc.
5161 South Millard Avenue
Chicago, IL 60632
Phone: 312-735-6200 Robert Raatz

XEROX CORPORATION

The Diablo-Xerox Terminal is a daisy-wheel printer with a typewriter-like quality. The application print speed is usually 30 characters/second.

Xerox Corporation	Diablo-Xerox	1740 RO	\$2337.00
		1740 KSR	2508.00
		1750 RO	2588.75
		1750 KSR	2603.00
		630 RO	2085.25

The ordering address is:

Xerox Corporation - Printing Systems Division
450 West Algonquin Road
Arlington Heights, IL 60005
Phone: 312-981-7400 Alex Henderson

NIPPON ELECTRIC CORPORATION

The Nippon Electric Corporation has marketed a replacement for the Diablo daisy-wheel document printer. The Spinwriter has proven to be more reliable, but no more expensive.

Nippon Electric Corporation	Spinwriter	5510-1 or 7710-1	\$2256.00
		5520-1 or 7720-1	2559.00
		5515-1 or 7715-1	2284.00
		5525-1 or 7725-1	2627.00
		5530-1 or 7730-1	2256.00
		5540-1	2655.00

The ordering address is:

Inland Associates Inc.
13100 Manchester Road
St. Louis, MO 63131
Phone: 314-821-3742 Bob Omer

COMDATA

Comdata has couplers and modems. The T212A is a replacement for the Rixon that we have used before. The major advantage of doing business with Comdata is their no-cost ship-back-to-repair policy.

Comdata	Coupler	302A2-13	\$176.90
		302A2-33	226.90
	Modem	T212A	851.90
		370E2-12	278.90
		370E2-42	328.90

The ordering address is:

Comdata Inc.
7900 North Nagle
Morton Grove, IL 60053
Phone: 312-470-9600 Philip Towle

MULTI-TECH SYSTEMS

Multi-Tech Systems supplies a 212A compatible modem for dial-up at 1200 baud only. For those who do not want the dual 212A modem from Comdata, the MT 212D-S is available at \$560.00.

Multi-Tech	Modem Mt212D-S (single unit with CA 211 Cable)	\$560.00
	Modem MT212D-R (rack mount with CA 211 Cable)	470.00

The ordering address is:

Multi-Tech Systems Inc.
82 Second Avenue S.E.
New Brighton, MN 55112
Phone: 612-631-3550 Tom Heimerman

RADIO SHACK

Radio Shack has offered about the same discount on their TRS80 equipment as the Byte Shop does on their Apple equipment. It is recommended that demonstrations be given by these vendors before you purchase. The demo should include your application.

Radio Shack	TRS-80 mod I peripheral	-22%
	TRS-80 mod II	-15%
	TRS-80 mod III	-22%
	TRS-80 Color Computers	-22%
	TRS-80 Pocket Computers	-22%
	TRS-80 Color Video Receivers	-10%
	TRS-80 Videotex Terminals	none
	TRS-80 Software	-22%

The ordering address is:

Radio Shack
National Bid Department
1600 One Tandy Center
Fort Worth, TX 76102

The Country Fair Radio Shack can be used for equipment demonstrations since equipment ordered will come to that store.

DIGITAL EQUIPMENT CORPORATION

The Digital Equipment Corporation has extended a bulk pricing for microcomputer products based upon the LSI 11/2 and 11/23 systems and software. A sample hardware system is shown here:

KDF11-HF	128K/23 with Mem. Management	\$2880.00
KEF11-AA	Floating Point	269.00
MXV11-AA	Multi-function 2 SLU/BOOT/8KRAM	448.00
MXV11-A2	Boot ROM CHIPS	38.00

Choice of System Boxes:

BA11-ME	1024.00
BA11-NE	1280.00

Choice of Disc:

5 meg	4320.00
10 meg	4968.00
(or alternate disc from DSD)	

Discount is approximately 36%. The ordering address is:

Digital Equipment Corporation
2400 North Main Street
East Peoria, IL 61611
Phone: 309-694-4235 Jim Divit

APPLE COMPUTER SYSTEMS

The Apple Computer Systems are available locally through the Byte Shop. Two sample systems are shown here:

Basic System

Apple II+ 48K Computer	
Disk II with Controller	
12" Black and White Video Monitor	
IDS 445G Paper Tiger Printer with Interface	
TOTAL BASE BID A	\$2561.07

If the 12" Video Monitor is not desired, subtract from Base Bid	117.25
--	--------

If the IDS 445G Paper Tiger Printer with interface is not desired, subtract	755.50
--	--------

Apple /// System Packages

Apple ///’s are sold as package systems. Apple /// option A includes:

Apple /// 128K bytes of RAM	
Information Analyst Package	
12" Black and White Video Monitor	
Silent-type Printer with Apple /// interface	
TOTAL BASE BID E	\$4103.40

Apple II Systems range in price from \$2000 to \$5000.
Apple /// Systems range in price from \$4000 to \$7000.

The ordering address is:

Byte Shop
P.O. Box 1678
1602 South Neil Street
Champaign, IL 61820
Phone: 217-352-2323 Dwayne Garrett

DATA SYSTEMS DESIGN

Data Systems Design has offered floppy disc and combination disc (Winchester/floppy) as alternative choices to those offered by DEC.

DISC (Data Systems Design) for LSI 11/2 and 11/23 Systems
Alternatives to DEC DISC

DSD 880 D/8-L11-A	\$5175.00
DSD 480 L11-2-A	3371.00
DSD 470	3221.00
DSD 440 L11-2-A	2921.00
DSD 430-A	2546.00

The ordering address is:

Data Systems Design Inc.
2560 Mission College Blvd.
Suite 108
Santa Clara, CA 95051
Phone: 408-727-3163 Tom Walker

INTEL TO HOLD OPEN HOUSE

Intel Corporation will be hosting an open house on September 23 at 6:00 P.M. in the Levis Center. This is by invitation only for faculty, staff and graduate students.

An overview of how Intel views the future of the industry will be given by engineers representing all divisions within the company.

To receive an invitation, please contact:

John M. Fox
Intel Corporation
Suite 815
2550 Golf Road
Rolling Meadows, IL 60008
Phone: 312-981-7200

NATIONAL EDUCATIONAL COMPUTING CONFERENCE

The National Educational Computing Conference (NECC) has issued a call for participation for the annual conference to be held in Kansas City, Missouri June 28-30, 1982. Papers to be presented at this conference should be submitted by January 15, 1982.

NECC provides a broad forum for discussion among individuals from all institutions with interests at all levels in educational computing. Based on previous conferences, approximately 1000 people are expected to attend. Papers are solicited which describe actual experiences with classroom computer use or the consequences of such use on the educational process in general. Papers reporting negative results are also encouraged, especially when the results could have a profound effect in the way educational computing should be viewed. Guidelines for submission of papers are available from:

Gerald L. Engel
Computer Science Department
Christopher Newport College
50 Shoe Lane
Newport News, VA 23606

SALES - EXCHANGES - HELP WANTED

PROGRAMMER WANTED

Should have considerable experience in handling large data sets on magnetic tape. Work will include writing, sorting, and merging programs and documentation of tape files. Would need to be available for approximately 200 hours of work during Fall and Spring semesters; the majority of work to be done in Fall semester. Send credentials to Dr. K. Parkay, 293 Bevier Hall, 905 S. Goodwin Ave., Urbana, IL 61801; or telephone 333-0606, or leave message at 333-2412.

INFORMATION WANTED

I am interested in knowing if anyone is using C.A.L. programs on the CYBER or the IBM, particularly as educational aids in the biological sciences.

I am mainly interested in programs in the following areas:

- ecology
- evolution
- population dynamics
- genetics (population and quantitative)

I would also like to know if anyone is using materials from the CONDUIT system. If you have information about the above, please contact me:

Keith Garbutt
134 Morrill Hall

Phone: 333-8507 (if no answer, leave a message at 333-6177)

SPECIAL EDITION ARTICLES AND INDEX

CYBER FILES - DAILY BACKUP PROCEDURE

Reprinted from *OFF-LINE*, December 1980

The procedure for providing daily backup of CYBER files has been changed, primarily to improve the time it takes to restore a destroyed disk pack. Keep in mind while reading about the new procedure that *all* backups are done after midnight.

The previous method was to backup daily on tape all files modified within the last 24-hour period. This was done every day of the week except on Sunday when a full backup of all files was done. Each of these daily tapes were kept for that week and then reused the next week.

The new method still provides for the full backup of all files on Sunday. However, the daily backup method has changed. Each day of the week, all files that are on disk and have been modified since Sunday (the last full backup) are dumped to tape. This implies that a full disk pack restore only requires the processing of two sets of tapes; a full backup tape and the most recent incremental tape of files modified since Sunday that are still on disk. Under the old scheme, the worst case required up to seven sets of tapes.

There is a significant difference in how daily backup tape sets are used. Under the old scheme, seven tape sets (one for each day) were required; under the new scheme, three tape sets are required and are used as follows:

<i>Daily Tape Set</i>	<i>Used on</i>
1	Monday and Thursday
2	Tuesday and Friday
3	Wednesday and Saturday

The significance of this is that should you create a file on Monday, it will be backed up on the Tuesday (early morning) daily tape. If you then accidentally purge the file on Tuesday, it will not appear on the Wednesday or Thursday incremental tapes. If you then wait until Friday to come to the Consultants to restore your purged tape, it will be too late because the Tuesday tape will have already been written over by the early morning Friday tape.

NOTE: This means that you no longer have a full week in which to get a file restored: you now have only two days!

This approach improves our recovery time in the event of a disk problem, and reduces the CSO tape storage needs. For example, a worst-case (Saturday) disk failure results in a reload of four 6250 tapes in contrast to the 50-60 1600 BPI tapes previously required; thus, reducing the chances of tape problems and considerably simplifying the restore procedure, as well as requiring less time to spin through all necessary tapes.

SPECIAL WEEKEND RATES

Reprinted from *OFF-LINE*, Jan-Feb, 1981

As of January 23, 1981, low-cost weekend rates were extended to include both batch and time-sharing on the CYBER 174 and 175 systems. The period of reduced rates is to begin each Friday at 4 PM and end each Monday at approximately 6 AM when the system is taken down for engineering. These lower rates are restricted to accounts on internal University users; they do not apply to bulk jobs.

To take advantage of these lower weekend rates you **must both logon and logoff** between the specified hours. For example, if you logon at 4:15 PM and logoff at 5:30 PM on Friday, you will be charged at the reduced rate. However, if you logon at 3:30 PM and logoff at 5:30 PM Friday, you will be charged at the usual rate since you logged on before the 4 PM start of the rate-reduction period.

During the rate-reduction period, batch and time-sharing jobs are charged at 60% of the usual rate. The rate reduction applies to all charges except those for printing and punching. The costs reported to you at the end of a batch job or a time-sharing session do not reflect the reduced rates. The rate reduction is applied at the end of the day when billing information is entered into the billing database, and the balances at the various accounting levels are decremented by the cost of the job.

Any jobs submitted to be run during this period **must** finish execution by the 6 AM Monday deadline. If these jobs are completed after the deadline, they will be charged at the regular rates. Users who do not wish their jobs to run at the regular rates can use the CANCEL command **early** Monday morning to delete (cancel) any job which has not yet completed execution.

Due to other pressing demands on manpower, no additional software support is being provided for this service. If practical experience dictates that further software support is required, the low-cost batch service will be withdrawn until such support can be provided.

NOTE: A similar low-cost service was extended to IBM users in May. Jobs read in by HASP between 4 PM Friday and 8 AM the following Monday are billed at 60% of the usual rate, independent of the time of execution. The charges reported on the burst page will reflect the reduced rates.

NEW 6250 BPI TAPE DRIVES

Reprinted from *OFF-LINE*, Jan-Feb 1981

In September, CSO acquired new tape drives for the CYBER 175, including 9-track drives capable of reading and writing at densities of both 1600 bpi and 6250 bpi. The transition to the new drives is now complete, and the tape drive configuration on the CYBER 175 is now:

- Three 9-track 1600 bpi / 6250 bpi drives
- One 9-track 800 bpi / 1600 bpi drive
- One 7-track 800 bpi / 556 bpi drive (which can also read at 200 bpi)

This configuration introduces 6250 capability and reduces 9-track 800 bpi capability from four drives to one drive.

The 9-track tapes use odd parity. The 7-track tapes use odd parity for binary data and even parity for coded data.

Successful 6250 bpi usage requires that the type of tape used for writing at this density be the precise type to which the tape drives have been tuned. Our local drives have been tuned to Scotch 701 3200 foot tapes rated at 6250 cpi (cpi=bpi), and only that specific tape should be used here for writing at 6250 bpi. (The critical aspect seems to be the writing of the tape. Almost any tape written at 6250 bpi appears reliable for reading.) Scotch 701 3200 foot tapes may be purchased from the Accounting and Distribution Office, 1208 W. Springfield. (Scotch 701 in shorter standard lengths is thicker and will not match the tuning of the drives.)

Tape written at 6250 bpi can hold about three times as much information in a given space as tape written at 1600 bpi. Thus, 6250 bpi is well suited for recording massive quantities of data. But remember, our IBM 4341 does not have 6250 drives; therefore, this high density cannot be used to transfer data between the two computers, nor can the IBM analysis and data recovery programs be used on any problematic 6250 bpi tape. Also, when preparing tape for transferring information to another site, 1600 bpi or perhaps 800 bpi is preferable to 6250 bpi because not all sites have 6250 capability.

The usage of 6250 bpi and the new tape configuration require few changes, simply more attention to the density parameter in the LABEL statement and changes in the RESOURC statement. The details are summarized below.

The following discussion refers to 9-track tapes only. The usage of 7-track tapes is unchanged.

The default for CYBER 175 tape usage will remain 9-track 1600 bpi. To specify 9-track tape, include NT in the LABEL statement or omit the track designation and get 9-track by default.

To read or write at various 9-track densities, include the following in LABEL statement:

- For 6250 bpi, always specify D=6250 or D=GE
- For 800 bpi, always specify D=800 or D=HD
- For 1600 bpi, omit the D= specification and get 1600 by default, or specify D=1600 or D=PE (including the density specification rather than using the default is good documentation).

Some examples of 9-track LABEL statements are given below. For more information on the LABEL statement see Chapter 10 of the CDC *NOS Version 1 Reference Manual*.

```
LABEL(TAPE,VSN=ABCDEF-D444,D=GE,PO=W,SI=ABCDEF,QN=1,W)
```

```
LABEL(TAPE,VSN=MYTAPE-F555,D=PE,PO=W,SI=MYTAPE,QN=9999)
```

```
LABEL(TAPE,NT,VSN=NEWDAT-TEMP,D=800,PO=R,LB=KU,F=S,CV=EB)
```

The RESOURC statement is required when more than one tape will be used concurrently in a job. In the RESOURC statement, you must specify the 9-track drives by the alphabetic characters for density:

- GE for 6250 bpi
- PE for 1600 bpi
- HD for 800 bpi

To specify two 9-track 1600 bpi drives, use:

```
RESOURC(PE=2)
```

To specify one 9-track 800 bpi drive and one 9-track 1600 bpi drive, use:

```
RESOURC(HD=1,PE=1)
```

To specify one 7-track drive and one 9-track 6250 bpi drive, use:

```
RESOURC(MT=1,GE=1)
```

Users of the EXAMINE and ARCHIVE programs should be aware that the report of the amount of tape used that is returned by these programs will be too large for 6250 bpi tapes. Also, the tape density must not be specified in the EXAMINE statement for 6250 bpi tapes, and EXAMINE does not give a correct report of density for 6250 bpi tapes. In all other respects, the programs work satisfactorily with these tapes.

EASY GRAPHING

Reprinted from *OFF-LINE*, April 1981

Easy Graphing is here! It is running on the CYBER 174 and CYBER 175. The English-like commands used in the Easy Graphing package require no programming knowledge and allow the user to produce plots, bar charts and pie charts with little effort. Some experience with the CYBER system is helpful, however. Experienced users and programmers will also find Easy Graphing a useful tool for producing plots because of its easy-to-use commands and its interactive nature.

The program, as purchased from Tektronix, supports the Tektronix 4006, 4010 and 4014 graphics terminals. Locally we have modified Easy Graphing so it can produce hard copy of the plot on our ZETA plotters.

For details describing the use of Easy Graphing, the *PLOT-10 Easy Graphing Users Manual* is available for purchase at the Accounting and Distribution Office, 1208 W. Springfield. A copy of this manual is available for inspection in the Systems Consulting Office at 1208 W. Springfield. The manual is tutorial in style, and is strongly recommended for those users who have little experience with graphing. A summary of the Easy Graphing commands can be found in the *Easy Graphing User's Reference Guide*, also available for purchase at the Distribution Office. This pocket-sized manual may be sufficient documentation for those users more experienced with computer graphics software. This guide is quite handy to have during a terminal session.

UPDATES ON PAGE PRINTING SYSTEM

Reprinted from *OFF-LINE*, August 1981

We are now automatically routing some large print jobs to the Page Printing System (PPS). Only jobs which run on the local CPUs and which would normally print on standard forms are affected. Jobs which run at UIC, jobs requesting special forms, and jobs which are routed to an RJE other than DCL are not affected.

For IBM jobs "large" is defined as more than 30,000 lines of output. For CYBER jobs it is defined as 4000 or more PRUs of disk space. Both definitions approximate 500 pages of output.

Users can override this default and force a large job to print on the usual line printer by using the FORMS=NOPPS parameter. For IBM jobs, the parameter appears on the ID card. For example:

```
/*ID FORMS=NOPPS
```

For CYBER jobs, the parameter appears on the PRINT command. For example:

```
PRINT/FORMS=NOPPS.
```

Users generating large printouts should be aware of the following limitations of the PPS and specify FORMS=NOPPS if they are a problem:

- The PPS can print at most 64 lines/page. Pages containing more than 64 lines will overflow to a second page.
- The only carriage control characters honored by the PPS are single space (blank), page eject (1), double space (0), and triple space (—). Any other carriage control character will cause unexpected results. Note that overprinting is not supported.

We are now dumping PPS output to tape for subsequent printing three times each day. The schedule is as follows (Monday through Friday only):

<i>Jobs Dumped to Tape</i>	<i>Output Available for pickup at DCL</i>
8:00 AM	2:00 PM same day
12:00 Noon	5:00 PM same day
9:30 PM	9:30 AM next day

Depending on the backlog of PPS work and the amount of output to be printed for CSO, it may be impossible for AISS to produce output in time for the 5 PM pickup noted above. In this event the output will be available for pickup the following morning at 9:30.

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Urbana, Illinois 61801

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Secretary	Joyce McCabe	150	DCL	333-1637

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OFF-LINE is the monthly newsletter of the Computing Services Office at the University of Illinois at Urbana-Champaign. Unless otherwise indicated, permission to reprint is freely granted, provided that the author, if named, and the Computing Services Office (CSO) are credited. Information in this issue is current as of September 21, 1981.

CSO operates a CDC CYBER 175 with 256K words of central memory and a CDC CYBER 174 with 196K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

CSO SHORT COURSE REMINDER

This is a reminder about the short courses that will be offered this month by CSO. Registrations are accepted one week prior to the start of the course. You may register by coming to 150 DCL, or by calling 333-6630. (See last month's issue for full descriptions of the courses.)

Introduction to the CYBER Computer Systems

Oct 6, 8, 13, 15	12 noon - 1 PM	115 DCL
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Graphics Compatibility System (GCS)

Oct 5, 7, 9, 12, 14, 16	12 noon - 1 PM	115 DCL
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Introduction to RNF

Oct 19, 21, 23	2 PM - 3 PM	201 Astronomy
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Intermediate RNF

Oct 26, 28, 30	2 PM - 3 PM	201 Astronomy
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CYBER Magnetic Tapes

Oct 26, 28, 30	12 noon - 1 PM	115 DCL
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Curve Fitting Routines

Oct 12, 14, 16	2 PM - 3 PM	201 Astronomy
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SPSS

Oct 5, 7	6:30 PM-9:30 PM	115 DCL
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SYSTEM NOTES

AUGUST RELIABILITY REPORTS

CYBER 175

8 recoverable interruptions
17 non-recoverable interruptions
7 of these were for more than 15 minutes

MTBF = 27.2 hours
MTR = 15 minutes
Availability: 99% of scheduled uptime

Major cause of downtime was related to
TELEX and power problems.

CYBER 174

1 recoverable interruption
7 non-recoverable interruptions
5 of these were for more than 15 minutes

MTBF = 85.2 hours
MTR = 35 minutes
Availability: 99.2% of scheduled uptime

Major cause of downtime was related to
main frame and disk controller problems.

IBM 4341:

9 interruptions
7 of these were for more than 15 minutes

MTBF = 77.9 hours
MTR = 60 minutes
Availability: 94.2% of scheduled uptime

Major cause of downtime was related to
power, disk, software, and air condi-
tioning problems.

MTBF = Mean Time Between Failures
MTR = Mean Time to Repair

CYBER

TELENET TELEPHONE NUMBER CHANGED

TELENET recently removed the 384-0011 telephone number for local access to TELENET. The new telephone number is 384-6428 which is an auto-baud number for both 300 and 1200 baud access to TELENET.

TELENET has upgraded three 300-baud connections to the CYBER to 1200 baud. This increase in baud rate only means that you will now be able to access the CYBER via TELENET at either 300-baud baud or 1200 baud. The 300 service is automatically offered because of the buffering capabilities of TELENET.

NEW VERSION OF NCAR GRAPHICS SOFTWARE

On October 19, a new version of the NCAR Graphics Software will be installed. This version and all associated documentation are currently available by using either of the following

GRAB,NCAR/FUTURE.
FUTURE,NCAR.

instead of GRAB,NCAR. After October 19, the current NCAR software will be available only via PAST,NCAR., for a short period before being removed from the system.

The new version of the NCAR library has the following new features:

- New subroutines CONRAN, CONRAQ and CONRAS can contour randomly spaced data.
- Other new subroutines, PWRITX and SCROLL, generate high-quality text.
- The ZETA plotter metacode translator supports four pens.
- A translator is provided for the Tektronix 4027 color graphics terminal.

The new library is incompatible with the old library in the following ways:

- The subroutine STRML2 has been replaced with STRMLN.
- The metacode file format has changed. Thus, old metacode files cannot be translated under the new translator.
- The translator parameter file is now in FORTRAN NAMELIST format instead of list directed format.

A document describing the use of the NCAR library, as well as the translators with their parameters, can be obtained by entering:

WRITEUP,NCAR.

The NCARDOC procedure used to obtain on-line documentation on the NCAR library has also been changed. To use the NCARDOC procedure, enter:

GRAB,NCARDOC.
NCARDOC,*routine*.

(NOTE: You must use FUTURE,NCARDOC until after October 19.) This will place the source for the named routine into the local file SOURCE, and a writeup into the file DOC. If the routine name is omitted from the NCARDOC command, a catalog of NCAR routines is written instead.

Sample programs illustrating NCAR use are available through the procedure SAMPLES by entering:

GRAB,SAMPLES.
SAMPLES,NCAR,*routine*.

(NOTE: You must use FUTURE,SAMPLES until after October 19.) This will give you a sample program for the named routine. Omit the routine name to receive a catalog of available samples.

Copies of the complete NCAR manual are now available for purchase at the CSO Distribution Office, 1208 W. Springfield.

STATISTICAL SERVICES

IBM SPSS RELEASE 9 AVAILABLE

SPSS Release 9 for the IBM 4341 computer is now available. It features three new procedures for statistical analysis:

- BOX-JENKINS for identification, estimation, and forecasting of univariate time series.
- MANOVA for a general linear models procedure.
- NEW REGRESSION for multiple regression analysis with extensive facilities for residual analysis.

The documentation for these procedures is contained in the manual *SPSS Update 7-9: New Procedures and Facilities for Releases 7-9*, Hull and Nie, McGraw Hill. This manual is available

for purchase at the CSO Distribution Office, 1208 W. Springfield. In addition, the manual is on reserve in the Undergraduate Library and available for viewing in the user manual rack in the Statistical Consulting Office, 65 Commerce West.

The IBM SPSS Release 9 software which CSO has obtained is a 1000 variable version of SPSS. Assuming that you use the default PARM of 80K for workspace and transpace, you will need to specify a REGION of about 280K when running SPSS programs. At the present you may access Release 9 by including the following statements in your program:

```
/*ID REGION=280K
// EXEC SPSS9
```

By adjusting the PARM, you can lower the memory requirements as in:

```
/*ID REGION=220K
// EXEC SPSS9,PARM=20K
```

After **November 1, 1981** you may access the various SPSS systems as follows (assuming the default PARM for workspace and transpace):

SPSS Release 9

```
/*ID REGION=280K
// EXEC SPSS
```

SPSS Release 8, 500 variable limit

```
/*ID REGION=220K
//PROCLIB DD DSN=SYS4.PROCLIB,DISP=SHR
// EXEC SPSSH8
```

SPSS Release 8, 1000 variable limit

```
/*ID REGION=260K
//PROCLIB DD DSN=SYS4.PROCLIB,DISP=SHR
// EXEC SPSSM8
```

All versions of SPSS prior to Release 8 will be removed from the system on November 1, 1981.

The proc for Release 9 has been changed slightly from previous versions to make it more compatible with the procs used at other IBM SPSS installations. You may obtain a listing of the Release 9 proc, a listing of the known errors in Release 9, and a listing of the errors corrected in Release 9 at the Statistical Consulting Office, 65 Commerce West (open Monday-Friday 10AM-4PM). Any questions or problems with using SPSS Release 9 should be brought to the attention of Beth Richardson, Box 86 Commerce West, 333-2172.

FEATURE ARTICLES

FORTRAN FUTURES

This article is part of a series on the work of the FORTRAN Standards Committee X3J3 in producing the next revision of the FORTRAN standard. The reader is reminded that the features described in this article are not a part of any FORTRAN compiler currently available, but rather are proposed requirements for FORTRAN processors produced in the late 1980's through the mid 1990's. Although every effort has been made to accurately describe the current position of X3J3 on these matters, the development of a revision to the FORTRAN standard is an evolutionary process, and these proposals may be subject to refinement, revision, or even retraction. Comments on these proposals may be given to Kurt Hirschert of the CSO Systems Consulting staff, who is a member of X3J3.

One of the areas in which FORTRAN has traditionally been considered weak is the structuring of data. If related pieces of information were of the same type, they could often be combined into an array, but if they were of different types, the options were more limited. In some cases, an array could still be used by clever application of the EQUIVALENCE statement. Unfortunately, most of these approaches were not in strict conformance with the FORTRAN standard and would not always transport correctly to new machines. In many cases the only portable approach was to use related names for the variables containing related information and with variable names of only six characters, that wasn't easy. X3J3 has adopted features for inclusion in the next FORTRAN standard which will make this task much easier.

The first step in using this new facility will be to declare what kinds of information are related. For example, if one were buffering character input/output, one might use a CHARACTER variable to hold the characters and two INTEGER variables to indicate where data should be added and removed from the buffer. The declaration for this might look something like

```
FORM BUFFER
  INTEGER IN,OUT
  CHARACTER*(BUFSIZE) CHARS
END FORM BUFFER
```

where it is assumed that BUFSIZE is a symbolic constant defined by an earlier PARAMETER statement. This declaration doesn't actually create a buffer; it just says what one looks like. Separate declaration can then be used to create as many variables or arrays of buffers as one wishes.

```
BUFFER: TTY_BUFFER,TAPE_BUFFER(0:99)
BUFFER: PRINT_BUFFER
```

The individual fields of a structured variable can be accessed by a combination of the variable name and the field name.

```
TTY_BUFFER.CHARS(TTY_BUFFER.IN:TTY_BUFFER.IN) = 'A'
TTY_BUFFER.IN = TTY_BUFFER.IN + 1
```

Limited operations are also allowed on structures as a whole. Equivalent structures can be assigned and compared for equality.

```
TAPE_BUFFER(6) = TTY_BUFFER
IF (PRINT_BUFFER.EQ. TTY_BUFFER) THEN
  PRINT_BUFFER.IN = 0
  PRINT_BUFFER.OUT = 0
END IF
```

(Two structures are considered equal if and only if each of the corresponding component fields is equal.) Similarly, a structure can be written and read as a whole using unformatted input/output. For formatted input/output, the appearance of a structure name is equivalent to the appearance of its components in the order they were declared. Thus,

```
PRINT *, TTY_BUFFER
```

would be equivalent to

```
PRINT *, TTY_BUFFER.IN,TTY_BUFFER.OUT,TTY_BUFFER.CHARS
```

Structures can be passed to subprograms and a function subprogram can return a structured value. A special case of this is the use of the FORM name as a function for constructing structure values.

```
TAPE_BUFFER(J) = BUFFER(0,0,CHARACTER_VARIABLE)
```

Although all of the preceding examples involved only a single level of structuring, there is no reason why one of the components of a structure can't itself be structured.

```
FORM FILE
  INTEGER UNIT
  BUFFER: FILE_BUFFER
END FORM FILE
```

```
FILE: FILE_INFO,FILE2
```

```
FILE_INFO.FILE_BUFFER.IN = FILE_INFO.FILE_BUFFER.IN + 1
```

```
FILE2 = FILE(10,BUFFER(0,0,CHARACTER_VARIABLE))
```

The work on developing this facility in the FORTRAN standard is not complete. Future developments in this area may include the following:

- The syntax used in this facility will likely be reviewed. The use of a period as the punctuation between structure and component names is quite natural, but unfortunately it can lead to ambiguities. For example, is A.EQ.B a comparison between structures A and B, or the component named B of the component named EQ of the structure A? The syntax used to declare structures is also still subject to much debate.

- The current rules consider two structures equivalent if they have the same kinds of components declared in the same order, but there is some sentiment that operations should be allowed between structures only if they are declared using the same FORM.
- As can be seen in the examples, the length of structure references could become quite long, so a facility for abbreviating such references may be introduced.
- Consideration is being given to "variant" structures, i.e., structures whose later components depend in some way on the value of an earlier component.
- The ability to define or redefine operations on structures may prove useful. In our buffer example, one may have wished an equality test to consider only those characters between the in and out pointers and one may have wished to define additional operations such as insertion into the buffer.
- The interaction between these data structuring facilities and the new array processing facilities (to be described in a later article) are being actively considered.

MISCELLANEOUS

1982 ADCIS CONFERENCE

The Annual ADCIS (Association for the Development of Computer-based Instructional Systems) Conference is a forum for both formal and informal sharing of computer-based instruction ideas, experiences, research findings, courseware, procedures, policies, standards, and educational strategies. Academic, commercial, government, and private groups are invited to attend and participate by discussing ways in which the field of computer-based instruction can be properly advanced. Demonstrations of hardware, software, and courseware are also solicited.

Papers on all topics relevant to computer-based instruction are welcome, but topics on this year's themes, Computer Literacy and Intelligent CAI, will be given top priority.

The conference will be held June 7-11, 1982 at the Hyatt Regency Hotel, 655 Burrard Street, Vancouver, B.C., Canada. A poster about the conference has been posted at DCL. Further information may be obtained by calling 800-228-9000 or writing to either of the following:

Prof. Emile Attala
ADCIS Conf. Prog. Chairman
Dept. Computer Science
California Polytechnic State U.
San Luis Obispo, CA 93407

ADCIS International Headquarters
Computer Center
Western Washington University
Bellingham, WA 98225

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CSO operates a CDC CYBER 175 with 262K words of central memory and a CDC CYBER 174 with 196K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

THE WHEELS OF JUSTICE

We are including this article which documents the results of an investigation of theft of computer time to underscore the seriousness of the offense. Computer time costs money and charges mount up rapidly. So do the penalties.

Last November, a project manager noticed that his project's funds were being depleted at an unusually rapid rate. He approached us with the problem. We examined our system logs and determined that someone was indeed making unauthorized use of his funds.

The problem was brought to the attention of Campus Security and an investigative officer was assigned. CSO worked with this officer and succeeded in identifying two suspects. Both were eventually apprehended.

It was subsequently determined that each student had used approximately \$1500.00 of unauthorized computer time.

As the theft of computer time was considered to be a crime against the state of Illinois, the campus police turned the matter over to the office of the State Attorney. The State Attorney's office has placed the two students in the Adult Diversion Program as an alternative to criminal prosecution. Under this program, each student is required to make full restitution of the misused funds and to perform from 50 to 150 hours of public service work. The public service work is restitution to the state for the time spent in pursuing the case. The number of hours worked will be equal to the estimated number of hours spent by state personnel on the case. Failure to fulfill the requirements of the Adult Diversion Program within a specified amount of time will result in full criminal prosecution of the case. The offense is considered to be a felony theft punishable by a prison term and up to a \$10,000 fine. Finally, the records and transcripts for each student will not be released by the university until all public service work has been completed and all stolen funds have been repaid.

The case also was turned over to the Student Disciplinary Committee. The committee put each student on probation for one year.

CHANGES AT CHICAGO CIRCLE

The computer center at Chicago Circle has informed us that they will install a new operating system in late December. The new software will not support the HASP to HASP communications protocol which is used for the current link to UIC. As a result, CSO users will not be able to submit jobs for execution at UIC after December 22, 1981.

The current UIC system contains a considerable amount of code which was developed by system programmers at UIC to support the link with our system. They have indicated that they would rather not repeat the effort in the new system to be installed in December. Since use

of the link has decreased to the vanishing point and since we can now run jobs requiring large amounts of core on our system, we have agreed.

There is a "generation gap" between our system and the one in use at UIC which makes communications difficult. We are investigating other ways of handling our RJE network, using newer software. It is possible that such software will again permit communications with UIC sometime in the future.

CSO SHORT COURSE REMINDER

This is a reminder about the short courses that will be offered this month by CSO. Registrations are accepted one week prior to the start of the course. You may register by coming to 150 DCL, or by calling 333-6630. (See the September issue for full descriptions of the courses.)

Introduction to the CYBER Computer Systems

Nov 2, 4, 6, 9	12 noon - 1 PM	115 DCL
----------------	----------------	---------

EASY GRAPHING

Nov 16, 18, 20	12 noon - 1 PM	115 DCL
----------------	----------------	---------

Introduction to RNF

Nov 16, 18, 20	2 PM - 3 PM	201 Astronomy
----------------	-------------	---------------

Algebraic Manipulation Packages

Nov 9, 11, 13	2 PM - 3 PM	201 Astronomy
---------------	-------------	---------------

SAS

Nov 2, 4, 9	7 PM - 9 PM	115 DCL
-------------	-------------	---------

SYSTEM NOTES

SEPTEMBER RELIABILITY REPORTS

CYBER 175

13 recoverable interruptions
 15 non-recoverable interruptions
 16 of these were for more than 15 minutes

MTBF = 36 hours
 MTR = 22 minutes
 Availability: 90% of scheduled uptime

Major cause of downtime was related to communications hardware and power outages.

CYBER 174

14 recoverable interruption
 9 non-recoverable interruptions
 12 of these were for more than 15 minutes

MTBF = 28 hours
 MTR = 53 minutes
 Availability: 93% of scheduled uptime

Major cause of downtime was related to main frame, communications hardware, and power outages.

IBM 4341:

21 interruptions
 10 of these were for more than 15 minutes

MTBF = 32.8 hours
 MTR = 16 minutes
 Availability: 95.2% of scheduled uptime

Major cause of downtime was related to power, CPU, software, and console problems.

MTBF = Mean Time Between Failures
 MTR = Mean Time to Repair

CYBER

ZETAVU: A UTILITY FOR PREVIEWING ZETA PLOT FILES

All ZETA plot files produced by ZETA software, GCS, NCAR, Easy Graphing or other software may be displayed on Tektronix Graphics terminals. ZETAVU is a new program which reads these ZETA plot files (often named TAPE99), interprets the instructions contained therein, and displays the graphics on a Tektronix 4006, 4010, 4014, or 4027 (color) graphics terminal. ZETAVU is run on the CYBER with the commands:

```
GRAB,ZETAVU.  
ZETAVU.
```

A 16-page user manual for ZETAVU may be obtained and printed by entering:

```
WRITEUP,ZETAVU.  
PRINT,ZVUDOC/CC/ASCII/EJ.
```

MATHEMATICAL SERVICES

TRANSACTIONS ON MATHEMATICAL SOFTWARE - TOMS

We now have on tape all algorithms published in *Transactions on Mathematical Software* up to September 1981 (from algorithm 493 published in the first issue of March 1975 up to algorithm 577). The directory of algorithms in file TOMS/UN=MATHLIB has been updated; to print it, enter the following:

```
GET,TOMS/UN=MATHLIB.  
PRINT,TOMS.
```

The "Math Note" series described in the March issue of *OFF-LINE* includes a note summarizing all algorithms published in TOMS to date. To print this note (it is note number 6), enter the following:

```
GET,MNOTES/UN=MATHLIB.  
MNOTES,6.  
PRINT,OUT/AS/CC/EJ.
```

(To print instructions on the use of MNOTES, substitute a 0 (zero) for the 6 above.)

The algorithms published in the June 1981 and September 1981 issues are as follows:

In the June issue:

- #569: COLSYS: Collocation Software for Boundary-Value ODEs
- #570: LOPSI: A Simultaneous Iteration Algorithm for Real Matrices
- #571: Statistics for Von Mises' and Fisher's Distributions of
Directions: $I_1(X)/I_0(X), I_{1.5}(X)/I_{0.5}(X)$,
and Their Inverses
- #572: Solution of the Helmholtz Equation for the Dirichlet
Problem on General Bounded Three-Dimensional Regions

In the September issue:

- #573: NL2SOL: An Adaptive Nonlinear Least Squares Algorithm
- #574: Shape-Preserving Osculatory Quadratic Splines
- #575: Permutations for a Zero-Free Diagonal
- #576: A FORTRAN Program for Solving $Ax=b$
- #577: Algorithms for Incomplete Elliptic Integrals

If you are looking for mathematical software, *Transactions on Mathematical Software* is one of the journals to check, along with *Numerische Mathematik*, *BIT*, the *Computer Journal*, and various Publications of ACM (the Association for Computing Machinery) and SIAM (the Society for Industrial and Applied Mathematics).

IMSL EDITION 8.1

Edition 8.1 of the IMSL subroutine library has replaced the current edition on the CYBER. Most changes to the library are minor internal corrections which are usually invisible to those using the routines; no routines have been added or deleted, and the instructions for using the routines have not changed, except for some clarifications to writeups. The routines for which a visible change in documentation has occurred or which were corrected for significant internal errors are as follows:

- BESRB -- corrected computation for STAT(9)
- DCSEVU -- eliminated dummy dimensioning with a variable that could be zero
- EQRH3F -- corrected condition which caused underflow
- GGAMR -- modified code so as to ensure correct branch is taken for all values of A and reinitialized local variables for use in subsequent calls to routine.
- GGETR -- modified so as to ensure correct branch is taken for all values of P and Q

- GGDAY -- modified source code to improve efficiency and protect against division by zero
- GGDA -- code changed for greater efficiency. Input vector P is no longer destroyed in output
- GGNSM -- modified code to increase precision in accumulation of RVEC
- GGUW -- zeroed out WK vector in a data statement in order to assure its integrity from call to call
- LGING -- corrected to handle rows of all zeros
- LLSQF -- made element switching mandatory for KBASIS=1
- MDFFD -- argument checking procedure changed to guard against user input errors
- MDNRIS -- revised routine to accommodate arguments less than machine epsilon (smallest number X such that $1+X \neq 1$)
- MDTD -- corrected code for nonintegral DF
- MDTPS -- code modified to avoid underflow and to improve efficiency
- MERFCI -- revised routine to accommodate arguments less than the machine epsilon
- MERRC -- corrected results for very small arguments
- NHEXT -- modified code for computation of P(1) and P(2)
- OFCOMM -- revised convergence technique to ensure convergence in a finite number of iterations
- RLEAP -- modified code to prevent division by zero when the problem is too ill-conditioned; extended the definition of IJOB(2) to allow for early termination and modified code accordingly
- RLFOTH -- modified code to avoid division by zero when perfect fit is obtained and added warning error when perfect fit is obtained with a model of lower degree than expected when $RSQ=100$
- RLFOTW -- same as for RLFOTH; also corrected code so that constant response variable will not result in a terminal error
- RLMUL -- code modified so that coefficient of variation ANOVA(13) is not computed if the mean response is zero

- RLONE -- code changed to avoid division by zero when dependent variable is constant. Changed documentation of IER=129
- RSMITZ -- modified code and added terminal error condition to avoid possible overflow
- RMSSE -- changed code to avoid overflow
- USBOX -- changed to handle constant input correctly
- USBOX1 -- replaced DASH with PLUS for two adjacent hinges
- USPLT -- corrected plot width when IOPT=0
- USSLF -- eliminated possible resetting of variable IUNIT
- ZXMIN -- corrected handling of case where N=1 and IOPT=0, and improved accuracy of initial hessian when IOPT=2 or 3
- ZX4LR -- corrected inadequate handling of artificial vector

The following is an exhaustive list of routines which suffered some actual code alteration, whether major or minor:

BESRB	CTRBYC	DCSEVU	EQRH3F	GGAMR	GGETR	GGCAY
GGDA	GGNSM	GGSTA	GGUBT	IQHSCV	LGING	LLSQF
MDFD	MDNRIS	MDTD	MDTPS	ERF	MERFCI	ERFC
GAMMA	ALGAMA	MMBSI0	MMBSI1	MMBSJ0	MMBSJ1	MMBSK0
MMBSK1	MMBSYN	MMPSI	MSMRAT	NDKER	NHEXT	NRWRST
OFCOMM	RLEAP	RLFOTH	RLFOTW	RLMUL	RLONE	RSMITZ
RMSSE	UGETIO	UHELP1	USBOX	USBOX1	USPLT	USSLF
VUAFB	VUAFQ	VUAFS	VUASB	VUASQ	ZXMIN	ZX4LR

Edition 8.1 updates for the IBM have been received, but are not yet installed.

FORSIM: A PARTIAL DIFFERENTIAL EQUATIONS PROGRAM

FORSIM, a program for the solution of systems of ordinary or partial differential equations, has been installed on the CYBERs. The program, from Atomic Energy of Canada at Chalk River, Ontario, has actually been here in test versions for a few years. It is designed to allow the user to easily solve a system of ordinary or (parabolic) partial differential equations without the usual worries of using a library routine with many parameters. The integration algorithms offered by the package are among the best currently known general methods: the Runge-Kutta-Fehlberg method, and the Gear algorithm (which is designed for "stiff" systems). Systems with very low or sparse coupling can be handled efficiently by sparse matrix techniques in the Gear algorithm.

FORSIM can be used to solve parabolic partial differential equations, like the following:

$$\frac{\partial U}{\partial t} = f(U, \frac{\partial U}{\partial x}, \frac{\partial^2 U}{\partial x^2}, \dots)$$

where "t" usually represents time and "x" is a spatial variable. Up to 3 space variables can be handled, with increasing levels of difficulty. Such a system is handled by the method of lines; spatial derivatives are replaced by finite difference approximations, and the system is reduced to a time-varying system of coupled ordinary differential equations. Boundary conditions of two types can be handled:

$$B_1 \frac{\partial U}{\partial x} + B_2 U = B_3$$

or

$$\frac{\partial U}{\partial t} = B_2$$

where U represents one of the functions at the boundary; B1, B2, and B3 may depend on U but not on its derivatives.

The package is accessed by entering the command:

```
GRAB,FORSIM.
```

This makes several files available in your local file space, one of which, FORSIM, is a procedure file. To use the package, you must write (usually) just one routine called UPDATE, in which the problem is completely defined, then link it to the rest of the package and run it with a data file. If UPDATE is in file PROBLEM, then the sequence of commands might look like this:

```
FTN,REW,I=PROBLEM,L=0,ER,T.
FORSIM,DATA,OUT.
PRINT,OUT/CC.
```

The package is explained in a manual, *The FORSIM VI Simulation Package for the Automated Solution of Arbitrarily Defined Partial and/or Ordinary Differential Equation Systems* from Chalk River. This manual will be available for purchase at the CSO Distribution Office (1208 W. Springfield) as soon as we complete a list of errata for it; it can also be ordered directly from Chalk River for \$9.00. The errata will also be put on-line under

```
WRITEUP,FORSIM.
PRINT,FORDOC/AS/CC/EJ.
```

for those persons who already may have a copy of the manual.

If you have any questions about FORSIM, please see Stan Kerr (175 DCL, 333-4715, or TELL,UN=MATHLIB on the CYBER).

ITPACK VERSION 2A INSTALLED

ITPACK, the library of iterative routines from the Center for Numerical Analysis at the University of Texas at Austin for solving large sparse symmetric positive definite systems of linear equations, is now at version 2A. It can be accessed by the command:

GRAB,ITPACK.

There is an on-line writeup for ITPACK which can be accessed and printed as follows:

WRITEUP,ITPACK.
PRINT,ITDOC/AS/CC/EJ.

Other software for solving sparse linear systems was discussed in the July 1981 issue of *OFF-LINE*.

REDUCE: A SYMBOLIC ALGEBRA LANGUAGE

REDUCE, a language for symbolic algebraic manipulation, has been installed on the CYBER. The language has been under development by its author, Anthony Hearn, since the late 1960s. Recently a version was created that will run on our system and this is the version we have installed. It has the following features:

- Expansion and ordering of polynomials and rational functions
- Symbolic differentiation
- Substitutions and pattern matching in a wide variety of forms
- Calculation of the greatest common divisor of two polynomials
- Automatic and user-controlled simplification of expressions
- Calculations with symbolic matrices
- A complete language for symbolic calculations in which the REDUCE program itself is written
- Calculations of interest to high energy physicists, including spin 1/2 and spin 1 algebra
- Tensor operations

The language is accessed by the following command:

GRAB,REDUCE.

Following this, you can enter

```
REDUCE,version.
```

where *version* may be A, B, or C and defaults to A. The versions differ in the amount of memory they allow (177000 octal for A and C, 250000 octal for B), and whether they include the high energy physics functions (A and B do, C does not). Other versions with different characteristics can be created if the need arises. REDUCE is intended to be run interactively, but it can be run in a batch mode; the manual contains instructions on how to do this.

The REDUCE manual is available on-line and can be obtained and printed as follows:

```
WRITEUP,REDUCE.  
PRINT,REDDOC/AS/CC/EJ.
```

This prints 89 pages.

If you have questions about REDUCE or other available symbolic manipulation programs, please contact Stan Kerr (175 DCL, 333-4715 or TELL,UN=MATHLIB).

NEW VERSION OF SLAM

A new version of the SLAM simulation package has been received and installed in FUTURE on the CYBER. It can be accessed by either of the following commands:

```
GRAB,SLAM/F.      or      FUTURE,SLAM.
```

The memory requirements for the new SLAM have gone up by about 6000 (decimal) words, to 123000 (octal).

Called SLAM II by the vendor, Pritsker and Associates, the updated package includes the following enhancements:

1. Event Calendar

Information regarding the event calendar (summary statistics, contents) are printed along with the information about other files. This information appears as that of the last file in the report, in other words, the next file after the largest file number defined by the user.

2. MONTR Statement, TRACE option

A negative value included in the list of up to 5 attributes specified in the MONTR,TRACE statement will result in the printing of the corresponding XX(.) variable instead of an attribute. For example, the statement

```
MONTR,TRACE,0.0,50.0,2,-1;
```

causes an event trace with ATRIB(2) and XX(1) to be printed from time 0.0 to time 50.0.

3. Plotting Capabilities

Plot information generated by SLAM is no longer restricted to storage in *either* core or on peripheral devices, but not both. Now, if more than one plot is generated, one may be stored in core and others on peripheral devices. *The limitation that only one plot may be stored in core is still in effect.*

Also, with respect to user-defined plot numbers, it is required that the user begin his number at 1 and continue sequentially (although it is not required that his RECORCD statements defining user-defined plot numbers be input in this order), to assure proper processing of plot information.

4. New Functions

Function FFAWT(IFILE) has been added to return the average waiting time in file IFILE. This information also appears in the file statistics section of the summary report.

Function NNBLK(IACT,IFILE) has been added to return the number of entities currently in activity IACT and blocked by the node associated with file IFILE.

5. Multiple Run Capabilities

Additional input fields have been defined to allow suppression of the summary report on selected runs and selective clearing of COLCT statistics between runs, as follows:

- The options now available for the ISMRY field on the GEN card are:

N	-	No summary reports
Y or Y/E	-	Summary report after every run (default)
Y/F	-	Summary report after first run only
Y/S	-	Summary report after first and last runs
Y/n	-	Summary report after every nth run

- Two optional fields have been added following the JJCLR field on the INITIALIZE card, giving the card the form:

```
INIT,TTBFG,TTFIN,JJCLR/NCCLR/JCNET,JJVAR,JJFIL;
```

Statistics to be cleared are defined as follows:

<i>Variable</i>	<i>Options</i>	<i>Default</i>
JJCLR	"Y" - Clear user-collected statistics with STAT code less than NCCLR	"Y"
	"N" - Clear user-collected statistics with STAT code greater than or equal to NCCLR	

<i>Variable</i>	<i>Options</i>	<i>Default</i>
NCCLR	Integer equal to breaking point for clearing of user-collected statistics	largest statistics code defined + 1
JCNET	"Y" - Clear network-collected statistics "N" - Do not clear network-collected statistics	JJCLR

6. **Binary Search Algorithm**

SLAM has been upgraded to include a binary search indexed list algorithm to expedite file entry insertion. To invoke the binary search procedure, only data input changes are required. An additional field has been added to the LIMITS statement which specifies the total number of tags to be used by all files. The format of the LIMITS statement is now

```
LIMITS,MFIL,MATR,MNTRY,NNTAG;
```

where NNTAG specifies the total number of tags. NNTAG must be positive if the binary search algorithm is to be used by any file. When NNTAG is positive, 3*NNTAG words in NSET/QSET storage are reserved for the NNTAG tags.

These and other enhancements are described in complete detail in a supplement to the SLAM text, *Introduction to Simulation and SLAM*. A copy of this supplement may be inspected at the Systems Consulting Office, 1208 W. Springfield. The supplement can be ordered directly from Pritsker and Associates for \$15.00 (plus \$3.00 handling per order). There is also a six-panel reference card for SLAM II, printed on heavy stock, which sells for \$1.00 (we are ordering a supply of these).

If you have any questions about SLAM, please contact Stan Kerr (175 DCL, 333-4715, or TELL,UN=MATHLIB) or Dan Pommert (179 DCL, 333-3740).

**PARTIAL DIFFERENTIAL EQUATIONS
SOFTWARE FROM NCAR**

We have installed on the CYBER a library of routines for partial differential equations obtained from the National Center for Atmospheric Research (NCAR) in Colorado. The bulk of the package, which is set up as a subroutine library, consists of FISHPAK, an integrated collection of routines for solving various classes of elliptic partial differential equations. For this reason, the library also has been named FISHPAK.

This library can be accessed by the command:

```
GRAB,FISHPAK.
```

This makes the library available in your local file space and adds it to your global library set; you then need only run a FORTRAN main program which calls the FISHPAK routines.

Two extra pieces of software are included in FISHPAK. They are routine FINPDF, which can be used to find the coefficients for a finite difference formula to approximate a given mixed partial derivative on a rectangular grid; and RKFPDE, a package of routines (accessed through the main routine RKFPDE) for solving certain systems of parabolic partial differential equations coupled to a single elliptic equation.

The MATH procedure can be used to obtain documentation or source for FISHPAK routines as follows:

```
GRAB,MATH.  
MATH,FISHPAK,routine.
```

where *routine* is the name of one of the routines in the library. This will provide you with two local files: SOURCE contains the complete FORTRAN source of the routine requested, and DOC contains just the writeup. A catalog of short descriptions of all the routines can be printed as follows:

```
GRAB,MATH.  
MATH,FISHPAK.  
PRINT,DOC.
```

As given, this will print at DCL. A paper by Swartztrauber and Sweet in the September 1979 issue of *Transactions on Mathematical Software* described a slightly older version of FISHPAK.

FEATURE ARTICLES

FORTRAN FUTURES

This article is part of a series on the work of the FORTRAN Standards Committee X3J3 in producing the next revision of the FORTRAN standard. The reader is reminded that the features described in this article are not a part of any FORTRAN compiler currently available, but rather are proposed requirements for FORTRAN processors produced in the late 1980s through the mid 1990s. Although every effort has been made to accurately describe the current position of X3J3 on these matters, the development of a revision to the FORTRAN standard is an evolutionary process, and these proposals may be subject to refinement, revision, or even retraction. Comments on these proposals may be given to Kurt Hirschert of the CSO Systems Consulting staff, who is a member of X3J3.

Pipelined and parallel computers are becoming increasingly important, especially in the performance of large scientific or engineering calculations. Efficient use of such processors requires the recognition of the parallelism present in such problems. This recognition is simplified if

the languages used to express a computation are capable of making such parallelism explicit rather than requiring analysis to determine the implicit parallelism. For this reason and others, X3J3 has spent a large part of its time and other resources in the development of array processing facilities for FORTRAN.

Fundamental to these new facilities is the idea that an array can be thought of not only as a collection of "variables" which can be individually set, but also as "variables" which can be set to a collection of values. The simplest use of this concept is an array assignment. If A and B are each 10x10 arrays, the FORTRAN 77 statements

```
DO 100 I=1,10
DO 100 J=1,10
100 A(I,J) = B(I,J)
```

could be replaced by the single statement

$$A = B$$

The scalar operations and intrinsics may be similarly applied in parallel. Thus the statements

```
DO 200 I=1,10
DO 200 J=1,10
A(I,J) = SQRT(B(I,J))*A(I,J)
200 B(I,J) = B(I,J) + A(I,J)
```

might be replaced by

$$A = \text{SQRT}(B) * A$$

$$B = B + A$$

(This does imply that the new value of the A array will be entirely computed before the new value of the B array, rather than interleaving the computation as with the DO loops, but in this case the results are the same.)

Ordinary scalar variables and values can also be freely used in such parallel computations:

$$B = 0$$

$$A = A / A(1,1)$$

The latter example also illustrates another important principle. The entire right-hand side is evaluated before anything is stored into the left-hand side so all of A is divided by the old value of A(1,1) before A(1,1) is changed to its new value of 1.

User-defined scalar functions will also be applicable in parallel if they are declared to be **ELEMENTAL**.

Such parallel computation is allowed as long as the arrays involved have the same shape, i.e., the same number of elements in each dimension.

If we had the following declarations

```
REAL R(10),S(0:9),T(-5:4),U(11),V(10,1),W(1,10),X(2,5)
```

Arrays R, S, and T could be used together for parallel computations. Arrays U, V, W, and X could not be used in parallel computation with R, S, and T, or with each other. U is also 1-dimensional, but has a different number of elements. V, W, and X are each 2-dimensional with different shapes (10x1, 1x10, and 2x5 respectively).

Since an entire array is often more than is wanted, several new ways of specifying subscripts have been added. One can specify the value of selected subscripts of an array while leaving others free by specifying the free subscripts with an asterisk. Thus, V(*,1) could be used in the previous example to indicate the 1-dimensional array that is the first (and only) column of V. Similarly, W(1,*) would be the first (and only) row of W. Both V(*,1) and W(1,*) could be used with R, S, and T in parallel computations. If all subscripts are specified with an asterisk, the effect is the same as if the subscripts were not specified at all. Thus, R(*) denotes the same array as R. If the asterisk is preceded by a minus sign, the elements of the array are referenced in the reverse direction along that dimension. Thus, R(-*) denotes the same elements as R, but in the reverse order. Ranges of index values can also be specified. Thus, U(1:10) denotes a 1-dimensional array of 10 elements that would be compatible with R, S, and T. A skip factor optionally may be specified. Thus, T(1:10:2) would denote a 1-dimensional array consisting of the five odd numbered elements of T. Negative skip factors can also be used. S(10:1:-1) denotes the same array as S(-*).

Another available approach will be to make your arrays the right size in the first place. In FORTRAN 77, a specification such as

```
REAL Z(N)
```

is allowed only if Z is a dummy argument of a subroutine or function with its actual argument properly dimensioned in the calling program. In the forthcoming revision of FORTRAN, such specifications will be allowed more generally, with arrays of the proper size being created dynamically when a subroutine or function is called and discarded when the subroutine or function terminates. This kind of flexibility should not only make it easier to create arrays that are the right size for the parallel computation to be done in a problem, but should also make it easier to write programs which adapt to the size of a problem as specified by the data. Another benefit of such adjustable array specifications will be the elimination of the need to pass "work" arrays to library routines such as those in IMSL, since such routines will be able to generate the necessary arrays internally with adjustable array declarations.

Another extension in subprograms will be the ability to specify that the shape of an array dummy argument is unknown (although the number of dimensions must still be known). The shape of the array will then be determined by the shape of the array or array expression that is the actual argument. Intrinsic functions will be available to determine the extent and upper and lower bounds of each dimension. (These intrinsics could, in turn, be used in an adjustable array declaration like those described in the preceding paragraph.) Once again, this will simplify the use of library routines, since it will no longer be necessary to pass a parameter indicating the size of an array separate from the array itself.

Although the unconditional parallel computation, extended subscripting, and extended array specification facilities described in the article do much to extend the array processing features of FORTRAN, they represent only "the tip of the iceberg." More array processing facilities will be described in next month's FORTRAN FUTURES.

DOCUMENTATION

NEW AND REVISED DOCUMENTATION

Manuals

Easy Graphing User's Manual \$10.00

A tutorial-style manual, strongly recommended for those users who have little experience with graphing. (See the April 1981 issue for the writeup of Easy Graphing.)

Easy Graphing Reference Guide \$1.00

A summary of the Easy Graphing commands.

GCS Primer \$7.50

A basic manual; introduction to using GCS (Graphics Compatibility System).

GCS Programmer's Reference Manual \$7.50

Alphabetical listing of all GCS subroutines and options.

NCAR Package \$14.00

The package combines three NCAR manuals: An Introduction to the SCD Graphics System; The SCD Graphics Utilities; and The System Plot Package.

IDA \$13.00

IDA (Interactive Data Analysis) is a conversational statistical package marketed by SPSS. (See the September 1981 issue for writeup of IDA.)

SPSS/ONLINE Manual \$2.00

SPSS Update Release 7-9 \$9.95

SPSS Manual/SPSS Update \$18.95

These manuals reflect the updates to SPSS; descriptions of new routines, etc.

This manual replaces the Introduction to the CYBER 175; revised to include usage of the CYBER 174.

Reference Guides

Many of the Reference Guides were recently updated to reflect the move of the Systems Consulting Office from DCL to 1208 W. Springfield. Since this was the only change to these guides, we are not listing them here.

RF-0.1 Reference Guide List -- Has been updated and revised to show the latest revision date for each guide.

RF-0.2 Documentation List -- Revised to reflect new manuals and prices.

RF-0.3 Job Entry Sites (RJE) -- Revised to reflect latest information on equipment at each site and new hours.

RF-4.19 GRG -- New reference guide. GRG is a program for non-linear optimization using the generalized reduced gradient method.

On-Line Documentation

On-line documentation has been added for the following products:

HARTMAN - an on-line listing of the computer-related equipment available at discount through CSO and the University (see September 1981 issue). This listing may be obtained and printed by entering:

```
WRITEUP,HARTMAN.
PRINT,COMPDIS.
```

NCAR - a graphing package (see May 1980 issue for description of software). The locally-written writeup for this package may be obtained and printed by entering:

```
WRITEUP,NCAR.
PRINT,NCARWRT/AS/CC/EJ.
```

ZETAVU - a utility for previewing ZETA plot files (see article on page 4 of this issue). The writeup may be obtained and printed by entering:

```
WRITEUP,ZETAVU.
PRINT,ZVUDOC/AS/CC/EJ.
```

FORSIM - a program for the solution of systems of ordinary or partial differential equations (see article on page 7 of this issue). The writeup contains errata for the FORSIM manual and may be obtained and printed by entering:

```
WRITEUP,FORSIM.
PRINT,FORDOC/AS/CC/EJ.
```

ITPACK - a library of iterative routines (see article on page 9 of this issue). The writeup may be obtained and printed by entering:

```
WRITEUP,ITPACK.
PRINT,ITDOC/AS/CC/EJ.
```

REDUCE - a language for symbolic algebraic manipulation (see article on page 9 of this issue). The writeup may be obtained and printed by entering:

```
WRITEUP,REDUCE.
PRINT,REDDOC/AS/CC/EJ.
```

SALES - EXCHANGES - HELP WANTED

SOFTWARE PACKAGE WANTED

Wanted: Software package to handle lists of references on CYBER. Program must enable user to sort references by author(s), combinations of authors, year, journal, single keywords and combinations of keywords. If you have knowledge of such a program please call:

G. Kling
201A Ornamental Horticulture
333-3363

COMPUTER PROGRAMMER

Available immediately. Ten hours per week until the end of the spring semester. \$4.50 per hour. Requires familiarity with the IBM and the CYBER at DCL. Experience in FORTRAN. Contact:

Nancy Hansen
116 Natural Resources Building
615 East Peabody, Champaign
Phone: 344-1481, Ex. 203

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Commerce West	70	Comm West	333-4500
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Electrical Engineering	146	EEB	333-4936
Florida Ave Res Hall		FAR	333-2695
Illinois St Res Hall		ISR	333-0307
Mechanical Engineering	65	MEB	333-1430
Psychology	453	Psych Bldg.	333-7531
Social Science	202	Lincoln Hall	333-0309

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CSO operates a CDC CYBER 175 with 262K words of central memory and a CDC CYBER 174 with 196K words of central memory. The 175 and 174 run under the NOS Operating System and share 512K words of ECS. The 175 serves over 200 simultaneously active text and graphics terminals and the 174 serves over 100 simultaneously active terminals. CSO also operates an IBM 4341 with 4 million bytes of memory running HASP-OS/MVT under VM. In addition, CSO operates a DEC PDP-11/50 with 252K bytes of core driving a GSI CAT-8 phototypesetter and a DEC VAX 11/780 with 2 million bytes of core, both running under the UNIX Operating System.

POLICY

FINALS WEEK RJE SCHEDULE

The schedule for the RJE sites during finals week, December 14-22 is:

ISR, FAR, CRH (Snack Bar)

Dec 14 - Dec 22 8 AM - 4 PM

COMM WEST

Dec 14 - Dec 22 8 AM - 6 PM

All other sites will maintain regular hours.

CHRISTMAS SCHEDULE

The schedule for the CSO staff offices and the Consulting Offices has not yet been finalized. Please watch HEARYE for the announcement of these hours.

The schedule for the RJE sites will be as follows:

CSO NORTH (DCL - Routing and Terminal Rooms)

Dec 24 Close at 4 PM

Dec 25 Closed

Dec 26 - Dec 31 8 AM - 5 PM

Jan 1 Closed

Jan 2 - Jan 3 8 AM - 5 PM

Jan 4 Resume regular hours

COMM WEST

Dec 23 Close at 5 PM

Dec 24 - Jan 3 Closed

Jan 4 - Jan 15 8 AM - 6 PM (closed weekends)

Jan 18 Resume regular schedule

ISR, FAR, CRH (Snack Bar)

Dec 22 Close at 4 PM

Dec 23 - Jan 17 Closed

Jan 18 Resume regular schedule

LH, ME

Dec 24 Close at 12 noon

Dec 25 - Jan 3 Closed

Jan 4 - Jan 17 8 AM - 6 PM

Jan 18 Resume regular schedule

CHEM, EE, PSYCH, AGRI

Dec 24

Close at 12 noon

Dec 25 - Jan 3

Closed

Jan 4

Resume regular schedule

INTERRUPTIONS TO SERVICE

There will be several interruptions to our services in the latter part of December.

During the week of December 27, air conditioning to DCL will be turned off, necessitating the shutdown of all of our computers. Equipment will be installed which will minimize the energy used to cool the computer rooms in DCL during the winter months. Whenever possible, it will utilize cold outside air to provide cooling rather than the usual steam powered equipment. If all goes well, installation will be completed in a single day and service will be restored the following day. At the time of this writing, we haven't learned the exact date on which the work will take place. We will publicize it in a HEARYE bulletin when we are notified of the exact date.

A lesser interruption, but one with an ongoing effect, will concern only those people who make use of the RJE facilities at DCL. Sometime between December 15 and January 1 the user facilities, the line printers, plotter, and card punches now located in rooms 127, 129, and 131 DCL will be moved to room 16 in the basement of DCL. There will be a slight reduction in the number of terminals available. The date of the move, which is expected to take a day, will be announced in a HEARYE bulletin. On the day of the move, no services will be available at DCL; scheduled service will continue without interruption at all other RJE sites. This will complete the series of moves of user facilities first announced in *OFF-LINE* last July.

The relocation of the RJE facilities at DCL will allow CSO to consolidate its professional staff, something we have wanted to do for several years. The continued deployment across campus, first of RJE equipment and subsequently of large numbers of time-sharing terminals, has eroded the status of DCL as the focal point of computing on campus, making this move possible.

Room 16 is located in the northwest corner of the basement of DCL. It can be reached conveniently by the stairs adjacent to the West entrance to the building.

SYSTEM NOTES

OCTOBER RELIABILITY REPORTS

CYBER 175

9 recoverable interruptions
 14 non-recoverable interruptions
 (3 of these were for more than 15 minutes)

MTBF = 29.3 hours
 MTR = 7 minutes
 Availability: 99.2% of scheduled uptime

Major cause of downtime was related to communications hardware and air conditioning problems.

CYBER 174

6 recoverable interruption
 12 non-recoverable interruptions
 (7 of these were for more than 15 minutes)

MTBF = 38.2 hours
 MTR = 30 minutes
 Availability: 99.4% of scheduled uptime

Major cause of downtime was related to main frame, communications hardware, and air conditioning problems.

IBM 4341

19 interruptions
 (9 of these were for more than 15 minutes)

MTBF = 39.8 hours
 MTR = 17 minutes
 Availability: 99.6% of scheduled uptime

Major cause of downtime was related to CPU, software, console, and air conditioning problems.

MTBF = Mean Time Between Failures
 MTR = Mean Time to Repair

CYBER

GRAPHICS SOFTWARE TRIAL PERIOD

If you are looking for graphics software for a minicomputer or mainframe, this article may be of interest to you.

As individual departments and research groups acquire their own computing facilities, they frequently discover they need some graphics output capabilities for data representation, engineering drawing, or various types of analyses. Most users have few problems in the selection of the graphics hardware, but find that the acquisition of software presents many problems.

The traditional approach taken by many of these minicomputer users has been one of the following:

- Developing their own software which is generally incompatible with other software, untransportable, usually poorly documented, and lacking in long-term support.
- Obtaining free or inexpensive software from the hardware vendor or an outside source such as another university. The same problems as above usually result.

We have been asked by a number of minicomputer users to supply or recommend graphics software. After discussing the problem, we feel that the following requirements must be met:

- The software should be reasonably priced for minicomputer users as well as mainframe users.
- The software should be transportable among computers.
- The software should have moderate memory requirements.
- The software should recognize current ANSI standardization efforts.
- The software should support readily available graphics hardware.

We feel that meeting these goals would encourage campus-wide sharing of applications software and easy transporting of application programs between minicomputers and the CYBERs. It would also provide a large user base for support and development of applications.

With these ideas in mind, we have negotiated an agreement with Tektronix to examine their Interactive Graphics Library (IGL). We have a trial copy of IGL running on the CYBER until the end of February 1982. During this trial period (Nov 1981 - Feb 1982), we encourage users to examine the documentation and try the software. In particular, any users who are interested in running copies of IGL on other computer systems should evaluate the package.

At the end of the trial period, if there is sufficient campus-wide interest, we will purchase IGL. If there is not enough interest in the package, we will return our copy of IGL to Tektronix. Due to the possibility of this latter option, we do not encourage development of any large-scale, long-term IGL applications at this time.

We are currently planning meetings to present the IGL package, its features and abilities, and the pricing structure. If you are interested in attending such a meeting, or in licensing information, contact Allan Tuchman, 181 DCL (333-2048).

IGL documentation is available for inspection at the Systems Consulting Office, 1208 W. Springfield. To access the IGL library of FORTRAN subroutines, enter:

GRAB,IGL

Following this, you simply compile and execute a FORTRAN program which calls the desired IGL subroutines.

Direct your comments about IGL to Allan Tuchman directly or through

TELL,GRAPHIC.

TERMINAL SIGNON SEQUENCES

It has been brought to our attention that users are sometimes confused by the different signon sequences required at various terminals. We hope this article will lessen the confusion.

If you have used a CYBER terminal at any of the RJE sites, you have probably observed the colored strip attached to the keyboard. The strip is about the size of three postage stamps and is green, blue, red, or black in color. Both the color of the strip and the words printed on it identify the machine to which the terminal is connected.

Terminals marked with a red strip are attached directly to the CYBER 174. Such terminals can be used **ONLY** on the CYBER 174. Similarly, terminals marked with a blue strip are connected directly to the CYBER 175 and terminals marked with a black strip are connected directly to the IBM 4341. These terminals can be used **ONLY** on the machines to which they are connected. On any of these types of terminals, you initiate the signon sequence by depressing the RETURN (CR) key.

You can probably see the drawback of this feature: terminals cannot be shared between machines. If all terminals were connected in this fashion, the effect would be to increase the number of terminals required.

Enter the Gandalf "switch". This device is an electronic switch with terminals connected to one side and computers to the other. It contains a small processor which communicates with a terminal user and, on the basis of this interaction, connects the terminal to the computer of choice. Note the involvement of the terminal user in completing the connection.

The majority of the terminals at RJE sites are marked with a green strip which indicates that the terminal is connected to the switch. From the above paragraph, it is clear that you must use a more elaborate signon sequence when using one of these terminals. Before signon can even begin, you must specify to the switch which computer you intend to use.

As is usual when communicating with machines, there is a prescribed format which must be followed when communicating with the switch. The signon sequence is documented at each switchable terminal, but in very brief form. A fuller description of how to logon at one of these terminals is presented below:

- First, depress the **BREAK** key once and hold it down for about one second. When the switch detects the **BREAK** signal, it puts your terminal into a queue of terminals waiting for service and responds by sending a sequence of null characters. Unfortunately, most terminals discard any null characters sent to them so you do not receive any visible acknowledgement that your **BREAK** character has been received. (The IBM terminals provided at several RJE sites are an exception. These terminals will print the null character as a backward question mark.) Some DOs and DON'Ts follow.

DO hold the **BREAK** key down for about one second. The switch ignores a very short **BREAK** signal, considering it to be electronic noise. While some terminals will always send a **BREAK** signal of reasonable duration, others transmit only while the key is depressed. A good typist using one of these latter terminals can generate a **BREAK** signal so short that the switch considers it noise.

DON'T hit the **BREAK** key more than once. Once a terminal has been placed in the service queue, another **BREAK** character will be treated as a request to remove the terminal from the queue.

- Wait two seconds and hit the **RETURN (CR)** key. The two-second wait gives the switch time to assign a server to your terminal. (A server is a component of the switch which can communicate with you and complete the connection with your chosen computer.) The **RETURN (CR)** key signals the server to proceed. The terminal responds with "enter class" which is the switch's way of asking which computer you want to use. If your terminal does not respond, there are a couple of possible reasons:

A server has not yet been assigned to your terminal. There are a limited number of them available and you may have to wait for one to free up. Wait a couple of seconds and depress the **RETURN** key again. Try this at least three times before giving up on this diagnosis.

The switch might not have detected your original request for service. (This should not happen if you held the **BREAK** key down for a full second.) If this has happened, the remedy is to go back to step one and depress the **BREAK** key again. This should always be a last-ditch diagnosis, given the switch's treatment of a **BREAK** signal for a terminal that is already in the service queue.

- Enter a three-digit code to identify the computer you wish to use, followed by a carriage return. The correct code is easy to remember: it is 174 for the CYBER 174 and 175 for the CYBER 175. (Some Computer Science students, using a special pool of terminals, can specify other numbers. We will not discuss these special numbers here.) If all goes well, your terminal will respond with "CLASS xxx START", where xxx is the code you entered. You might, however, get one of the following messages:

CLASS xxx UNASSIGNED

The three-digit code xxx is unknown. You will be prompted for another.

CLASS xxx UNAVAILABLE

The class xxx is temporarily not available. The chosen computer might, for instance, be out of service. You will be prompted for another code.

CLASS xxx RESTRICTED

The code you have given is not acceptable from the terminal you are using. You might, for instance, have accidentally given a code that is recognized but used only for diagnostic purposes. You will be prompted for another code.

CLASS xxx BUSY

QUEUE SIZE yyyy DO YOU WISH TO QUEUE?

This pair of messages indicates that all paths to the computer you have chosen are busy and that the number of terminals waiting for a path to free up to this computer is yyyy. If you want to be put at the end of this waiting list, enter Y. While you are waiting, you will receive periodic reports of your queue position. (A BREAK character entered while you are waiting in the queue will disconnect your terminal from the switch, offering an escape route if you tire of waiting.) When a path becomes available, you will be prompted with a START message.

If you do not want to wait, but want to try to connect to another computer, enter N. You will be prompted for another three-digit code. If you want to abandon your attempt to use the computer, type Q. You will be disconnected from the switch.

BYE

You waited too long (more than 20 seconds) to enter the requested three-digit code. Your terminal has been disconnected from the switch and you will have to start over by depressing the BREAK key.

- Enter RETURN (CR) to initiate the usual CYBER signon sequence. From this point, the switch simply transmits every signal generated by your terminal directly to the computer. There is no way for your terminal to communicate further with the switch.

The connection will be broken when the computer you are using sends a disconnect signal to the switch, something that is normally done when you type BYE to logoff.

FEATURE ARTICLES

FORTRAN FUTURES

This article is part of a series on the work of the FORTRAN Standards Committee X3J3 in producing the next revision of the FORTRAN standard. The reader is reminded that the features described in this article are not a part of any FORTRAN compiler currently available, but rather are proposed requirements for FORTRAN processors produced in the late 1980's through the mid 1990's. Although every effort has been made to accurately describe the current position of X3J3 on these matters, the development of a revision to the FORTRAN standard is an evolutionary process, and these proposals may be subject to refinement, revision, or even retraction. Comments on these proposals may be given to Kurt Hirschert of the CSO Systems Consulting staff, who is a member of X3J3.

Last month's article described the basics of a FORTRAN array processing facility, including parallel application of scalar operators and extensions in declaring and referencing arrays. The description of the FORTRAN array processing facility continues in this month's article.

Although parallel application of scalar operations provides the means to express many kinds of parallel operations on arrays, there is another common form of array parallelism, operations along the length of one or more dimensions *within* an array. Depending on the nature of results computed, such operations are called recurrences or reductions. Beyond the use of DO loops, X3J3 has not yet adopted a mechanism for the general expression of recurrences and reductions, but it has adopted intrinsic functions to express the most common reductions, including sum, product, maximum and minimum value, logical sum, logical product, and the count of true values in a logical array.

All of the parallel operations described so far are unconditional, but in many problems, they need to be applied to selected elements, so conditional forms of these facilities will also be available. Parallel application of scalar operations is made conditional using a WHERE statement similar to the logical IF in ordinary FORTRAN:

WHERE (*logical array expression*) *array assignment statement*

For example

WHERE (A.NE.0) C = B / A

There is also a block-WHERE similar to the block-IF:

```
WHERE (logical array expression)
  array assignment statements
OTHERWISE
  array assignment statements
END WHERE
```

For example

```
WHERE(A.NE.0)
  C=B/A
OTHERWISE
  C=1
END WHERE
```

In either form, evaluation of the right hand side and actual assignment is performed only for those positions corresponding to the true elements in the logical array (the false elements for the OTHERWISE block). Obviously, the logical array and the arrays in the assignment statements must have the same shape. This kind of limited evaluation also applies to the operands of several of the array intrinsic functions, including a function to merge elements from two array expressions according to a logical mask and extended forms of the reduction functions which accept a logical mask indicating which elements are to be included in the computation.

Another important array operation is the selection and reorganization of elements in an existing array. Array subscripting is a special case of this, but there are applications which go beyond what one can represent with the subscripting extensions. For example, one may wish to treat the diagonal of a square array as a 1-dimensional array or treat a 1-dimensional array as though it were a 2-dimensional array with the odd numbered elements in one column (or row) and the even numbered elements in the other. A general facility, called the IDENTIFY statement, can be used to define a "virtual" array which is actually composed of elements in another array referenced by subscripts which are a linear combination of the subscripts of the "virtual" array. Our examples could be written:

```
REAL SQUARE(10,10), VECTOR(0:49)
  •
  •
  •
IDENTIFY < 10 > DIAGONAL(I) = SQUARE(I,I)
IDENTIFY < 0:24, 2 > TWO_COLUMNS(M,N) = VECTOR(2*M+N-1)
IDENTIFY < 2, 0:24 > TWO_ROWS(M,N) = TWO_COLUMNS(N,M)
```

There are also intrinsic functions to perform some of the more common reorganizations that cannot be represented by subscripting. These include a matrix transpose function and a function to create an array of higher dimensionality whose new subscripts have no effect on the value of element returned (e.g., "spreading" a vector into a matrix whose columns (or rows) are all identical to the original vector).

There are also facilities for reorganizing in nonlinear ways. 1-dimensional arrays can be used as subscripts to perform operations like permutations. The PACK statement can be used to transfer the elements of an array to a 1-dimensional array in canonical order and the UNPACK statement can be used to perform the reverse transfer. Both PACK and UNPACK can be used under control of a WHERE statement to transfer only selected elements.

The remaining array intrinsics fall into several categories:

- Intrinsics for vector dot product and matrix multiply will be provided, although these operations can also be performed using combinations of more basic operations. Intrinsics for matrix inverse, determinant, and the solution of linear systems were proposed, but are not currently part of the array processing facility because of concerns expressed by the numerical community that such intrinsics would be used when they are computationally inappropriate.
- Special purpose selection and reorganization intrinsics include functions to perform circular and "end-off" shifts, a function to concatenate an array to itself a specified number of times along a specified dimension, a function which reduces the dimensionality of its argument through selection, and a function which produces a diagonal matrix with specified values on the diagonal (such as an identity matrix).
- Array generating functions include a function to generate a vector containing a sequence of integer values and a function to generate a vector containing alternating sequences of true and false values.
- Intrinsics will be available to isolate the first and last true values in a logical array or along a specified dimension of such an array.
- Intrinsics will be available to return the dimensionality, shape, bounds, and size of an array.

Several areas in array processing are still under consideration:

- As noted earlier, no general mechanism for expressing recurrences or reductions has been proposed.
- The interaction between array processing and data structuring proposals is being investigated.
- Consideration has been given to integration or regularization of the array processing facilities and facilities for manipulating character and bit strings. This includes concatenation of arrays.
- A means for creating array valued constants is being proposed.
- Work is progressing on a means of providing user-defined array valued functions.

Recent Actions by X3J3

X3J3 met November 2-6, 1981 in Yorktown Heights, New York. Actions taken at that meeting include the following:

- The use of REAL control variables in the new block-DO was eliminated. The use of REAL control variables in the FORTRAN 77 DO loop remains.
- Several formal interpretations were made on the FORTRAN 77 standard. Preliminary work was done on additional interpretations.
- A proposal was adopted to merge the mechanism for interprocedure data sharing with the mechanism used for data access in internal procedures.
- Several corrections and clarifications on the array processing facilities were adopted.
- The rules for adjustable array bounds expressions were liberalized in preparation for user-defined functions returning array values.
- X3J3 expressed support for the proposed change in X3H2's formal program of work to include the definition of language-independent database manipulation semantics.
- Rules were adopted for argument association of real and complex arguments where precision requirements are explicitly specified.
- The basics for user-defined generic functions (i.e., functions accepting arguments of various types) were adopted.
- A variant on the E format item was adopted. It would restrict the exponent value to a multiple of three, in keeping with notational practice in many engineering disciplines.
- The basics for a macro facility were adopted. In its current form, this facility provides only text inclusion with no argument substitution.
- A proposal defining the contents of the core language was discussed extensively.
- The problems in resolving the differences between the FORTRAN 77 argument association model and the model proposed for the next standard were explored.
- The meaning of the SAVE and DATA statements in recursive routines was discussed. Proposals based on the results of these discussions will be presented at a forthcoming meeting.
- In addition to the development and maintenance of standards for the FORTRAN language, X3J3's formal program of work calls for the development of a standard for database manipulation from FORTRAN. The task group charged with primary responsibility for this work has disbanded. The future of this work was discussed.

- A presentation was made on event/error handling in an asynchronous multi-tasking environment.

SALES - EXCHANGES - HELP WANTED

HALF-TIME RESEARCH ASSISTANT

CSO has an opening for a half-time Research Assistant to work as a system consultant. The primary job function is to aid users experiencing difficulty in using CSO's services. The position offers a good opportunity to learn a variety of software packages and languages.

The applicant should be a knowledgeable user of the CYBER system and must have a working knowledge of FORTRAN. Familiarity with CSO's IBM services or expertise in areas such as the use of mathematical libraries or graphics software is desirable.

This position will be available January 1, 1982. If you would like to discuss it further, contact Robert Penka, Assistant Director for User Services, 173 DCL (333-4709).

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