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Contents

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Editor : Naomi Miner

Comments about the content of this newsletter, or suggestions for changes may be directed to the editor, 235a Experimental Engineering, or call 612/376-4668.

tests of FORTRAN functions - part three

In the previous two parts of this article I have discussed tests of FORTRAN's REAL, DOUBLE PRECISION and COMPLEX functions. This month I will finish the series with discussion of the maximum relative errors and timing in microseconds for the REAL functions of FORTRAN tested against specific ranges. You may want to refer to the first article (November newsletter) for a definition of relative error and for the W. J. Cody loss-of-bits tests for these same functions.

accuracy measurements

For binary computers the basic relative error decreases by a factor 2 as function results go from a value just greater than, to a value just under the next power of two. This decrease is due to the Cyber machines' minimum value increment of 2**(-47) just over a power of two as opposed to a minimum change of 2**(-48) just under the next power. Binary machines have the least relative error change over a base exponent range. Base 16 machines, such as IBM-compatible machines, experience a factor of 16 decrease proceeding from values just over a power of the base to the next power. Accurate programming for such machines often means avoiding values at or just over a power of the base, i.e., 1/16, 1, 16, 256, etc. This means that users of higher base machines who wish to avoid loss of accuracy just over a power of the base must use extraordinary measures or uncommon algorithms.

For Cyber machines 3.55*10**(-15) represents a 1/2 bit change for values just over a power of two. If we use a 1 1/2 bit error (10.65*10**(-15) to be the minimally acceptable maximum relative error for a standard function, one M77 and three FTN4.8 functions do not meet that criterion for the given tests. These are TAN for M77 and ASIN, TAN and TANH for FTN. Only FTN's ASIN function has a maximum error greater than two bits (14.2*10**(-15)). See the table accompanying this article for the figures.

timing measurements

In the timing measurements, examination of the results would lead one to think that except for TAN, M77 was uniformly faster than FTN on the Cyber 74. This is true for call-by-reference evocations such as OPT=0, D, T on the FTN control statement, or for referencing functions in EXTERNAL statements as done for these tests; but FTN also has a call-by-value entry for these functions that reduces the execution time. The estimates from reference 2 for this reduction on the Cyber 74 are given in the table column labeled (T)Overhead. If we subtract this column value from the preceding column value, we get an estimate of the FTN call-by-value timing. This subtraction shows approximately equal timings for the ATAN, ATAN2, COS, and SIN routines that we developed and use on both compilers. Thus, the only significantly faster routines are COSH and SINH on M77 and TAN on FTN.

other considerations

So far in discussing FORTRAN functions, I have omitted philosophical questions about error detection and about designing functions for a specific machine. The error detection question is "should a function always stand ready to warn a user about invalid and semi-valid input values -- on our machines, indefinite and infinite operands?" MNF and M77 have always done this and have provided a trace back through all levels to the main program. FTN4 and FTN5 are moving slowly in this direction, but continue using call-by-value as the normal mode of function evocation. This means there is still a school of thought at CDC that says "Use (T) when debugging and drop it for production runs." Unfortunately this older theory assumes that programs at some point become fully debugged and worse, implies that the adage "what you don't know can't hurt you" applies to such programs.

The second question left unanswered is "should different functions be programmed for different types of central processors employing the same instruction set?" I have usually programmed functions for the parallel instruction set CP's (Cyber 74, 750, 7600) and have added conditional code to eliminate some flagrant biases (saving 3 to 6% in execution time) for the unified CP's (171-174, 720-730). If I were to write functions purely for a unified Cyber CP, then I would often use continued fraction algorithms instead of the current algorithms because a REAL multiply takes the same time as a divide. In fact three to six multiples can be done in a single divide time on the parallel CP Cybers. Both CDC and I believe that only one algorithmic method should be used for all processors, since comparisons of jobs run on different model central processors would show inconsistent results if differing algorithms were used.

summary

I am pleased to report that MNF, M77, and FTN FORTRAN functions have advanced to fast, accurate and robust routines in comparison to the early routines on Cyber machines. For M77, DTAN, TAN and ** double precision routines will be improved in accuracy and speed of execution. If you are interested in more information on FORTRAN functions, the following references may be worth your effort:

1. William J. Cody, Jr. and William Waite, Software Manual for the Elementary Functions, Prentice Hall, Inc., 1980.

2. FORTRAN Common Library Mathematical Routines Reference Manual, CDC publication 60498200.

3. J. Hart, E. Chaney, et al., Computer Approximation, Robert E. Krieger Publishing Co., 1978.

L. A. Liddiard, 373-5239

FORTRAN FUNCTION	TESTED RANGE	REAL vs DOUBLE PRECISION Maximum Relative Error *10**15		REAL Function Timing in Microseconds				
				CYBER 74			CYBER 172	
		M77	FTN4.8	M77	FTN4.8(T)	(T)Overhead	M77	FTN4.8(T)
ACOS	(-1 to 1)	- 6.1, 6.8	- 6.0, 5.6	22.7	24.1	3.5	96.8	85.0
ALOG	(.135 to 7.38)	- 6.1, 7.3	-10.1, 5.8	20.6	24.1	4.2	86.8	73.1
ALOG10	(.01 to 100)	- 5.1, 3.8	- 8.8, 4.9	20.5	24.2	4.0	91.4	78.7
ASIN	(-1 to 1)	- 6.5, 5.5	- 6.9,14.7	21.9	24.0	3.5	91.3	87.4
ATAN	(-2 to 2)	- 6.5, 8.1	- 6.5, 8.0	21.6	24.4	3.2	78.1	84.0
ATAN2	(-2 to 2)	- 6.5, 8.1	- 6.5, 8.0	26.1	29.6	5.3	86.9	95.2
COS	(pi/2 to pi/2)	- 7.4, 6.6	- 6.7, 6.5	19.0	24.2	3.4	88.4	95.7
COSH	(-1.5 to 1.5)	- 7.8, 6.0	- 6.3, 7.9	22.6	28.0	5.0	79.4	105.0
EXP	(-1 to 2.8)	- 7.4, 5.1	- 6.8, 5.0	17.6	19.8	5.7	72.3	67.7
SIN	(-pi/2 to pi/2)	- 7.7, 6.6	- 6.8, 6.5	19.3	23.5	3.4	88.3	95.6
SINH	(-1.5 to 1.5)	-10.4,10.0	- 7.4, 6.6	20.4	31.3	5.2	71.4	110.1
SQRT	(0 to 100)	- 3.5, 3.7	- 3.5, 3.5	16.3	16.6	4.0	41.2	47.3
TAN	(-pi/2 to pi/2)	-12.0, 9.9	-12.3,12.6	31.1	20.0	4.2	106.0	80.9
TANH	(-1.5 to 1.5)	-10.1, 7.7	- 9.9,11.2	19.8	22.7	6.5	70.7	72.8

permanent files

Those of you who have large permanent file catalogs or who share an account with others may find "user categories" (UC) useful. You can specify the UC parameter on the SAVE, DEFINE, RETAIN, and CHANGE commands to set the user category of a file. This allows you to divide your files into several smaller categories.

For example,

```
SAVE(PHOEBUS/UC=APOLLO)
```

would set the user category name of the file PHOEBUS to APOLLO. The name of the user category may be any combination of up to seven letters or numbers. However, the first character of the name must be a letter.

You may use the CHANGE command to change or set the user category for a file. The following command will change the user category of the three files to OLYMPUS:

```
CHANGE(URANUS,CRONOS,ZEUS/UC=OLYMPUS)
```

Once you have set user category names on your files, you can use the CATLIST command to list only those files within a certain category.

```
CATLIST(LO=F,UC=OLYMPUS)
```

will give a full catlist for only those files with the user category name OLYMPUS. In this case, it would report only the files URANUS, CRONOS, and ZEUS. Any other files you have would not be listed.

On the CATLIST command, you may place an asterisk in the UC parameter to match any character. For instance, if several people use your account, you can set the first three characters of the user category name of your files to your initials, and the last four to, say, some project name. To catlist only your files, you could enter:

```
CATLIST/UC=SEC****.
```

which will list every file whose user category name begins with SEC, regardless of what the last characters (up to four) happen to be.

To see which files do not have user category names, enter:

```
CATLIST(UC=0)
```

If you want to clear the user category name, set it to zero:

```
CHANGE(GAIA,RHEA,HERA/UC=0)
```

The UCW list option on CATLIST will show the user category name of a file. Simply enter:

```
CATLIST/LO=UCW
```

for a listing of the user category name for all the files on your account.

S. E. Collins, 376-5608

CRAY service

In a previous issue of this Newsletter, we announced that we obtained a substantial amount of time on a CRAY-1 computer located in the Twin Cities area. The amount of time is large enough that we can offer CRAY service for approximately one year.

The CRAY-1, a vector processor, is the largest and fastest mainframe available on the market today. It is an ASCII machine with 64-bit words and eight 8-bit characters per word. It is typically used for compute-bound applications like weather forecasting and nuclear research. When in vector mode, the machine can execute as many as 140 million floating point instructions per second.

speed

We ran several FORTRAN benchmarks on the CRAY-1 and found that when calculations were good candidates for vector processing, the CRAY was as much as 58 times faster than the Cyber 74. When the vector capability was intentionally turned off, the computer was 7 times faster than the Cyber 74. Since we needed a constant by which to compare the CRAY to the Cyber 74 for accounting purposes, we chose the number 10. This figure is probably low since most CRAY users will likely have vector applications.

access

Initially, we will deliver the CRAY jobs to the CRAY site after they have been dumped to tape. You can send jobs to the CRAY in two ways:

a deck of cards can be read through any remote site; or

a job can be entered into the input queue on the Cyber 74 using the ROUTE or SUBMIT commands.

In either case you would use the MI parameter on the job card to designate the job as CRAY-bound. Specify the parameter as MICR. Once a day, at 12-noon, we will execute a utility which will dump CRAY-bound jobs to tape. We will then deliver the tape to the CRAY site at about 2:00 PM. The following day, a tape containing the output from the CRAY jobs will be returned to Lauderdale where another utility will read the tape. If you submitted the job as a card deck, the output will print at the site where the deck was read. The output will look the same as output from a job executed on the Cyber 74 with the usual banner page and trailer page. The only difference will be that the output between the banner and trailer page will be the CRAY output. If you entered a CRAY job via the SUBMIT or ROUTE commands, the output will be RETAINed as a permanent file under your user number. The name of the file will be the same as the job name. The file will not contain a banner page nor trailer page, only the CRAY output.

help

We are willing to help with job setup for the CRAY and with advice on program changes which take advantage of the vector processor. In fact, for any but the most trivial applications, we may be the only source of help because CRAY system manuals are in extremely short supply. You can order manuals through our Computer Store.

For information on the CRAY's operating system and on using its FORTRAN compiler, you will want to look at WRITEUP(SERVICE=CRAY).

costs

We have pegged the cost of CRAY service at the NOFRILLS rate on the Cyber 74. The objective of our pricing schedule is to assure that a typical job run on the CRAY cost no more than the same job run NOFRILLS on the Cyber 74. We have decided that the CRAY-1 is 10 times faster than the Cyber 74 for the sake of billing purposes. We have also decided that for a typical compute-bound job, the number of SRU's used is very close to the number of CP seconds. Specifically, for every CPU second used on the CRAY-1, we will charge for 10 SRU's at the NOFRILLS rate. Clearly, this rate is quite advantageous to anyone who can make use of the CRAY's vector capabilities. For the time being, charges accrued on the CRAY will simply be added into the monthly SRU charges. Eventually, we will institute a separate charging category which will appear on the ACCSTAT report.

who qualifies

The CRAY service is available to any non-commercial user, that is, any University user, any agency of the state or federal government, any organization under contract to the state or federal government or any non-profit organization. For billing purposes all CRAY users must have a Cyber 74 account number. Direct inquiries about CRAY service to

T. Lanzatella, 376-5606

seminar

We are pleased to announce a seminar, sponsored in conjunction with the Department of Applied Statistics, on the major statistical programs on our Cyber systems and on the St. Paul IBM system. Professor Sanford Weisberg of the Department of Applied Statistics, will discuss SPSS, BMDP, MINITAB, SAS, and MULTREG, emphasizing their capabilities and usefulness in data analysis. He will also mention less familiar methods of judging lack of fit and influence, illustrating their usefulness in regression analysis. If you are interested in choosing a package for finding lack of fit, failure of assumptions, "bad" points, and influence, jot down the following time and place:

February 3, 1981
3:15 PM
15 Architecture

S. P. Yen, 376-4886

statistics packages

We provide the following statistical packages and programs:

SPSS	Statistical package for the social sciences
SPSSONL	SPSS on-line system
BMD	Biomedical computer programs
BMDP	Biomedical computer programs, P-series
OMNITAB	General purpose numerical, statistical data analysis
MINITAB	Timesharing statistical system
SIR	Scientific information retrieval system
ISIS	Interactive statistical instructional system
IMP	Interactive mathematical package
UMST	University of Minnesota statistical programs
COFAMM	Confirmatory factor analysis with model modification
LISREL	Maximum likelihood for analysis of linear structural relationships
HICLUS	Hierarchical cluster analysis program
KYST-2A	Multidimensional scaling and unfolding program
SINDSCAL	Individual difference model of multidimensional scaling program

You may meet with the statistical consultant, Monday through Friday from 11:00 AM to 1:00 PM in 140 Ex, or you may call 376-5062, Monday through Friday from 1:00 PM to 2:00 PM.

S. P. Yen, 376-5062

library changes

We made the following changes to libraries on December 20, 1980.

MINNLIB Library

DMXLNEQ and DMXLNEF - corrected an error when more than one equation is being solved without calculation of an inverse (M.LT.-1).

SYMINV - now gives the correct rank and zero determinant when the matrix is rank-deficient.

PLOTPAC - now gives the correct value of X or Y when an X or Y length error occurs and a scale factor (FACTOR call) is being used. In addition, PLOTPAC now uses a new windowing algorithm.

FORTRAN, FTN5LIB, MNFCLIB, M77LIB
MINNLIB - If you insert a CALL MINNLIB statement into a program (the statement need not be executed) the equivalent of the control statement

```
FETCH(MINNLIB/V=compiler)
```

is performed.

FTN5 Libraries

As of December 2, 1980, you can use UCC libraries on the Cyber 74, 172 and 720 with FTN5. The appropriate statement is:

```
FETCH(LIBRARY/V=FTN5)
```

where LIBRARY may be MINNLIB, IMSL, EISPACK, TEKLIB, HTEKLIB, UTEKLIB, CALCOMP, ALMAP, or SIMPLX. The FUNPACK, BESPACK, MEXPLOR, BSPLINE and YSMPLIB libraries are available only on the Cyber 74 and 172.

See WRITEUP(LIBSET) for background information on libraries. For more information on a particular library, see WRITEUP(LIBNDEX) or the User Manual supplement, Guide to User Libraries.

M. Frisch, 376-1636

WRITEUPDATE

What better way to start off the new year than by resolving to keep up to date on the exciting things happening with WRITEUPs! Here are the most significant changes to the catalog for the month of December.

CAL (74/172) - Instructions for making your own personalized calendar for the new year with the Pascal plotting program CAL. (Expensive!)

CLASSES (all machines) - Updated schedule for our Winter Quarter short courses.

CONTROL (74/172) - Updated reference document for NOS control statements.

DOCLIST (all machines) - The complete list of all documentation available at UCC.

SWPRICE (74/172) - A description of our new software pricing policy (see related article in last month's Newsletter).

VIDEO (all machines) - The newest information on our wide variety of instructional video tapes.

That's it for this month. For comments, questions, and random observations on our WRITEUP service, call

J. T. Jaynes, 373-9490

text formatting

To assist users in setting up text files to be formatted by Prose, we have established a series of command files to set up a particular formatting environment for Prose. You may insert one of these files at the beginning of a text file. We currently have the following Prose commands: for formatting dissertations to the University of Minnesota specifications (file = PRDIS); to adhere to MLA publishing standards (file = PRMLA); and to format bibliographies (file = PRBIB). Others will be added as they are needed. If you have a need or an idea for a specific format, please let us know. These files may be accessed on either the Cyber 172 or the Cyber 74 by entering:

FETCH(PRxxx)

If you would like a copy of any of these files placed on your Terak disk, you may use COM, or call Vicky Walsh, 373-5780.

This winter we are offering a 3-day class on text formatting (see page 9). The instructor will explain general concepts, then provide specific instruction in use of Prose. For additional information call Sara Graffunder, 376-1637 or Lincoln Fetcher, 376-1637.

in the pits?

If you think that all archaeology is the pits, then think again! The latest UCC Technical Report is now available in the Reference Room (235a Ex) under the title "A Computer Simulation of the House Construction Activity System at Nichoria in SW Greece" by V. Walsh. This report deals with a computer aided study of the Bronze Age houses which were excavated under the direction of W.A. McDonald, Classics Department, University of Minnesota.

what computing can do

If you've been wondering of what possible use the computer could be for your research, you may find the answer in a short course offered Winter Quarter (see page 9). Entitled "What Computing Can Do For You," it will present a general discussion and specific examples on text analysis, data bases, statistics, simulation, and games (GAMES?!). Pass the word on! For more information, call Lincoln Fetcher at 376-1637 or

V. A. Walsh, 373-5280

need money?

Well, help is closer than you may think. The University provides assistance in finding granting agencies and writing grant proposals for research support. Each college has a Research Development Office which maintains written sources of information about grants as well as providing some individualized assistance in preparing grant proposals. Graduate students can also get help from the Graduate School Fellowship Office which handles grants as well as fellowship information. The overall University center which handles all University grants is the Office of Research Administration. The personnel in all these offices are willing to advise at all stages of grant search and proposal preparation. Most of the offices also maintain a small library of reference materials on granting agencies. These provide the basic source of information on where to apply and the particular requirements of each agency. Wilson Library and the Minneapolis Public Library also have a reference collection on federal, state, and private funding sources.

Here are some important offices and phone numbers relating to grant applications:

Office for Research Administration (376-7614)
IT Research Development Office (373-2228)
CLA Research Development Office (373-5101)
Graduate School Research Development Center (373-3001)
Graduate School Fellowship Office (373-2833)

Most granting agencies consider computing costs a valid expense for research projects. However, computing costs are difficult to estimate. To help in writing grant proposals which include computing costs or equipment, we will work with proposal writers to develop reasonable cost estimates and help to integrate the computing aspects into the project as a whole. In order to do this effectively, it is important that computer personnel be consulted early in the proposal development process.

A useful tool for estimating computing costs is currently being developed in the form of an indexed writeup called,

WRITEUP(COSTEST)

Each section of the writeup presents a sample run of an application or program including input deck and dayfile with cost. We will add material to this writeup as examples become available. Call J. Jaynes at 376-9490 for more information about COSTEST.

I am available for general questions about grant proposals and will also assist in determining computing costs estimates. I will direct users to the appropriate staff members when necessary.

V. A. Walsh, 373-5780

fair use

"I'm just making a few copies for use by my staff."

"I need several copies for the micros in my lab, but I'll buy only one -- it's cheaper."

"We're an educational institution; we shouldn't have to buy 20 copies."

"They know people are going to copy their software; that's why their prices are so high."

These are the comments and rationalizations of microcomputer users, especially those who bought micros and forgot to budget for software. However, most good software carries a copyright notice and with it represents some rights of the developer and restrictions for the buyer.

The following is excerpted from a statement prepared by the law firm of Gould, Reichert and Strauss for the Materials Council of the National Audio-Visual Association. You may find the entire statement in the November, 1980 issue of USERS, the MECC instructional computing newsletter.

> ...a copyright proprietor of materials utilized in such systems retains all of those rights inherent in a copyright being more specifically: the right to reproduce copies and/or duplications of such works; the right to control distribution of such works whether by sale, lease, rental, loan or any other form of dissemination; the right to use such works for purposes of adaptive or derivative creation; the right to perform or license others to perform such works publicly, with or without commercial gain; and the right to display or publicly show or exhibit such works.

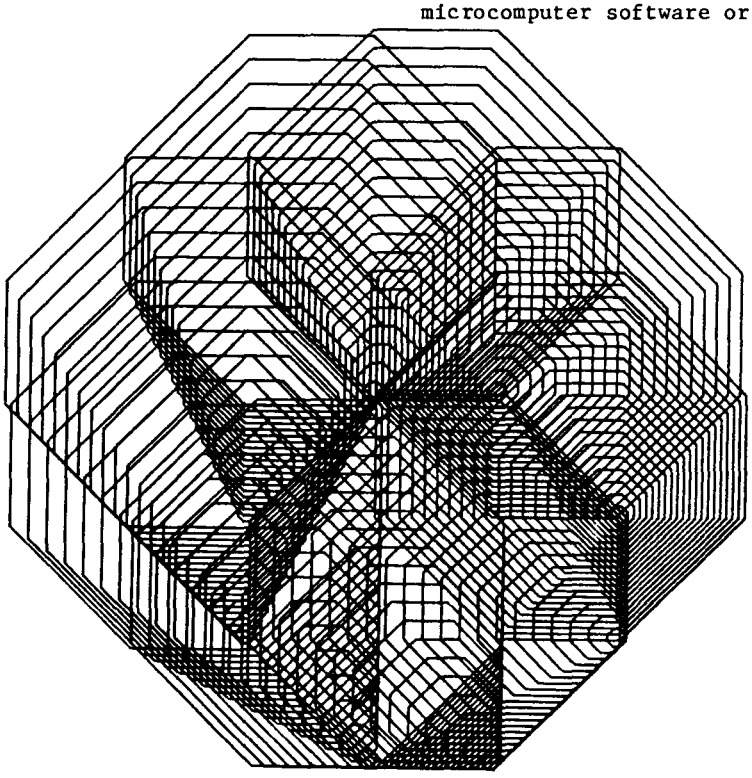
This bundle of rights is in no way diminished simply because a copyrighted work is utilized in conjunction with computer-like systems, which entails that a cassette or diskette cannot be reproduced or distributed without prior authorization of the copyright owner.

The only extent to which there may be limitations on these rights are those concerning "fair use" which, under Section 107 of the 1976 Copyright Reform Act, unfortunately remains a rather obfuscated concept. Examination of this Section (107) and the pre-1978 case law, however, makes it clear that there are significant limitations on educational, archival, or library privileges respecting copyright and "fair use". A school system, for example, may not purchase a cassette or diskette and simply reproduce unlimited copies to be disseminated around its various locations. It may make, perhaps, one copy under "fair use" exemptions in the event that the original is lost, destroyed or become worn. If, however, the school system desires to have several such cassettes or diskettes in circulation, then it must purchase, rent or lease the copies.

It is this firm's opinion that it would be a clear case of copyright infringement to reproduce multiple copies from an original cassette or diskette in lieu of ordering additional sets, and we would expect any instructor guilty of making such unauthorized copies to be prosecuted under the 1976 Act's punitive provisions.

Like it or not, it appears we must pay for good microcomputer software or develop it ourselves.

M. M. Skow, 373-7745



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winter quarter short courses

** NOTE ** Changes (see $) and addition of room numbers!!

^Computing: What is it?	3:15-5pm, 12-15 Jan (mtwth)	Arch 15
^NOS (system configuration)	3:15-5pm, 19 Jan (m)	Arch 5
^Introduction to UCC	3:15-5pm, 20 Jan (t)	Arch 5
^NOS (files/jobs)	3:15-5pm, 21-23 Jan (wf)	Arch 5
^NOS (permanent files)	3:15-5pm, 26 Jan (m)	Arch 5
^NOS (program execution)	3:15-5pm, 28 Jan (w)	Arch 5
NOS (intro to tapes)	3:15-5pm, 30 Jan (f)	Arch 5
Microcomputing	2:15-4pm, 27 Jan-24 Feb (t)	Ex 193
Pascal for Programmers	3:15-5pm, 26 Jan-13 Feb (mwf)	Arch 15
Comparing DBMS's	3:15-5pm, 26 Jan (m)	Arch 45
SPSS (SPSS basics).live	3:15-5pm, 26 Jan (m)	Arch 55
SPSS (data manipulation).live.	3:15-5pm, 27 Jan (t)	Arch 55
SPSS (SPSS files).live	3:15-5pm, 28 Jan (w)	Arch 55
SPSS (On-Line).live	3:15-5pm, 30 Jan (f)	Arch 55
^Interactive Systems Commands	3:15-5pm, 27-29 Jan (tth)	Arch 40
Introduction to System 2000	3:15-5pm, 28 Jan-13 Feb (mwf)	AkerH 319
^XEDIT	2:15-4pm, 2-6 Feb (mwf)	Ex 193
Intermediate FORTRAN	3:15-5pm, 2-20 Feb (mwf)	AkerH 211
$ Linear Regression	3:15-5pm, 3 Feb (t)	Arch 15
Graphics	3:15-5pm, 9-13 Feb (mtwf)	AkerH 215
Graphics Workshop	7:30-9:30pm, 12 Feb (th)	Laud# (see note)
What Computing Can Do For You.	2:15-4pm, 9-13 Feb (mwf)	ForH 349
COBOL	3:15-5pm, 10 Feb-5 Mar (tth)	AkerH 211
$ Text Formatting	2:15-4pm, 18-23 Feb (wfm)	Ex 193
SIR	3:15-5pm, 18-27 Feb (mwf)	AkerH 215
System 2000/v260 to v280	3:15-5pm, 19 Feb (th)	Lind 320
System 2000/PLEX (PLI)	3:15-5pm, 23-27 Feb (mwf)	Arch 15

NOTES:

^: up-arrow (^) indicates this course is a prerequisite for other, unmarked courses.

$: Indicates changes in schedule since first publication.

#: Class held at Lauderdale conference room, Lauderdale computer site, 2520 Broadway Drive, Lauderdale, MN.

HOLIDAY: 16 February (m) is a University holiday. No classes will be held.

For more information concerning these short courses, see "WRITEUP(CLASSES)" or call Lincoln Fetcher at 376-1637.

statistics

***PRODUCTION USAGE SUMMARIES: Cyber 74+172

	November, 1980	November, 1979
System resource units (SRU)	1,107,312 (1,392,538)	1,061,890 (1,339,481)
Batch jobs and MIRJE sessions	113,921 (123,901)	128,753 (139,298)
Total central processor (CP hours)	129/183 (148/263)	165/139 (179/234)
DELAY queue CP hours	45/ 41 (48/ 52)	56/ 23 (58/ 32)
NO FRILLS queue CP hours	7/ 14 (8/ 14)	--/ -- (/-)
Mass storage transfers (KPR)	368,484 (452,412)	347,190 (436,632)
Magnetic tape transfers (KPR)	7,106 (10,015)	10,861 (14,587)
Pages printed, charged from UCC	835,042 (949,040)	1,047,778 (1,186,286)
Cards punched	177,669 (185,600)	639,385 (696,578)
Microfilm frames produced	15,162 (445,692)	15,752 (458,450)
MIRJE terminal hours	13,136 (15,210)	12,749 (14,901)
Number of terminal sessions	34,033	31,115
Statos plotting production (feet)	5,507	6,584
Tapes mounted	9,210	11,254
Average file storage (char)	3,349.9 million	2,523.6 million
Mean time between failures	116.3/66.5 hours	120.3/120.3
Available during scheduled hours	99.9/99.7 percent	99.9/ 99.0 percent

(totals in parentheses include staff development, accounting, and maintenance runs)

***DOWNTIME SUMMARY: December, 1980 (Column 1, Cyber 74 : Column 2, Cyber 172)

	0800-1800 M-F		other		total	
Total possible scheduled uptime hours	216.8	216.8	251.0	251.0	467.8	467.8
Total downtime hours (see Schedule A)	0.2	0.1	3.1	0.0	3.3	0.1
Total uptime hours	216.6	216.6	247.9	251.0	464.5	467.7
Uptime (percent)	99.9	99.9	98.8	100.0	99.3	99.9
Average downtime per occurrence (min)	11.0	1.0	61.7	---	49.0	1.0
Mean time between failures (hours)	108.4	108.4	62.8	-----	93.6	233.9
Subsystem failures						
SUPIO	6	-	6	-	12	-
TELEX	0	2	1	0	1	2
EXPORT	0	-	0	-	0	-

Schedule A: downtime hours

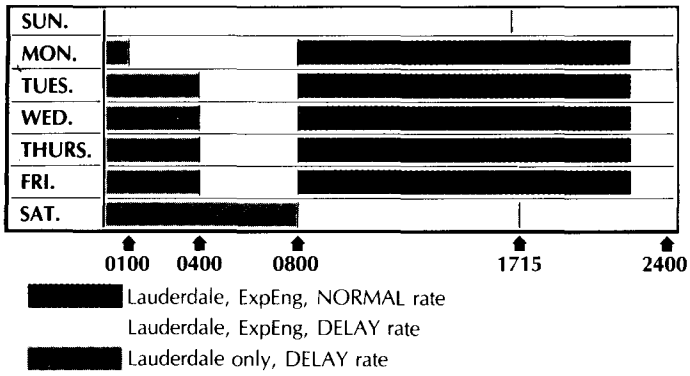
	Number		Total hours		Average minutes	
(1) Preventive maintenance over-runs	0	1	0.0	0.1	0.0	1.0
(2) Software related problems	2	0	0.1	0.0	2.5	0.0
(3) Hardware related problems	2	0	3.2	0.0	95.5	0.0
(4) Indeterminate problems	0	0	0.0	0.0	0.0	0.0
(5) External Problems	0	0	0.0	0.0	0.0	0.0

***PRODUCTION USAGE SUMMARIES: Cyber 720 (MERITSS)

	November, 1980	November, 1979
Number of jobs run	373,704	255,039
Central processor hours	215.7	170
MERITSS terminal hours	42,532	31,952
Number of terminal sessions	82,785	57,449
Maximum number of simultaneous users	188	147
Average file storage (char)	478.9 million	439.8 million
Mean time between failures	44.6 hours	110.8 hours
Available during scheduled hours	99.5 percent	99.9 percent

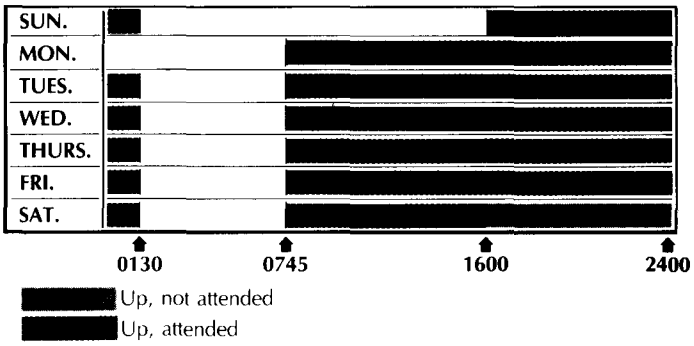
operations

CYBER 74+172 OPERATING HOURS



See WRITEUP(HOURS) for schedule of batch job pickup/delivery service.

CYBER 720 OPERATING HOURS



See WRITEUP(LABHOUR) for a schedule of open hours in the student computer laboratories.

TWIN CITIES CAMPUS PUBLIC REMOTE JOB ENTRY SITES

SITE	ID	SUPERVISOR	PHONE
		East Bank	
ElectE 38	4V	V. Zahhos	373-5346
EltH N640	4W	D. Anderson	373-5827
ExpEng 130	3L	I/O Coordinator	373-4596
ExpEng 130	4B	I/O Coordinator	373-4596
ExpEng 130	4N	I/O Coordinator	373-4596
FrontH	4E	D. Schumacher	373-2740
KoltH S191	4Z		
MinMet 321	41	R. Larson	376-2668
Physics 69	44	L. Whitney	376-7627
TerrH W106	4I	B. Hackett	373-6621
D388 Mayo	24	L. Croatt	373-7714
Zoology 314	4J	E. Cushing	373-2232
		West Bank	
SocSci 167	4X	D. Lund	373-3608
SocSci 1009	4K	M. Mongiat	373-0168
		St. Paul	
BioSci 257A	47	M. Simmons	373-1961
ClaOff 125G	48	C. Bingham	373-0988
McN H	42	G. Wahlert	373-0939
NorH 24	4G	J. Colten	373-0990
NorH 24	40	J. Colten	373-0990
		Lauderdale	
User's Room	49	Secretary	373-4912
User's Room	3F	Secretary	373-4912

Keypunches provided at each site.

TWIN CITIES INSTRUCTIONAL COMPUTER LABORATORIES

SITE	SUPERVISOR	PHONE	EQUIPMENT
	East Bank		
CentH	R. Rickgarn	3-2289	TTY33(2)
ComH	C. Youngdale	3-2453	TTY43(1)
DiehlH 535	N. Sauro	6-7005	CRT(2)
EltH 121, 125	D. Anderson	3-5827	TTY33(6) CDC713(1) Hazeltine(3) Teleray(1)
FrontH	D. Schumacher	3-2740	TTY33(1)
HS-A 1-752	L. Ellis	3-0331	TTY33(4) TTY43(2) Teleray(1)
LindH 25	M. Schneider	3-0137	CDC713(6) Decwriter(5) Tektronix4013(1) Teleray(1) TTY43(11)
MechE 308	D. Riley	3-0340	TTY33(4) Teleray(3) Decwriter(5)
SanfH	M. Kilbury	3-3434	TTY33(1)
TerrH	B. Hackett	3-3567	TTY33(1)
VincentH 4	W. Stenberg	3-2586	TTY33(2) CDC713(2) Decwriter(7) Teleray(2)
WaLib 204	R. Estelle	3-2538	TTY43(10) CRT(2)
	West Bank		
BlegH 140	D. Lund	3-3608	TTY43(13) Teleray(1)
MdbH	R. Baker	3-9818	TTY33(1)
SocSci 167	D. Lund	3-3608	TTY33(5) Teleray(3) Decwriter(2)
	St. Paul		
ClaOff 125	C. Bingham	3-0988	TTY33(6) Hazeltine(2) Decwriter(4)

phone numbers

Accounting 373-4548, 373-2521
Computer-Aided Instruction 376-2975
Computer Hours (recorded message) 373-4927
Computer Store 373-4877
Consulting
  HELP-line 376-5592
    9 AM—5 PM, Monday—Friday
  Business Data Products 376-1761
    10-11 AM and 1-3 PM, Monday—Friday
  COBOL Language 376-1761
    11 AM—12M, Monday, Wednesday, Friday
  Statistics Packages 376-5062
    1-2 PM, Monday—Friday
  Data Bases 376-1761
    10-11 AM and 1-2 PM, Monday—Friday
  Microcomputers 376-4276
    10-12 AM and 2-4 PM, Monday—Friday
  Humanities 373-5780
    10:30-11:30 AM, Monday, Wednesday, Friday
    2-3 PM, Tuesday, Thursday
Contract Programming 376-1764
Data Base Applications 373-7878
Educational Services 376-3963
EDUNET Interface 373-7745
Equipment Purchase or Lease 376-8153
Experimental Engineering I/O 373-4596
Field Engineering 376-7584
Graphics Software 376-1636
HELP-line 376-5592
  9 AM—5 PM, Monday—Friday
HOURS-line (recorded message) 373-4927
Image Processing Center 373-7878
Information, Experimental Engineering 373-4360
Information, Lauderdale 373-4912
Information Systems 373-7878
Instructional Labs 373-5754
Job Status, ExpEng (recorded message) 373-4994
Lauderdale Operations 373-4920
Lauderdale Services 373-7538
Lauderdale Users Room 373-4921
MECC Interface 373-4573
Microcomputers 376-4276
Microfilm Operator 373-4995
Newsletter Subscription 376-4668
Permanent File Restoration 376-5605
Professional Services Division (PSD) 376-1764
Project Assistance 376-1764
Program Librarian 376-1636
Programming Languages 376-7290
Reference Room 373-7744
Remote Batch (RJE) Services 373-5754
Short Courses 376-1637
Shuttle Bus Service 376-3068
System Status (recorded message) 373-4927
Tape Librarian and EBR Operator 373-4995
Technical Writing 373-2522
User Numbers
  Instructional Batch 373-2521
  Instructional Timesharing 373-7745
  Research Batch 373-2521
  Research Timesharing 373-2521
User Services 373-4599

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User Services
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