

Cyber Interactive Debug

Cyber Interactive Debug (CID) is a facility designed to help you find errors in an executing program. You can use CID to debug a single program module, a set of program modules with all required object library modules, or a set of programs on overlays.

CID is a supervisory program module loaded in the field length to operate on loaded object programs. Consequently, you can use it to debug programs produced by any assembler or compiler in the CDC product set. You do not need any special statements in a source program you wish to debug under CID; more features are available for debugging BASIC, COBOL, and FORTRAN programs, however, if they are compiled for use with CID. Although CID is designed for interactive use, it can be used with batch jobs; not all the features available interactively are available for batch use.

Debug Session

A debug session is the execution of a program under CID control. To begin a debug session, you must load and execute the program with debug mode turned on. The DEBUG control statement turns on debug mode, which in turn loads the CID supervisory module with the relocatable object program being debugged. When the program is executed, CID takes control and issues the following message:

CYBER INTERACTIVE DEBUG

CID then issues a question mark prompt to indicate that you can enter CID commands.

During a debug session, a program executes until conditions you have set (and some default conditions) suspend execution. While execution is suspended, you can observe and change the values of variables, data items, and memory locations associated with the programs. When you are done observing and changing values, you can resume execution or terminate the debug session. You can change the conditions that suspend execution any time during the session. The debug session ends when you enter the QUIT command.

CID Features

CID features include:

Breakpoints - You can set breakpoints that suspend program execution when specified places in the program are reached. Use the SET,BREAKPOINT command.

Traps - You can set traps that suspend program execution when specified conditions occur. Use the SET,TRAP command.

High-level language features - High-level language features are available only for BASIC, COBOL, and FORTRAN programs compiled for use with CID. You can enter language-dependent CID commands similar in syntax and action to statements contained in the source language. In other, language-independent, CID commands, you can specify locations in a high-level form, with variable names, line numbers, COBOL procedure names, and FORTRAN statement numbers.

Command sequences - Sequences of CID commands can be defined as groups, bodies, or line sequences. A group executes when so directed by a READ command. A body executes automatically when a particular trap or breakpoint occurs. A line sequence is a series of CID commands contained on one line.

Debug variables - CID provides debug variables to give you information such as the current field length, the number of the source line currently being executed, and the number of traps or breakpoints currently defined.

Suspend and resume features - When a debug session takes place, the entire session can be suspended to return control to the operating system's command mode. This feature is most useful when you attach or edit files during a session. When the debug session is suspended, breakpoint definitions, trap definitions, group definitions, debug variables, and current status of the debug session are placed on a local file.

Informative output - Informative output during a debug session includes listings of information such as the breakpoints, traps, or groups currently defined; the values of all program variables or data items; the current status of the debug session; and a load map containing the names of all program modules currently loaded.

For complete information on how to use CID, see the following CDC manuals: *Cyber Interactive Debug Version 1 Reference Manual* (publication number 60481400); *Cyber Interactive Debug Version 1 Guide for Users of FORTRAN Version 5* (60484100); *Cyber Interactive Debug Version 1 Guide for Users of FORTRAN Extended Version 4* (60482700). These manuals can be special ordered through the Computer Store; the first two may be examined in the UCC Reference Room, 235a Experimental Engineering.

Questions about CID should be directed to the UCC HELP-Line, 376-5592. (Tom Lanzatella)

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Director: Peter C. Patton
Editor: Christine Mack Gordon

Comments about the content of this newsletter, or suggestions for changes may be directed to the editor, 235a Experimental Engineering, or call 612/376-9832.

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SYSTEM NEWS/NOTES

Cyber Notes

SWITCHING FAMILIES

You can now switch permanent file families on the Cyber 730 without resorting to a long form of the USER command. Simply enter

```
FAMILY,familyname
```

where familyname is either C74 or C172. For an explanation of FAMILYS, their purpose and use, see WRITEUP (FAMILY).

CALLPRG AND NOTICE/NOTIFY CHANGES

We will be installing a new version of the UCC CALLPRG utility on our NOS systems at the end of spring quarter. This new version, which provides several new features, is similar to the MECC CALLPRG program. In addition, we will be changing NOTICE/NOTIFY to use CCL (Cyber Control Language) procedures for compatibility with the new CALLPRG. Further details will be forthcoming in the May UCC Newsletter. (A.B. Hastings, 376-5604)

Cray News

MINPACK ON THE CRAY

MINPACK, a library of nonlinear least-squares routines and nonlinear equation solvers developed at Argonne National Laboratory, has been tested and was installed on the Cray 1B. This library can be accessed using the following control statement:

```
LDR,LIB=MINPACK
```

A machine-retrievable writeup is available on the Cybers. To obtain an index of this writeup, execute the following control statement:

```
WRITEUP(MINPACK=INDEX)
```

MINPACK joins the IMSL and MINNLIB libraries on the Cray. For additional details about these conversions, see the February (IMSL) and March (MINNLIB) UCC Newsletters.

If you have any questions when using MINPACK, please call James Wang, 376-5262. (James Wang, 376-5262)

Graphics

DISSPLA MANUALS AVAILABLE

The *DISSPLA Manual*, version 9.0 and the *DISSPLA Pocket Guide*, which describe the DISSPLA collection of graphics subroutines, are now available at the Computer Store, 211 Experimental Engineering. The cost is \$39.60 for the manual, \$8.25 for the pocket guide.

PHONE NUMBER CHANGE

Phone inquiries related to graphics software (including the area of image processing) will now be handled through UCC's main HELP-line, 376-5592. We are making this change to provide a more immediate response to those of you with questions about graphics.

Engineering Services

QUME SPRINT PRINTER RECALL

Qume Sprint 5/45 printers may have a potentially hazardous wiring error that could cause fire or electrical shock. If you have one of these printers, disconnect it from the AC outlet and call Engineering Services for information on corrective action. (*Doug Parkes, 376-7067*)

Microcosm

TERAK ACCESS CARDS

Spring quarter Terak access cards for UCC's micro-computer labs are now available at the Computer Store. Cards are \$10 for students, \$30 for faculty and staff; they are good until June 14.

IMS Journal

DBMS DEFINED

In the past few weeks, we have received a number of calls that indicate a need to define the term "data base management system." A data base is any collection of data, usually assumed to be resident on a computer. Data base management systems are large computer programs designed to allow organizations to use and manage their data resources more effectively. DBMS packages are intended to:

- Provide an easy way for people without extensive computer experience to access information
- Enhance data integrity by providing error checking on data put into the DBMS
- Centralize data storage to reduce redundant storing of the same data for different programs
- Isolate applications from storage so that changes in storage do not force extensive reprogramming
- Provide security and control of access to the data
- Centralize the data management function and provide tools with which to manage data more effectively
- Provide backup and recovery facilities to deal with unforeseen disasters that occur from time to time

When data base management systems first appeared (they are not a recent development: IBM's IMS recently celebrated its twentieth birthday), exaggerated claims were made that all computing would eventually be done with or be associated with these systems. This has not happened, but DBMS technology has had a great impact on the way large data bases are organized and implemented. Not all applications are suitable for DBMS; if, however, you are spending too much money developing different programs to access data in data files or are having difficulty managing your applications, a DBMS might save you time and money. For more information, talk to our consultants on the IMS HELP-line.

DATA BASE DESIGN

This article is the first in a series that will examine the data base design process. The series is aimed at data base administrators, those who design, implement, and manage a data base for themselves or for a group of users.

The data base design process is an orderly sequence of activities that produces a data base design suited to a specific application or set of applications. A data base design is the administrator's conceptual view of the data base, specified by a schema and a data dictionary. A conceptual view describes the way you perceive the data, not necessarily the way it is stored in the computer. You may think of a schema as a frame that imposes structure on data elements (variables) within the data base. Data dictionaries are lists of data descriptions that contain all the characteristics and usages of each element in the data base. Given these definitions, we will try to give you some practical tips on how to approach the design process.

From the current literature, you might get the impression that success in data base design requires experience, skill, luck, confusing rules of thumb, artistic talent, and possibly a pact with a supernatural agency. We have found that it requires only a systematic approach coupled with some common sense. When you plan to use a DBMS to accomplish a task, a number of complex issues must be addressed. In an attempt to establish some order among these diverse issues, we will categorize them as follows:

- Issues inherent in the application(s)
- Issues inherent in the data
- Issues concerning particular data base management systems

Next month we will discuss issues related to application(s).

SYSTEM 2000: NUMBERING COMPONENTS

The only explicit restriction related to the component numbers of a System 2000 definition is that the numbers must be integers from 1 to 4095 inclusive. You can attain the highest level of efficiency, however, when the components in the definition begin with 1 and increment by 1; this includes strings and functions. System 2000 can then use the component number as a pointer to the location in which the definition is stored. It looks for this "start at 1, increase by 1" condition in the definition and, if it is found, sets a flag that permits the pointer use, eliminating the need for a definition search.

SIR: PRESORTING DATA FILES

To save money, data entered into your SIR data base should be sorted before you enter the SIR package. The recommended sort order can be either of the following, whichever is more convenient for your data organization.

1st CASE ID	1st RECORD TYPE
2nd RECORD TYPE	2nd CASE ID
3rd other sort variables	3rd other sort variables

SORT/MERGE is an easy to use and efficient sort package. A sample submit job to sort data file *SIRDATA* follows. *SIRDATA* has the following structure:

column(s)	width	contents
1-4	4	StudID SIR CASE ID
5	1	Recno SIR RECTYPE NUMBER
6-25	20	Lastnm SIR SORT ID
26-80	55	Data Other data

In order to produce sorted file *SIRSORT* in the order Studno-Recno-Lastnm you would submit the following job:

```

SIRSRT(T50)
USER(account,password)
ACQUIRE(SIRDATA)
PURGE(SIRSORT/NA)
DEFINE(SIRSORT)
FILE(SIRDATA,BT=C,RT=Z,FL=80)
FILE(SIRSORT,BT=C,RT=Z,FL=80)
SORTMRG.
-end-of-record
SORT
FILE,INPUT=SIRDATA,OUTPUT=SIRSORT
FIELD,STUDID(1,4,DISPLAY),RECNO(5,1,
DISPLAY),LASTNM(6,20,DISPLAY)
KEY,STUDID(A,COBOL6),RECNO(A,COBOL6),
LASTNM(A,COBOL6)
END

```

For more information, see the *SORT/MERGE User Guide* and the *SORT/MERGE Reference Manual*, available at the Computer Store.

CYBER COBOL

As we noted in the October 1981 *Newsletter*, we will remove COBOL 4 from the system in September, 1983. It is not too soon to start converting your application programs to COBOL 5. The *COBOL 4 to COBOL 5 Conversion Aids Manual* (CDC publication 19265021) is available from our Computer Store.

— (*Information Management Systems Group*)

VAX Service

GETTING MOREHELP ON VMS

We have installed a new command on the Shepherd Labs VAX/VMS system: MOREHELP. If you can't find the on-line information you need with HELP, try typing MOREHELP.

While HELP supplies on-line assistance for VMS commands, MOREHELP leads you to information on UCC VAX/VMS services such as on-line writeups, classes, consulting hours, special output devices, and additional software.

The syntax of the MOREHELP command is identical to that of the HELP command, that is:

morehelp	Tells you what main topics morehelp has information on
morehelp writeups	Explains how to retrieve on-line writeups
morehelp classes...	Lists all information on UCC short courses

MOREHELP can be abbreviated MOR.

We will continue to add new topics to MOREHELP. If HELP doesn't tell you what you want to know, ask for MOREHELP.

All Systems Bulletins

PROPOSED 1982-83 RATES

As a result of inflation, University-wide cutbacks, and a loss of income due to fewer federal research grants, we have proposed the following rate changes for the 1982-83 fiscal year.

Increases	1981-82	1982-83
Paper/page	\$.03	\$.033
Card/output	.008	.011
Varian plotter setup	.50	.55
Tape mount unlabeled	.40	.44
Tape mount labeled	.60	.66
Tape mount transient	1.00	1.10
Disk pack mount	2.00	2.20
VAX/CPM internal	1.20	2.00
VAX/CPM external	1.80	3.00

Most labor dependent rates will increase 5-15%.

Decreases	1981-82	1982-83
MERITSS 300 baud port/year	\$3000.00	\$2400.00
Disk storage	30/600K	15/720K

A \$750 grant for graduate thesis work will still be available, but may only apply to SRU, SBU, and CPM usage. A small fee will be charged for most short courses.

FOR SALE

Two Varian Statos 31 electrostatic plotters, one with PDP-11 interface, the other with an off-line magnetic tape system; two Control Data 405 card readers. Contact Doug Parkes, UCC Engineering Services, 376-7067.

UCC SHORT COURSE SCHEDULE

Introductory Sequence

*INTRODUCTION TO COMPUTERS	Mar 30-Apr 1 (TWTh)	3:15-5 p.m.	AkerH 21
*INTRODUCTION TO UCC	Apr 7 (W)	3:15-5 p.m.	Arch 10
*NOS SYSTEM CONFIGURATION	Apr 13 (T)	3:15-5 p.m.	AkerH 309
NOS FILES/JOBS	Apr 14-15 (WTh)	3:15-5 p.m.	AkerH 309
NOS PERMANENT FILES	Apr 16 (F)	3:15-5 p.m.	AkerH 309
NOS PROGRAM EXECUTION	Apr 19 (M)	3:15-5 p.m.	AkerH 309
*INTERACTIVE SYSTEM COMMANDS	Apr 20-22 (TWTh)	3:15-5 p.m.	AkerH 321
*TEXT PROCESSING: AN OVERVIEW	Apr 19 (M)	3:15-4 p.m.	Arch 60
*XEDIT	May 3-5 (MW)	3:15-5 p.m.	Mech E 102

Cray

*INTRODUCTION TO THE CRAY 1B	Apr 22 (Th)	3:15-5 p.m.	AkerH 319
*COS (CRAY OPERATING SYSTEM)	Apr 26-30 (MWF)	3:15-5 p.m.	Arch 30
CRAY FORTRAN FEATURES	May 4-13 (TTh)	3:15-5 p.m.	Arch 35

Data Base Management Systems

*INTRODUCTION TO DBMS	Apr 28 (W)	3:15-5 p.m.	Arch 15
SIR	May 4-20 (TTh)	3:15-5 p.m.	Arch 40
INTRODUCTION TO SYSTEM 2000	May 3-19 (MWF)	3:15-5 p.m.	Arch 45
INTRODUCTION TO RIM	May 24-26 (MW)	3:15-5 p.m.	Arch 45
SYSTEM 2000 REPORT WRITER	May 24 (M)	3:15-5 p.m.	Arch 60

Graphics

GRAPHICS I—OVERVIEW	Apr 13 (T)	3:15-5 p.m.	Arch 30
GRAPHICS II—TELL-A-GRAF	Apr 14-15 (WTh)	3:15-5 p.m.	Shep Lab 113
GRAPHICS III—WORKSHOP	Apr 20-22 (TWTh)	3:15-5 p.m.	AkerH 21

Microcomputing

MICROCOMPUTING	Apr 14-May 12 (W)	3:15-5 p.m.	Arch 60
TEXT PROCESSING ON MICROS	May 25-Jun 2 (TW)	3:15-5 p.m.	Mech E 102

Operating Systems

*NOS SYSTEM CONFIGURATION	Apr 13 (T)	3:15-5 p.m.	AkerH 309
NOS FILES/JOBS	Apr 14-15 (WTh)	3:15-5 p.m.	AkerH 309
NOS PERMANENT FILES	Apr 16 (F)	3:15-5 p.m.	AkerH 309
NOS PROGRAM EXECUTION	Apr 19 (M)	3:15-5 p.m.	AkerH 309
NOS INTRODUCTION TO TAPES	Apr 23 (F)	3:15-5 p.m.	AkerH 309
NOS MISCELLANEOUS STATEMENTS	Apr 26 (M)	3:15-5 p.m.	AkerH 309
NOS CONTROL LANGUAGE	Apr 27 (T)	3:15-5 p.m.	AkerH 309

*INTERACTIVE SYSTEM COMMANDS	Apr 20-22 (TWTh)	3:15-5 p.m.	AkerH 321
*COS (CRAY OPERATING SYSTEM)	Apr 26-30 (MWF)	3:15-5 p.m.	Arch 30
INTRODUCTION TO VAX/VMS	May 3-7 (M-F)	3:15-5 p.m.	AkerH 321

Programming

INTRODUCTION TO PROGRAMMING	May 17-28 (MWF)	3:15-5 p.m.	Arch 30
PASCAL FOR PROGRAMMERS	May 17-28 (MWF)	3:15-5 p.m.	AkerH 321

Programming Languages

BEGINNING FORTRAN	Apr 27-May 6 (TTh)	3:15-5 p.m.	AkerH 319
ADVANCED FORTRAN	May 10-14 (MWF)	3:15-5 p.m.	Arch 30
PASCAL FOR PROGRAMMERS	May 17-28 (MWF)	3:15-5 p.m.	AkerH 321
SNOBOL	Apr 6-15 (TTh)	3:15-5 p.m.	Arch 40

Statistical Packages

SCSS	Apr 5-7 (MW)	3:30-5 p.m.	Arch 15
SPSS	Apr 19-23 (MTWF)	3:15-4:30 p.m.	Arch 30

Text Processing

*TEXT PROCESSING: AN OVERVIEW	Apr 19 (M)	3:15-4 p.m.	Arch 60
TEXT EDITING	Apr 21 (W)	3:15-4 p.m.	Mech E 102
TEXT FORMATTING	Apr 23 (F)	3:15-4 p.m.	Arch 60
OUTPUT DEVICES	Apr 26 (M)	3:15-4 p.m.	Arch 60
*XEDIT	May 3-5 (MW)	3:15-5 p.m.	Mech E 102
TEXT EDITING ON THE VAX/VMS (EDT)	May 10-19 (MW)	3:15-5 p.m.	Mech E 102
PROSE	May 11-13 (TTh)	3:15-5 p.m.	AkerH 321
SCRIBE	May 18-27 (TTh)	3:15-4 p.m.	Arch 35
TEXT PROCESSING ON MICROS	May 25-Jun 2 (TW)	3:15-5 p.m.	Mech E 102
VAX			
INTRODUCTION TO THE VAX/VMS	May 3-7 (M-F)	3:15-5 p.m.	Aker H 321
GRAPHICS II—TELL-A-GRAF	Apr 14-15 (WTh)	3:15-5 p.m.	Shep Lab 113
TEXT EDITING ON THE VAX/VMS (EDT)	May 10-19 (MW)	3:15-5 p.m.	Mech E 102
SCRIBE	May 18-27 (TTh)	3:15-4 p.m.	Arch 35

Courses are free; no registration is necessary; no credit is given.

*Indicates this course is a prerequisite introductory course for other, unmarked courses.

Courses with the same name (e.g. NOS) are designed as a sequence, and should be taken in order.

HOLIDAY: May 31 is a University holiday; no classes will be held.

For more information concerning UCC Short Courses, see WRITEUP(CLASSES) on one of UCC's Cyber systems, or call Jerry Stearns at 373-4360.

SPRING QUARTER EXTENSION CLASSES

The following classes are offered through University of Minnesota Continuing Education and Extension (CEE). You may obtain more information and registration materials by calling (612) 373-3195 or stopping by 101 Wesbrook Hall, Minneapolis campus.

COMPUTING:	Mar 30-		
WHAT IS IT?	Apr 15 (TTh)	6:15-8 p.m.	Phys 131
PASCAL FOR	Apr 19-		
PROGRAMMERS	May 12 (MW)	6:15-8 p.m.	Arch 15
PERSONAL COMPUTERS: A PERSPECTIVE ON MICROCOMPUTING	May 4, 6 (MW)	6:15-8 p.m.	Ford 120
UCSD AND CP/M SYSTEMS ON MICROS	May 18, 20		
	(MW)	6:15-8 p.m.	Ford 120
PROGRAMMING TECHNIQUES ON MICROS: WRITING YOUR OWN MICROCOMPUTER PROGRAMS	Jun 1, 3 (TTh)	6:15-8 p.m.	Ford 120

ST. PAUL COMPUTER CENTER SHORT COURSES

The St. Paul Computer Center will offer two short courses this quarter. One course covers the statistical analysis system, SAS, a comprehensive statistical package available on SPCC's IBM 4341. The other covers MUSIC, an interactive system. The MUSIC operating system allows you to edit and save files, submit batch jobs, or run jobs interactively. For those who would like to access SAS remotely via an interactive terminal, MUSIC allows you to submit jobs to SAS and get the output back on a disk file. The course schedule is as follows (for the Minneapolis campus):

SAS	Apr 12-16	3:15-5 p.m.	Arch 10
	(MWF)		
MUSIC	Apr 19-23	3:15-5 p.m.	Arch 10
	(MWF)		

If you would like to be added to SPCC's mailing list, please call our main office, 373-0987. SPCC hours are 7 a.m.-10 p.m. Monday through Friday, and 8 a.m.-4:30 p.m. Saturday. The user room is located in 90 Coffey Hall; the HELP-line phone number is 376-4602 (10 a.m.-4 p.m.). (Ron Schultz, 376-2828)

PHONE NUMBERS

Budgets	373-2521	HOURS-line (recorded message)	373-4927
Computer-Aided Instruction	376-2975	Image Processing	376-2895
Computer Hours (recorded message)	373-4927	Information, Experimental Engineering	373-4360
Computer Store	373-4877	Information, Lauderdale	373-4912
Consulting		Information Systems	376-1764
HELP-line	376-5592	Instructional Labs	376-3963
9 a.m.-5 p.m., Monday-Friday		Job Status, ExpEng (recorded message)	373-4994
Business Data Products	376-1761	Lauderdale Computer Room	373-4940
1-3 p.m., Monday-Friday		Lauderdale Operations Manager	373-4920
Statistics Packages	376-5062	Lauderdale Services	373-4995
1-2 p.m., Monday-Friday		Lauderdale Services Manager	373-7538
Data Bases	376-1761	Lauderdale Users' Room	373-4921
1-3 p.m., Monday-Friday		MECC Liaison	373-4573
Microcomputers	376-4276	Newsletter Subscription	376-4668
10-12 a.m. and 2-4 p.m., Monday-Friday		Permanent File Restoration	376-5605
Humanities	373-5780	Professional Services Division (PSD)	376-1764
10:30-11:30 a.m., Monday, Wednesday, Friday		Project Assistance	376-1764
UNIX	376-8649	Program Librarian	376-1636
1-2 p.m., Monday, Wednesday, Friday		Programming Languages	376-7290
Contract Programming	376-1764	Reference Room	373-7744
Data Base Applications	376-1764	Remote Batch (RJE) Services	376-3963
Educational Services	376-3963	Short Courses	373-4360
EDUNET Liaison	373-7745	Shuttle Bus Service	376-3068
Engineering Services	376-8153, 376-1023	System Status (recorded message)	373-4927
Engineering Services—Service Contracts	376-8153	Tape Librarian: see Lauderdale Services	
Equipment Purchase	376-8153	Text Processing Services	376-2943
Experimental Engineering I/O	373-4596	User Accounts	373-4548
Graphics Software	376-5592	User Services	376-3963
HELP-line	376-5592		
9 a.m.-5 p.m., Monday-Friday			

OPERATING HOURS

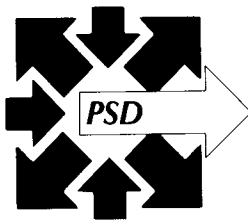
	Cyber 74/730	Cray	MERITSS (Cyber 172)	VAX
M-F	8 a.m. - 4 a.m.	8 a.m. - midnight	7:45 a.m. - 1:30 a.m.	8 a.m. - 6 a.m.
Sat	4 a.m. - 5:15 p.m.	8 a.m. - 5 p.m.	7:45 a.m. - 1:30 a.m.	24 hours
Sun	4 p.m. - 1 a.m.	4 p.m. - midnight	4 p.m. - midnight	24 hours

PUBLIC LABS—TWIN CITIES CAMPUS

Location	Batch	Interactive	Micro	Location	Batch	Interactive	Micro
<i>East Bank</i>				<i>West Bank</i>			
Arch 160		X	X	BlegH 140			X
CentH		X		MdbH			X
ComH		X		OMWL 2	X		X
DiehH 270		X		SocSci 167, 1009	X		X
ElecE 38	X			<i>St. Paul</i>			
Elth 121, 125		X		BaH			X
Elth N640	X			BioSci 257	X		
ExpE 130	X			ClaOff 125	X		X
FolH 304a		X	X	McN	X		
FrontH		X		NorH 24	X		
KoltH S191	X			<i>Lauderdale</i>			
LindH		X		Users Room	X		
MasCan 39	X						
Mayo D388	X						
MechE 308		X					
MinMet 325	X						
Physics 69	X						
SanfH		X					
TerrH	X	X					
Vinch 4		X					
WaLib 204		X					
Zoology	X						

P ROFESSIONAL S ERVICES D IVISION

statistical analysis: full range of services available
system analysis and design: analysis of existing systems; design of new systems
financial analysis: forecasting, accounting
data base development: design and implementation using state-of-the-art technology
tape conversion: conversion of off-site tapes to UCC internal format
customized programming: COBOL, FORTRAN, Pascal for virtually any application
research applications: scientific or social research environments



If you qualify for a University Computer Center account, and are interested in our services, please contact us.

376-1764 • 227 Experimental Engineering • 208 Union St. S.E.

University Computer Center Newsletter

User Services
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