Proposal for microcomputer use at the University of Hawaii at Manoa Libraries

Prepared by Ruth Marie Quirk

for LS 675
Microcomputers in Libraries
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SUMMARY

The University of Hawaii at Manoa (UHM) Libraries have been automating both public and technical services for approximately 10 years. End user hardware for automation activities has been limited to (1) dot matrix printers, (2) special use terminals for accessing a specific bibliographic utility (OCLC) and (3) general use dumb terminals for accessing the University of Hawaii Computing Center (UHCC), online literature searching and the in-house automated library system. Microcomputers have not yet been provided for use by the library staff and/or patrons.

This report was developed to expand upon the ideas expressed in "1985-1995 A Strategy for Academic Quality" prepared by the Strategic Plan Steering Committee for the University of Hawaii. The next ten years will bring rapid growth in communications and information technologies therefore it is crucial that the library staff, which serves the university community be as technology-literate as possible. Although a large percentage of the library staff currently use terminals or computers, their use is limited to 'special purpose' shared-systems many are still not computer literate. The introduction of microcomputers for staff use should aid in quickly closing this literacy gap.

This proposal includes (I) a rationale and general specifications for the introduction of microcomputers to the library to replace terminals; (II) a list of existing and new activities which could be performed by library staff using microcomputers; (III) general hardware and communications requirements; (IV) specifications for use of microcomputer controlled word processors to increase library staff's "word production"; (V) Appendices which include (A) examples of microcomputer applications in libraries; (B) an ergonomics report by a subcommittee of the UHM Steering Committee for the Library Automation Program; (C) a preliminary list of components for a micro network using Macintosh hardware and software (no costs are included since the UHM discount will not be announced until May 1985); (D) a commercially prepared description of the Honeywell microSystem PC (compatible with the Ultimate computer used by the UHM library) with IBM PC compatible hardware, bundled software and peripherals and the UHCC price list for IBM microcomputer purchase with a UHM discount.
I. Rationale for the introduction of microcomputers in the library to replace terminals:

The UHM library is currently in the process of automating the major tasks performed by the library staff. This includes ordering, receipt and purchasing, cataloging and circulating library materials. It is fundamental that the library staff become computer literate as part of this process. Much attention has been directed toward the automation of routine library activities yet little attention has been paid to what word processing alone could do for both the professional and paraprofessional staff. Recent expansion of the Library Systems Office staff means the necessary technical support to guide and implement installation of microcomputers is available and will not jeopardize the on-going installation of the integrated automated library system. Specific factors which encourage and support introduction of microcomputers include:

1. The UHM library budget for the 1985-87 biennium requests $80,000 to purchase 42 smart terminals, $10,000 for an IBM PC-controlled laser disk reader and $3,200 for microcomputers with enlarged displays for the visually impaired.

2. The cost of microcomputers has dropped drastically in the last five years. This reduction in costs has made it more feasible to consider the use of microcomputers in place of smart terminals. For example, the only terminal currently available which can display the full American Library Association (ALA) character set (TELEX) costs approximately $3,500 each and can only function as a dedicated synchronous terminal. The Research Library Information Network (RLIN) terminal which supports a Chinese, Japanese and Korean character display costs approximately $10,000 each and can only be used as dedicated special purpose terminals.

For approximately the same investment the library can have work stations which meet immediate needs for record display but which may also be used in other productive activities by staff. Appendix C provides a preliminary list of Macintosh hardware and software and an office layout design that would allow microcomputers to be utilized in place of special single purpose terminals and for other activities as well.
3. The additional effort required to develop custom software for the microcomputers can be offset by the additional productivity due to staff utilization of the microcomputers when the microcomputers are not in use for displaying the ALA character set or accessing laser disk stored records.

During scheduled off times, staff uses could include word processing (see section IV for a full justification of this application), generation of statistical reports, project planning, organization of small bibliographic databases (i.e. new acquisitions, special pamphlet files, etc.). Availability of microcomputers would provide an opportunity to lighten the clerical load associated with routine tasks, increase productivity and free up time for implementation of many innovative projects and new services.

4. Microcomputers allow greater flexibility when used as terminals. Tasks which tie the microcomputers directly into the ADLIB system may be handled in one of three ways: (1) strictly as an exchange between two "alien" computers (a local editing microcomputer and the main integrated database management system) or (2) the microcomputer may be used strictly as a terminal, unless (3) the microcomputer supports the PICK operating system and the same software is run on both computers.
II List of possible uses of microcomputers in UHM libraries

A. Current Activities which can be enhanced:

1. Online literature searching. Available software will allow for off-line input of search strategies and the automatic transmission via a telephone during off hours to reduce online costs. Microcomputer software could also improve searching by allowing for the storage of past search strategies and related information (e.g. the rate of successful retrieval within various data files). Online searches result in customized bibliographies which may be stored, updated using a microcomputer and distributed to other patrons with similar information needs.

2. Conventional text processing, production of memos, procedures and other written materials, preparation of library maps and library use instructional materials, current acquisition lists could be replaced with word processing.

3. Computer program development for uploading onto the UHCC computers and for in-house documentation of those programs.

4. Project planning, time-lines and other administrative and management organizational tasks.

5. Scheduling of personnel to cover public service areas.

6. Use of spreadsheet programs to prepare statistical reports and to calculate and predict expenditure of funds. (See Appendix A for an example of the use of microcomputers to track student help funds).

7. The control of sensitive information (see Appendix A for an example of use of PFS to control library staff identifiers and menu assignments for the in-house system).

8. Library skills instruction.
B. Additional Activities which could be performed:

1. Chinese, Japanese, Korean and other vernacular languages catalog card production, correspondence and other word processing type tasks.

2. Online display of vernacular language cataloging requiring graphics oriented character sets (such as Chinese, Japanese and Korean).

3. Creation and editing of cataloging records employing the full ALA character set.

   ALA expanded character set-to-microcomputer translation table(s) would have to be developed to allow for the display of constructed characters (characters which are built from other characters). There is commercially available software which supports a one-to-one translation for all ALA defined characters. UHM would have to develop software which combines the full character sets into an appropriate display for public viewing.

A design for accessing, displaying, inputting, and creating the Chinese, Japanese and Korean characters using microcomputer capabilities must be completed in order to determine what modifications to standard microcomputers are necessary to accommodate these vernacular language activities (e.g. RAM disk or PROM storage of character set, expanded CPU to facilitate the extensive screen use and interface, hard disk storage for the creation and storage of new characters as needed, special communications hardware to speed up data flow, etc.).

4. Control and monitoring of communications equipment.

5. Computer-aided instruction for training student assistants, new library staff members and to enhance current staff skills (e.g. typing tutors, computer literacy).


7. Word processing and bibliographic software to replace typewriters available to students and faculty for preparation of classroom materials and for use by library staff and other faculty members for preparation of customized bibliographies using information downloaded from the UHM library database and other online databases.
8. Online storage of graphic representations of rare materials and non-book materials such as artifacts, art prints, etc. This application would require hardware and software which can be used to make a digitized image of the item which could then be stored and retrieved as a graphic. The system must be small and portable, able to make image of three dimensional objects, and should be easy and fast to learn and use. The graphic images should be stored using a format that is already supported by the system (e.g. Koala MacVision stores the digitized image as a MacPaint document).

9. Database display of enlarged characters for the visually impaired.

10. Microcomputers could serve as smart front-end processors to minimize CPU time required while performing online cataloging on the UHM library automated system.
III. General Hardware Requirements:

1. The microcomputers must interface with the Ultimate computer system and it is highly desirable that they interface with the UHCC's IBM 3081 and DEC 2060. (NOTE: UHCC has already written software for IBM PC's to link to these computers and they are currently in the process of writing this software for the Macintosh.)

2. The display screen must minimize health hazards and maximize comfortable use (e.g. have high resolution black lettering on white non-glare screens). (See the report by the SCLAP ergonomics subcommittee in Appendix B).

3. Laser and dot matrix graphics printers must be compatible with the microcomputer and allow for the printing of any character or image that can be displayed on the screen. The printers should be able to utilize both tractor and friction feed for paper.

4. The microcomputers must have Local Area Network (LAN) capabilities. They should be able to interconnect and share common peripherals such as Optical Character Recognition devices (OCR), laser printer and modems. LAN system requirements include the need for an intelligent file server with a 20-megabyte hard-disk system for electronic mail facilities and print spooling. (Apple talk and IBM PC LAN have these capabilities.)

5. There must be the capability for synchronous and asynchronous data communications at a minimum of 56k bits per second (bps).

6. The capability to support 32 network nodes must exist for attachment of workstations, output (printers) and input (OCR) devices at a distance of approximately 200-300 meters between nodes (distributable). The microcomputers must be flexible enough to allow for easy relocation of workstations and devices.

7. Software must be available which supports integrated word processing, spreadsheet generation, graphics, relational database creation, and communications and be easy to use and learn. The software should include the ability to have multiple documents open at once and to
Proposal for microcomputer use

cut and paste between them; to update multiple files without opening them all individually; to suppress sensitive information through the use of varying display formats; to produce graphics such as charts and graphs and telephone communications with or without modems.

A. General requirements for communications:

The microcomputers must be:

1. Resistant to radio frequency interference (RFI) or static discharge;

2. provide 16 to 32 network nodes without requiring special network configuration;

3. be capable of a 64–192 kilobits per second (bps) data transfer rate using CCITT (Comité Consultatif International Téléphonique et Télégraphique) standards;

4. allow 150–300 meters maximum distance between nodes;

5. be compatible with the International Standards Organization (ISO) Open Systems Interconnections (OSI) model. Protocol must be equivalent to the ISO OSI layers 1 through 5 (physical, data link, network, transport and session);

6. operate using an access scheme based on a carrier sense multiple access with collision avoidance (CSMA/CA) model.
IV. Specifications for word processors to improve utilization of UHM library staff time

Introduction

The library staff consists of 160 full time employees, including professionals, paraprofessionals, and APTs in clerical, technical, and administration positions as well as many part-time student employees. In addition to performing tasks which will be automated upon implementation of the ADLIB integrated library software system staff members are also involved in the production of training and instructional materials, library guides, memos and letters, procedural documentation, articles for journals and monographs, and research manuscripts.

The major "product" of any university is knowledge, and knowledge is most frequently transmitted in the form of "words". A university library facilitates access to knowledge which in essence improves the quality of the "product" of the university. The processing of words in the library is steadily increasing, but is inhibited by a lack of personnel to support the various administrative, research, and other writing tasks such as those outlined above. This steady increase in writing tasks means it is more difficult to maintain the same levels of library service without additional clerical and administrative support but it does not appear that more clerical and administrative support will be available in the near future.

The existing clerical and support staff attempt to handle the major writing tasks which serve instructional and administrative needs but cannot adequately meet the needs of individual library professionals, researchers and the unique needs of the specialized library collections. This results in a backlog of word processing tasks and forces individuals to seek alternatives such as paying private typists or using text composition programs at UHCC.

The diverse nature of the UHM library collection adds additional complications to automating the processing of words. The library not only provides access to materials which are romanized using an expanded ALA defined character set it also supports vernacular catalogs in graphics oriented character sets such as Chinese, Japanese and Korean.
A. Advantages of microcomputer-controlled word processing:

Word processing software relieves staff of the burden of constantly retyping text, simplifying the performance of edits and eliminating the common problem of introducing new errors to the text with each retyping.

Word processing greatly increases the ability to manipulate and print text to specification. Text can be copied, moved, searched, replaced or deleted; documents may be merged to create customized form letters and mailing labels, and perform other functions which would require substantially more typing in a manual system.

Word processing allows individuals control over their own documents without requiring the supervision of a central system manager. Each user's work is secure and there is minimal opportunity for an inexperienced user to cause any system-wide problems. Word processing requires a minimum use of paper by providing electronic display and modification capabilities.

Word processing programs are simple to use and do not require great familiarity with computers. They can provide a minimally stressful initiation to computer use and may serve to reduce the training time required for other uses of computerized systems.

B. Specifications:

The word processor must (1) telecommunicate, (2) interface with optical character scanners, and (3) photocomposition devices, in order to reduce the amount of time spent inputting and outputting documents which originate and terminate with another system. The word processor must also support multiple character sets for production of written material in non-Roman languages.

1. Telecommunication provides the ability to receive, write and store computer programs, user documentation, and library data as if it were a text document. When the user is ready, the "text" can then be telecommunicated to the main computer for processing, optimizing time on the main computer.
2. An interface with optical character scanners enables the system to "read" standard type-written pages and greatly decreases the time spent in basic entry of text.

3. An interface with photocomposition devices allows preparation of professional quality typesetting without requiring that the text be retyped into a typesetter. This eliminates the proofing of the newly input text and reduces the overall production time of photo-ready copy.


"IBM Talks to MACINTOSH", in *The MACazine*, December 1984, pp. 7-10.


"Which is the Fairest Display of Them All?", in Infosystems, March 1985, Vol. 32, No. 3, pp. 84-84.

Using a Spreadsheet to Monitor Student Help Expenditures

The attached format was designed using VISICALC to allow a library technician to easily calculate and keep track of student fund expenditures and to predict over or under expenditures in the long run as the time period covered by each allocation, progresses. The attached example is for the fourth quarter—which is fifteen weeks long—began on March 11th and will end on June 25th.

The fund allocation table set up for each quarter is organized as follows:

1) name - student names
2) reg. pay - applicable regular hourly wage
3) t. hr. wk - total number of hours each student works per week
4) n. hr - total number of hours worked after 6 pm this is because those hours are paid a $0.15 differential they are calculated separately.
5) wk. pay - (reg. pay x (t. hr. wk - pm. hr)) + ((reg. pay + $0.15) x pm. hr)
6) estimated quarterly pay = wk. pay x number of weeks in that quarter

The next columns are updated during the quarter to reflect the exceptions to the expected quarterly pay. If there is a holiday or a special rush project to be completed, or if a student is sick, the student may work more or less hours than is expected.

7) r. hr. ex. - monitors exceptions to the expected number of regular working hours
8) n. hr. ex. - monitors exceptions to the hours worked after 6 pm
9) holiday - If a student is called on a state or federal holiday to work on a rush project or because of an emergency, he/she receives a time and a half wage increase.
10) actual$ - e. q. pay + (r. hr. ex x reg. pay) + ((n. hr. ex x (reg. pay + $0.15)) + (holiday x (reg. pay x 1.5)))

The totals provide us with an overview of activities for the office which assist in planning.

The information, encased in the box, shows a prediction of expenditures versus allocations. Over spending is apparent early on in the semester. However, student absentees due to school work and illness
tend to be extensive as the semester progresses. In anticipation of this, students' work schedules are heavier early in the semester and will be modified later if necessary.

Work study students are given an individual allocation for a particular time period which is different then the time period used for students paid on general funds, therefore they must be monitored separately. This is illustrated by the separate calculations for Val and Jay which are listed below the regular student assistants.
Problem:

The library administration needs to maintain security sensitive information for all users of the in-house automated system. Password and identifier information must never be available to unauthorized users, so it is crucial that this information not be maintained on the main in-house computer system. The record keeping related to the assignment of new menus designed by the Library Systems Office and the administration should also be maintained on a stand alone system which would allow for the production of lists to enable the department heads to properly monitor the activities of their staff. Currently this information is all maintained in paper files which are difficult and cumbersome to use and almost impossible to protect.

Proposal:

In order to appropriately protect this information and still provide the ability to produce reports for the library management a microcomputer based record keeping system should be developed. The system should be easy to use and allow for the production of lists and reports which are made up of part or all of the information required for identifier and menu assignment.

Description of record content and reporting possibilities using PFS:

(Note: PFS is an example of forms management software which available for most microcomputers, similar software could be used with equivalent or superior results.)

The data needed is collected from the user on the form attached, it is reviewed by the administration and then would be input into a files management file.

The information which is currently needed for identifier creation and maintenance include: name, department (to allow for easy departmental review), job title, creation date (to allow for retrieval of menus created before or after a particular software revision), deletion date (to allow for deactivation when staff member changes positions or leaves the library), password, identifier, menu assigned, and access level. An automated record (see Example A attached) which includes this information can be then be retrieved and sorted by any element in the record. The reports produced can exclude any of the information in the records which is inappropriate for the audience of that list. In this way the department heads and administration should be able to easily monitor system access.
For examples see the possible report types described below and the various lists attached.

Description of possible report types:

1. Complete information for each user. This report would only be used for Identifier maintenance/creation/deletion. (Example B attached).

2. General list of everyone (alphabetically by user) with sensitive information suppressed. (Example C attached).

3. List by departments (arranged alphabetically by user name) with sensitive information suppressed.

4. List selected by menu to allow for situations when user must be notified about menu changes and to facilitate updating their records.

5. List selected by deletion date less than today to aid in keeping the file of authorized users current so appropriate actions may be taken on ADLIB.

6. List selected by menus input before a particular creation date. Often times software modifications require all ID’s created after a creation date to be updated.
### GENERAL STUDENT FUNDS 3/11-6/25/85

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**TOTALS** 20.00 116 17 430.15 6452.25 -236.75 -12.50 16.00 5656.83

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**B1 FUND ALLOCATION FOR FOURTH QUARTER 1985**

Balanced: 466.175

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### WORK STUDY STUDENT FUNDS 3/11-5/31/85

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**JAY'S ALLOCATION FOR SPRING 1985**

Balanced: 18.30

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**VAL'S ALLOCATION FOR SPRING 1985**

Balanced: -33.20
NAME (LAST, FIRST M.I.):
DEPARTMENT:
JOB TITLE:
ID (7 CHARACTERS MUST BE ALPHA NUMERIC COMBINATION):
PASSWORD (UNLIMITED MAY BE ALPHA OR NUMERIC OR BOTH):
CREATION DATE (YY/MM/DD):
DELETION DATE (YY/MM/DD OR 99 IF PERMANENT):

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING:
ACQUISITIONS STAFF: ACQUISITIONS TRAINING:
CIRCULATION SUPERVISOR: CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING:
STAFF ONLINE CATALOG: PUBLIC ONLINE CATALOG: ONLINE CATALOG TRAINING:
SINCLAIR LIBRARIAN ONLINE CATALOG:
NAME (LAST, FIRST M.I.): CHANTINNY, MARTHA  DEPARTMENT: CATALOGING
JOB TITLE: CATALOGER

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1=VIEW ONLY 2=VIEW AND ADD 3=VIEW, ADD, UPDATE 4=VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING:
ACQUISITIONS STAFF: ACQUISITIONS TRAINING:
CIRCULATION SUPERVISOR: CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING:
STAFF ONLINE CATALOG: PUBLIC ONLINE CATALOG: ONLINE CATALOG TRAINING: 3
SINCLAIR LIBRARIAN ONLINE CATALOG:

NAME (LAST, FIRST M.I.): LUNDEEN, GERRY  DEPARTMENT: GSLS
JOB TITLE: INSTRUCTOR LS 670

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
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ACQUISITIONS STAFF: ACQUISITIONS TRAINING: 2
CIRCULATION SUPERVISOR: CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING: 2
STAFF ONLINE CATALOG: PUBLIC ONLINE CATALOG: ONLINE CATALOG TRAINING: 2
SINCLAIR LIBRARIAN ONLINE CATALOG: 1

NAME (LAST, FIRST M.I.): MACMILLAN, GARY  DEPARTMENT: ADMINISTRATION
JOB TITLE: ASSOCIATE UNIVERSITY LIBRARIAN

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1=VIEW ONLY 2=VIEW AND ADD 3=VIEW, ADD, UPDATE 4=VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: 4 CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING: 4
ACQUISITIONS STAFF: 4 ACQUISITIONS TRAINING: 4
CIRCULATION SUPERVISOR: 4 CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING: 4
STAFF ONLINE CATALOG: 4 PUBLIC ONLINE CATALOG: ONLINE CATALOG TRAINING: 4
SINCLAIR LIBRARIAN ONLINE CATALOG: 4

NAME (LAST, FIRST M.I.): MORRIS, JANET  DEPARTMENT: GOVERNMENT DOCUMENTS
JOB TITLE: LIBRARIAN

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1=VIEW ONLY 2=VIEW AND ADD 3=VIEW, ADD, UPDATE 4=VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING:
ACQUISITIONS STAFF: ACQUISITIONS TRAINING:
CIRCULATION SUPERVISOR: CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING:
STAFF ONLINE CATALOG: 3 PUBLIC ONLINE CATALOG: ONLINE CATALOG TRAINING: 4
SINCLAIR LIBRARIAN ONLINE CATALOG:
NAME (LAST, FIRST M.I.): QUIRK, RUTH MARIE  
DEPARTMENT: SYSTEMS  
JOB TITLE: LIBRARIAN

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
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CATALOGING SUPERVISOR: 4  CATALOGING STAFF: 4  CATALOGING STUDENT: 4
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STAFF ONLINE CATALOG: 4  PUBLIC ONLINE CATALOG: 1  ONLINE CATALOG TRAINING: 4
SINCLAIR LIBRARIAN ONLINE CATALOG: 4

NAME (LAST, FIRST M.I.): SMITH, MAJORIE  
DEPARTMENT: CIRCULATION  
JOB TITLE: HEAD

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
   1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: 4  CATALOGING STAFF: 4  CATALOGING STUDENT: 4
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STAFF ONLINE CATALOG: 4  PUBLIC ONLINE CATALOG: 1  ONLINE CATALOG TRAINING: 4
SINCLAIR LIBRARIAN ONLINE CATALOG: 4

NAME (LAST, FIRST M.I.): YATSUMATSU, KENGO  
DEPARTMENT: CATALOGING  
JOB TITLE: HEAD

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
   1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: 4  CATALOGING STAFF: 4  CATALOGING STUDENT: 4
CATALOGING TRAINING: 4
ACQUISITIONS STAFF: 4  ACQUISITIONS TRAINING: 4
CIRCULATION SUPERVISOR: 4  CIRCULATION STAFF: 4  CIRCULATION STACKS: 4
CIRCULATION STAFF: 4  CIRCULATION TRAINING: 4
STAFF ONLINE CATALOG: 4  PUBLIC ONLINE CATALOG: 1  ONLINE CATALOG TRAINING: 4
SINCLAIR LIBRARIAN ONLINE CATALOG: 4

NAME (LAST, FIRST M.I.): LUNDEEN, GERRY  
DEPARTMENT: GSLS  
JOB TITLE: INSTRUCTOR LS 670
ID (7 CHARACTERS MUST BE ALPHA NUMERIC COMBINATION): ONE4YOU  
PASSWORD (UNLIMITED MAY BE ALPHA OR NUMERIC OR BOTH): CRAZYWREALL  
CREATION DATE (YY/MM/DD): 85/03/12  
DELETION DATE (YY/MM/DD OR 99 IF PERMANENT): 05/05/19

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
   1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: 2  CATALOGING STAFF: 2  CATALOGING STUDENT: 2
CATALOGING TRAINING: 2
ACQUISITIONS STAFF: 2  ACQUISITIONS TRAINING: 2
CIRCULATION SUPERVISOR: 2  CIRCULATION STAFF: 2  CIRCULATION STACKS: 2
CIRCULATION STAFF: 2  CIRCULATION TRAINING: 2
STAFF ONLINE CATALOG: 2  PUBLIC ONLINE CATALOG: 1  ONLINE CATALOG TRAINING: 2
SINCLAIR LIBRARIAN ONLINE CATALOG: 1
NAME (LAST, FIRST M.I.): MACMILLAN, GARY
DEPARTMENT: ADMINISTRATION
JOB TITLE: ASSOCIATE UNIVERSITY LIBRARIAN
ID (7 CHARACTERS MUST BE ALPHA NUMERIC COMBINATION): 837EUWY
PASSWORD (UNLIMITED MAY BE ALPHA OR NUMERIC OR BOTH): REEUQJON
CREATION DATE (YY/MM/DD): 84/04/10
DELETION DATE (YY/MM/DD OR 99 IF PERMANENT): 99

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: 4 CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING: 4
ACQUISITIONS STAFF: 4 ACQUISITIONS TRAINING: 4
CIRCULATION SUPERVISOR: 4 CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING: 4
STAFF ONLINE CATALOG: 4 PUBLIC ONLINE CATALOG: ONLINE CATALOG
SINCLAIR LIBRARIAN ONLINE CATALOG:

NAME (LAST, FIRST M.I.): SMITH, MAJOREE
DEPARTMENT: CIRCULATION
JOB TITLE: HEAD
ID (7 CHARACTERS MUST BE ALPHA NUMERIC COMBINATION): 3783UEY
PASSWORD (UNLIMITED MAY BE ALPHA OR NUMERIC OR BOTH): KIT IS CUTE
CREATION DATE (YY/MM/DD): 84/10/28
DELETION DATE (YY/MM/DD OR 99 IF PERMANENT): 99

INDICATE THE APPROPRIATE ACCESS LEVEL FOR THE MENU(S) SELECTED
1 = VIEW ONLY 2 = VIEW AND ADD 3 = VIEW, ADD, UPDATE 4 = VIEW, ADD, UPDATE, DELETE

CATALOGING SUPERVISOR: CATALOGING STAFF: CATALOGING STUDENT:
CATALOGING TRAINING:
ACQUISITIONS STAFF: ACQUISITIONS TRAINING:
CIRCULATION SUPERVISOR: 4 CIRCULATION STAFF: CIRCULATION STACKS:
CIRCULATION STUDENT: CIRCULATION TRAINING: 4
STAFF ONLINE CATALOG: PUBLIC ONLINE CATALOG: 1 ONLINE CATALOG
SINCLAIR LIBRARIAN ONLINE CATALOG:
1. What is the Committee's charge?
This committee was assigned the following tasks:

   a. Conduct a literature survey relating to the ergonomics of library automation, specifically video display terminal and work station design and to a lesser extent the literature relating to health aspects of vdt's in the workplace.

   b. Arrive at recommendations on work station design, and the design of space and an appropriate environment for OPAC.

   c. At a later date, when appropriate select, or assist in selecting furniture in line with these recommendations.

   d. Make some recommendations on how the patron use of portable personal computers in the library should be accommodated.

In pursuing its first task, the committee found the literature relating to office automation and vdt's to be vast and highly specialized, some of it inaccessible to those without specialized expertise.
The committee reviewed the more accessible material on a selective basis. It should be kept in mind that corporations hire experts to design VDT work spaces and those experts in turn consult specialists on specific problems, eg. lighting. The Panel on Impact of Video Viewing on Vision of Workers of the National Research Council Committee on Vision was commissioned to do a review of the literature which took this panel of experts approximately one year to complete. The Ergonomics Committee has relied heavily on this report, supplementing it with recent journal articles and books as needed.

Another point we'd like to make about the literature is that the distinction between health and ergonomics is somewhat arbitrary. Poor ergonomic design can and does result in health problems.

2. What is ergonomics?
Ergonomics is the European term for what we call human factors engineering—the design of things and facilities so that they can reasonably well serve human needs, particularly in the workplace. It's important to stress that our tools and our environment should be subordinate to our human requirements and needs. In other words, our tools and our work environment should work for us, not
against us. Ergonomically designed work environments make us more comfortable, more satisfied with our jobs, and give us a greater sense of well being, leading to an increase in productivity.

3. Why is Ergonomics suddenly such an issue? Comfort in the workplace was just as important before the advent of office and library automation, yet few work places were well designed. The advent of the vdt is forcing us to pay more attention to these issues because placing vdt's into a traditional desk top work environment, with its bright lighting, non-adjustable work surfaces and chairs, has resulted in various health complaints and in some instances serious morale problems accompanied by a decline in productivity. Such problems usually center on poorly designed vdt's, poor visibility of the screen due to glare from lights and windows and furniture which is uncomfortable and the results are usually headaches, backaches, neckaches, irritation and burning of the eyes, and eyestrain.

4. What are the essential elements of a well-designed vdt workstation?

The essential elements of a well-designed vdt workstation are a soundly designed vdt, appropriate
lighting, well designed and adjustable furniture, a well designed document holder, a suitable footrest, and the appropriate placement of these elements in relation to one another.

4a. What constitutes a well-designed VDT?

**Screen color**

In the United States most VDT's use green or white phosphor. According to the NRC Panel, the color of the phosphor itself appears to have no physiological effect as long as the blue and the red extreme levels of the spectrum are avoided. European standards specify amber phosphor. Many users have strong personal preferences for one color or another, but according to the Panel these are without scientific foundation.

The NRC Panel makes a strong case for negative contrast screens—dark characters on a light screen, black lettering on white background because usually VDT operators work back and forth between printed or written material (black on white) and the screen. When screens consist of light lettering on a dark background there is a temporary loss of visibility as the eye adjusts from one to the other. According to the Panel, a switch from positive to negative contrast screens can result in as much as a 15% increase in visual acuity. One study showed better
--4--

performance time and fewer errors among operators of negative contrast screens.

Image quality

4b. The image on the screen must be clear, that is of high resolution. There must not be a perceptible flicker as seen on some television sets, which is the result of too high a refresh rate. A legible display should have about 729-1,029 raster lines. A visible raster structure is not desirable. A 525 line raster structure will typically show the lines forming the characters. 7-10 raster lines per characters provide acceptable legibility, with 7 being a minimum. In a dot matrix display format, the number of dots per character matrix should be from 7x9 to 9x11.

The frequencies at which flicker is perceived range from approximately 30 Hz to as high as 100 Hz. A higher repetition rate of 100 Hz is recommended for negative contrast vdt's because of their increased brightness. For most other vdt's a rate of around 50 Hz does not result in flicker. Flicker is of concern for reasons other than comfort. Although this is uncommon, it has been reported to cause epileptic seizures.

There should be sufficient contrast between the characters on the screen and the background. The
legibility. Negative contrast displays (dark letters on a light background) are more legible than positive contrast displays (light letters on a dark background).

A well-designed vdt has brightness controls that are within easy reach of the operator.

4c. Adjustability

Both vertical and horizontal adjustability of the screen angle are desirable features of vdt's.

5. Keyboard

The news that the standard QWERTY keyboard is not designed with either ergonomics or typing speed in mind is probably no surprise to most typists. The difficulty is two-fold. The QWERTY keyboard has only a few of the most frequently used letters in the English language on the home row, thus resulting in decreased speed and most of the letters are typed with the left, or weaker hand. In spite of these problems, however, it does not make sense to retrain staff already familiar with qwerty to other keyboard configurations due to loss of efficiency. The inefficiency of the standard keyboard is something that the library will have to live with. There are a lot of other features of the keyboard, however which can be controlled for efficiency:
5a. The keyboard should be adjustable so that it can be positioned where the user finds it most comfortable.

5b. There should be wrist rests at the bottom of the keyboard.

5c. Separate right and left keyboards laterally tilted toward the outside enable the typist to hold wrists in the more natural, less twisted position. This is important for operators who spend many hours a day contorting their wrists inward at the standard keyboard. Such keyboards may become more widely available in the future.

5d. There should be both tactile and auditory feedback since about 70% of typing errors are self-detected and self-corrected. Visual feedback is necessary only for unskilled typists, unless the operator must frequently strike special function keys, and other remotely placed keys.

5e. The keyboard should be light to the touch. A lot of pressure should not be required to strike the keys.
5f. There should be slightly deeper depressions on the home row keys to provide reinforcement for the accurate location of fingers.

5g. Keyboard and keys should be made from a non-reflective, but durable material suitable for key legends.

5h. The profile angle of the keyboard should be between 5-15°.

5k. The keyboard should be as thin as possible to avoid uncomfortably high positions of arms and hands.

5l. A separate numeric key pad is desirable, considering the variety of functions to which these machines will be put in the library.

5m. The keytops should be square, about 12-15 mm, with intercenter spacing of about 18-20 mm.

5n. There should be color coding for the function keys, even if it is subtle, such as on the IBM PC keyboard.
50. Keys with a major fatal effect should be located where there is little likelihood of their being struck accidentally.

5p. For ease of operation, keys should be telematic, automatically repeating when they are depressed for more than half a second.

6. Chair

Ease of adjustability and comfort are the most important attributes of a good chair. Even if chairs were custom designed for individuals, they would not continue to be comfortable throughout the working day without some degree of adjustability because a person assumes many different positions throughout the day to relieve muscular stress.

6a. The seat pan should be designed so that it carries most of the body weight to avoid constriction of blood flow to the legs. It should be inclined about 15' to the back to relieve disc pressure. (There is 35% more disc pressure while sitting than while standing.)

6b. It should be upholstered, but firm and the surface should not be too highly contoured because as
positions and individuals change, this can be uncomfortable.

6c. The front of the seat pan should have a "waterfall drop" to avoid constricting blood flow to the legs.

6d. It should be conveniently adjustable in height by the simple flick of a lever or a button. The adjustability should be approximately from 16 to 22 inches, allowing the occupant to keep his feet flat on the floor, again to prevent constriction of the blood vessels in the legs.

6e. The seat and backrest should be adjustable as a single unit, with a tilting range of 3% or more.

6f. The seat should enable the operator to bend his/her knees because outstretched legs further flatten out the curvature of the lower back (lardosis) and place additional pressure on the lumbar region of the spine.

6g. A well designed backrest also supports some of the body weight and stabilizes the trunk, providing essential support for the lumbar region with its inward curvature (lardosis) of the lower back.
A high backrest with an incorporated neck support also allows relaxation of neck and trunk muscles.

6h. The backrest should be firmly attached to the seat pan. It should be padded, but firm and be easily adjustable in depth, height and angle in relation to the seat pan. Backrests should be adjustable from 80-120° measured from the seat pan. The adjustable backrest height should be 2 inches or more. All adjustments should be independent of the seat pan.

6i. Armrests are a desirable feature. The closed loop designs are superior to the cantilevered designs, which tend to get caught on clothing. Armrests should be short enough to permit the operator to get close to the working surface.

6j. The base of the chair should preferably have five rather than four casters for added stability. This is now a European standard.

6k. The material of the chair should preferably be non-reflective. Polypropylene or polyurethane are good materials for the chair skeleton because they resist staining and scuffing and are non-reflective. The upholstery fabric is preferentially of textured
nylon. This is durable, allows for adequate ventilation, and has good sound absorbancy.

7. **Document holder**
A good document holder is essential for avoiding excessive stress on the neck muscles. Because more energy is expended moving the head up and down to view a document lying flat next to the VDT than one to the right or left, it is best to have one which holds the document right next to the screen at the same eye level. A number of different types are available. They should be stable and non-reflective. Some of the best are metal holders which allow the document to be attached with a magnet. In situations where microcomputers are used (with floppy or hard disk drives) magnets are not recommended because they may result in loss of data.

8. **Foot rest**
Foot rests are extremely important because they may be the only way a very short person can keep his/her feet resting flat on a firm surface to prevent constriction of blood flow to the legs. Footrests should be approximately 2 inches high and should be inclined at an angle of 10-15°.
9. Work table

Some degree of adjustability in a work table is highly desirable. Although if the other elements of the work station are highly adjustable this is not mandatory. There are tables where the surfaces which hold the vdt and the keyboard are adjustable. The surface should not be bright and reflective and there must be sufficient clearance so the operator can bend his knees comfortably under the table, about 27 inches. Most vdt work areas do not have adequate space for source documents, required documentation etc. For comfort and efficiency, it is essential that such space be appropriate to the tasks required of the operator.

10. Lighting

Good lighting is one of the most important elements in a well designed vdt work station. Since the turn of the century, the ambient lighting in offices has risen steadily from 2 foot candles (21.5 lux) in 1910 to about 100 foot candles in 1980 (1076.4 lux). Many of the problems associated with vdt use have resulted from their introduction into traditional offices with bright lighting intended to illuminate desk tops. It is well to keep in mind that the vdt itself is a
light source with a highly reflective surface subject to a great deal of glare. Any reflections off the screen surface reduce visibility by reducing the contrast between the display characters and the screen background.

10a. Ambient lighting should be much lower than what is found in the typical office. According to the NRC Panel about 300-500 lux provides for adequate visibility of the display and source materials.

10b. Other sources recommend highly adjustable task lighting (architects lamps or direct overhead spotlight lighting) to illuminate source documents and the keyboard. One such model has a combination 60 watt incandescent bulb in the center of a 22 watt fluorescent ring, designed specifically for VDT work. Such a task light should never be positioned behind the shoulder, but on the side where the source document is kept, or it will illuminate the screen as well. Lamps which clamp onto the desk are ideal because they save space.

10c. One of the biggest problems in lighting VDT work areas is to avoid glare from windows and bright lights. The following are some important ways in which reflections and glare on the screen can be avoided:
1. All ceiling lights should be shielded in some way, either using prismatic or grid shielding.

2. The direction of the lights should be parallel to the viewing direction of the VDT operator and to the windows.

3. The ratio of the display luminance (brightness) to the areas immediately surrounding the display should be no lighter than 1:3.

4. Areas not immediately surrounding the display, but still within the operator's peripheral vision should have luminances about 5 to 10 times that of the display.

5. VDT screen should be positioned to minimize glare. The plane of the screen should always be perpendicular to the plane of a window or a light source, never parallel.

6. Windows should be screened in some way by means of draperies or blinds. These should not be patterned or the louver type which can reflect their patterns onto the surface of the screen.
7. Vdts with adjustable screen angles can more readily be adjusted to avoid glare.

8. Hoods on tops of the screen can help reduce the light, veiling reflections which reduce visibility.

9. Negative contrast displays (dark characters on light background) can help to reduce the effect of glare.

10. Reducing the reflectance of the materials in the area surrounding the vdt helps reduce glare.

11. Screen filters (anti-glare screens) can help to reduce reflections on the screen. However, this necessarily reduces character brightness and resolution. Two different types of filters are available -- micromesh and polarisation. There are problems with each. Polarization filters reduce both direct and diffuse reflections, but since they have very shiny surfaces, they tend to be reflective themselves. They are most effective on small surfaces, but they reduce character legibility. Micromesh filters are effective in reducing reflections, but when viewed at certain angles the display can be difficult to read. The characters can be less bright, because some of the
light passing through the mesh is scattered. (A personal note from Paula Szilard. The micromesh antiglare filter placed on top of the Eye-guard protective screen does not reduce visibility in the least when the brightness control is adjusted upward on the IBM PC screen.)

12. Surface treatments of the vdt screen have been used with variable effects to reduce glare and reflection. These include etching the glass surface of the screen, spray-on reflective coatings, vapor deposited screen coatings, and thin film layers, sometimes called a quarter wavelength layer. The most effective of these is the thin film layer. It is applied to a glass panel which is then applied to the screen. Less effective is etching the surface of the screen because it can reduce character brightness by as much as 80%. The other treatment is considered even less effective.

How are all of these individual elements combined into a well designed work station?

It cannot be overemphasized that the vdt work station must be looked at as an integrated whole. Changing one element will necessitate changing others to compensate. Therefore it is impossible to design
work stations piece by piece, optimizing one element, then working on the others in turn because they will not work together as a whole.

In addition to the suggestions contained in the discussion of the individual elements of a work station, the following are some established principles of how these elements should be arranged:

1. The line of sight from the operator to the screen should slope downward from 15-30' below the horizontal level for optimal viewing. This means that the center of the screen should be lower than the eyes.

2. The operator should not be positioned in such a way that he or she looks out a window or a bright light to avoid loss of visibility.

3. There should be adequate leg room under the work surface, about 27 inches.

4. The keyboard should be within an arm's reach.

5. The back row of the keys should be positioned no further than 400 mm or 15.6 inches from the front edge of the desk.
6. A free area of about 60 mm or 2.34 inches is useful for resting the hands and to avoid the cutting action of the edge of the keyboard on the operator's wrist.

7. The viewing distance should be from 450-500 mm, or 17.55--19.5 inches. It should not exceed 700 mm, or 27.3 inches.

What are some of the limitations of the human element in vdt work station design?

Anthropometry and biomechanics

Since humans have certain biological limitations relating to posture, vision, range of movement etc., it is the work station that must be designed to fit the individual, not vice versa. And when work stations are designed with a number of operators in mind, a high degree of adjustability and flexibility are required. It is a truism of ergonomic design that a large woman does not have the dimensions of an average man, and the two cannot necessarily share a work station unless there is a great degree of adjustability in each component.

In Hawaii our situation is even more complex. We not only have small, average, and large men and women.
We have an ethnically and racially diverse population of small, average, and large men and women, populations for which anthropometric data is by and large unavailable. Most vdt elements, particularly furniture is designed for caucasian bodies.

A well designed vdt work station minimizes muscle and eye fatigue and postural stress while maximizing efficiency. Most postural stress can be relieved by simply shifting position. The design of the work station should make this easy to do.

During movement (dynamic work) muscles rhythmically contract and relax in turn, a process that favors blood circulation. When the body simply maintains a posture (static work), muscles contract only, impeding blood flow and causing lactic acid build up. If static loads are sustained over a long period of time, acute muscular pain can result. Over the long term, this may lead to rheumatic disease. Armrests on chairs, wristrests on keyboards, split keyboards and chairs with upper back and neck support all help to ease statically loaded muscles. The work station should be laid out in such a way that work is performed with joints in the middle of their range of motion. Optimal height and keyboarding posture for hands and arms have not been established, suggesting
as much flexibility as possible to meet individual needs.

Vision
The process of human vision itself makes demands on vdt work station design. Even the young eye is slow to adapt to different light levels, as the vdt operator typically looks from source document to screen to keyboard once every .8 to 4 seconds. Most people experience a steady deterioration of vision from the age of about ten. From age 20 to age 60 visual acuity is reduced by about 25%. When eyes adjust to different viewing distances, the iris contracts to change the size of the lens. As people age more and more cells are added to the lens. Some do not receive adequate nourishment and oxygen and as a consequence they die and harden and the lens becomes stiffer, and therefore less able to change its shape to accommodate to different viewing distances. This condition is known as presbyopia and requires correction in the form of eyeglasses. Sensitivity to glare increases with age and sensitivity to contrast decreases with age. In practical terms all of these things mean that the older vdt user must be slower, or be in a job where a greater risk of error is acceptable.

The American Optometric Association has recommended corrective glasses for vdt workers even
Noise

The recent trend toward totally "open plan" work spaces is reversing itself, fortunately, with the realization that in open work spaces noise levels are usually much higher and other distractions are more frequent. This is not to say that work space design should sacrifice worker contact and all sociability. However, in the interests of productivity, workers who need to concentrate intensely on the task at hand should be given every opportunity to do so. The following are some recommendations on noise levels:

1. The ambient noise level should be less than 55 dB(A) in task areas requiring a high level of concentration.

2. The noise level should be less than 65 dB(A) in areas where routine tasks are performed.

3. Equipment noise levels should be no greater than 5B(A) above ambient noise levels.

4. The work environment should be free of high frequency tones.

5. Any printers in the area should be quiet, eg laser jet or should be well insulated with acoustical shielding.

Job design

The NRC Panel emphasizes that while many of the complaints relating to vdt's in the work place are
the result of poor ergonomic design, some are the direct result of the way that jobs are designed or structured.

"Jobs in which vdt's are used are not purely vdt jobs, even when a vdt dominates everything about a job. A total job is defined less by the equipment used than by the outcomes achieved, the methods and procedures followed, the skills and abilities demanded, and the general set of circumstances under which the work is done. Jobs can be carefully designed to make a work experience satisfying and productive, but they usually are not; most jobs develop with little real planning, and any planning that does take place is more likely to consider equipment rather than the person who uses it." (Video displays, work and vision, NAS/NRC 1983, p173.

Most complaints are made by workers in jobs devoted to a single task, e.g. data entry, performed all day long. In such jobs the pay is usually low, the worker has no opportunity to display initiative or creativity. She or he is expected only to work continuously and intensively to avoid errors. There is no variety in the tasks performed and no sense of achievement. It is imperative that as the library moves further into automation that such single task jobs be avoided at all cost. This will be especially important when most technical services tasks in the library are
structured so that they allow the worker variety, a little freedom and initiative. Worker satisfaction and productivity are increased when tasks performed in individual jobs are varied and when the worker is allowed some degree of self-determination.

The extent to which a worker has control over his or her work and his working environment can relieve stress related to VDT work. Actually involving the worker in selecting hardware and software and in job changes resulting from the new technology may help to establish some degree of control. Also the flexibility to switch tasks, the actual amount of time spent at the terminal and the scheduling of this time (massed versus spaced), and allowing for interactions with co-workers all may help establish a sense of control.

The least amount of control exists in jobs where performance and accuracy are monitored by machine. More health and emotional problems are associated with machine-paced work than with self-paced work. Under such conditions workers are literally turned into human machines in electronic sweatshops. The library should strive to invest its approach to automation with a human touch. It is an approach that will reap benefits for both the employer and the employee.
A PRELIMINARY LIST OF NECESSARY ELEMENTS FOR A DEVELOPING A
MICROCOMPUTER NETWORK TO SERVE THE SPECIAL NEEDS OF UHM
LIBRARIES

HARDWARE:

1  MACINTOSH-XL 2 megabytes (DESIGN and Engineering setup)
   10 mg byte internal hard disk, 3.5inch disk, and 12inch screen.

5  MACINTOSH-512k (For Chinese, Japanese, Korean and
   other graphics oriented language storage.)
   10 mg byte hard disk and 3.5inch floppy, and dot
   matrix printer.

10 MACINTOSH-128k for ALA character set display.

1  Laser Printer

SOFTWARE:

6  JAZZ (wordprocessing, spreadsheet, database management,
   reports/forms, project management, communications and
   graphics)

3  PC SPEAK for MACINTOSH to IBM PC communications.

6  APPLE TALK to allow inter MACINTOSH communications.
A preliminary list of elements needed for developing Macintosh applications to serve special library needs.

HARDWARE:

1. MACINTOSH-XL 2megabytes (DESIGN and Engineering setup)
   10 mg byte internal hard disk, 3.5inch disk, and 12inch screen.

SOFTWARE:

DATA COMMUNICATIONS SOFTWARE (such as BIAST communication available from Communications Research Group, 8939 Jefferson Highway Baton Rouge, La. 70809 $250.00) which can transfer binary data through direct connect, modem or local networks.

FONT BUILDER to facilitate the construction and hex code definition specialized character sets.

THE PROFESSIONAL BIBLIOGRAPHIC SYSTEM Data base.
A bibliographic package which allows for the compilation of bibliographies and use of citations. Supports the expanded ASCII ALA character set, outputs to printer screen disk of other computer. Integrated with MACWRITE and MACPAINT. Compatible with the 128k MACINTOSH and the 1 megabyte MACINTOSH XL. May also download from Bibliographic Utilities into the MACINTOSH for special databases. Currently the software can link with OCLC, RLN and DIALOG.

ADDITIONAL INFORMATION NEEDED

1. Bit maps for dot matrix construction of the American Library Association character set would be helpful in the development of the software necessary to display the character set as it should be for reading. For example the MARC input rules require that a diacritic character be input before the letter it qualifies but to understand the diacritic's meaning it should display overprinted on the character (i.e. 'a and 'n and 'e are input separately but must be displayed together to be understood: à and ñ and é).
2. Information on the development of Chinese, Japanese and Korean character sets for the MACINTOSH developed by other libraries that extend character sets to fit their specific needs. UHM extension of any existing character set would be facilitated by building upon other developments.

3. The Technical manual and specifications for the MACINTOSH 128k, 512k and XL.

4. Necessary information for creating new PROMS if desired.
At Honeywell, we believe our customers shouldn't be given the run-around about running the professional, personal computer software they need. That's why we're offering the microSystem PC. IBM PC-compatible hardware, bundled software, and your choice of peripherals. A single package selected by and available from a single source. Because you've already done the hard part — assessing your personal computing needs. Now Honeywell can help you put that assessment to work.

Honeywell's microSystem PC is an extremely flexible processor designed to provide a wide range of capabilities that are compatible with IBM PC and XT systems. The microSystem PC supports the comprehensive MS-DOS* operating system, which makes software versatility possible.

The basic microSystem PC contains a 16-bit 8088 processor with either 128K or 256K bytes of RAM memory, expandable to 640K bytes. The system's modular design allows either two 5-1/4-inch, 360K-byte dual diskettes, or one 5-1/4-inch diskette and one 10M-byte Winchester-type disk. Also available are emulators, which allow the microSystem PC to operate as a terminal with Honeywell, IBM, and various other host systems.

With each microSystem PC ordered, Honeywell includes the Super Pack software package. The variety of programs offered in this package enables the user to work with a spreadsheet, a word processor, a data manager, a financial manager, the MS-DOS operating system, languages, graphics, communications, tutorial lessons, and diagnostics. Other vendors typically sell these programs separately.

In addition, the microSystem PC can be integrated with a wide range of industry-standard hardware and software. The microSystem PC is compatible not only with a large number of professional application packages, but also with numerous hardware components — including keyboards, printers, and monochrome or color monitors.

Direct access to Honeywell and other mainframes, as well as various sharing networks, is made possible through terminal emulation software.

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*MS-DOS is a trademark of Microsoft Corporation.
Standard Features

- Choice of dual diskettes, or single diskette and hard disk
- 16-bit 8088 processor
- 128K or 256K bytes RAM (expandable to 640K bytes)
- Eight (IBM PC-compatible) expansion slots
- Two RS-232-C serial ports
- One IBM-compatible Centronics-like parallel printer port
- Super Pack software package
- IBM-compatible keyboard with LED displays

Super Pack — An Additional Competitive Advantage at No Additional Cost

Honeywell's microSystem PC also includes Super Pack, a complete set of office productivity tools — at no extra charge. This application package includes:

- MS-DOS — The disk operating system that allows you to run a growing number of popular software programs.
- The Perfect Series — A series of four programs that offer common operations from program to program. There's no need to learn a new set of command sequences every time you change an application. In addition, common information can be used throughout the series, so retyping information is unnecessary. The series includes:
  - Perfect Writer — A highly versatile word processing program that lets you create and edit volumes of text. Simple commands help you design formats, reorganize, and prepare for hardcopy printout.
  - Perfect Speller — Works in conjunction with Perfect Writer to correct spelling mistakes. It includes a complete dictionary, with the additional capacity to store frequently used phrases.
  - Perfect Calc — A revolutionary electronic spreadsheet with sophisticated multiple file buffers. You can create and store several spreadsheets concurrently and freely cross-reference and share data among them.
  - Perfect Filer — A multipurpose data base management system that is ideal for mailing lists and form letters.
- Tim IV — Designed for sophisticated information management needs, this program offers one of the most complete relational data bases offered on the market today.
- Fast Graphs — A program for creating high-resolution pie charts, bar charts, scatter plots, and other business graphics by entering information or taking previously-stored data from Perfect Calc or Tim IV files.
- Home Accountant Plus — A best-selling program designed for managing personal finances and complex investment portfolios.
- Perfect Link Asynchronous Communications — The program that sets the stage for computer communications throughout the world by letting you select from among five types of terminal emulation.
- GW BASIC — A rich implementation of the BASIC language, this application offers extensions for taking advantage of your system's color, graphics, sound, and real-time capabilities.
- ATI TUTORIALS — In addition to productivity tools, we offer these four online tutorials to help you master the system and its accompanying application software.
MONITORS

Your Honeywell microSystem PC should be matched with the right monitor. Choose from among three color and monochrome monitors for use in a variety of business and distributed processing applications. All three monitors are ergonomically designed for viewing ease and comfortable use. The DMU0793 and DMU0794 are 12-inch (diagonal) monochrome amber phosphor monitors with 25 lines of 80 characters each. The DMU-0794 is the choice when requirements demand work processing, spreadsheet calculations, data base management, and other non-graphic display applications. The DMU0793 has a graphics capability, which is useful for popular business-graphics applications. The DMU0795 is a 13-inch (diagonal) color monitor with 25 lines of 80 characters. The color monitor is capable of displaying up to 16 color variations. It is ideal for business charts and other business-graphics applications in which colors and resolution are important.

SPECIFICATIONS

DMU0793
(monochrome graphics)
Monitor: 12-inch (diagonal), monochrome screen, with amber phosphor display
Screen Format: 25 lines x 80 columns
Character Positions: 2000
Matrix Size: 7 x 7 (8 x 8 field)
Resolution: 640 x 200 pixels
Graphics Capability: Yes

DMU0794
(monochrome text)
Monitor: 12-inch (diagonal), monochrome screen, with amber phosphor
Screen Format: 25 lines x 80 columns
Character Positions: 2000
Matrix Size: 7 x 9 (9 x 14 field)
Graphics Capability: No

DMU0795 (color)
Monitor: 13-inch (diagonal), screen, RGB color signal, 16 color variations
Screen Format: 25 lines x 80 columns
Character Positions: 2000
Matrix Size: 7 x 7 (8 x 8 field)
Resolution: 320 x 200 pixels
Graphics Capability: Yes
Honeywell's PRU0066 — dot matrix impact printer-quiet, lightweight, and compact — is designed for use in office environments where lighter duty PC work is the requirement. Just 4-1/2 inches tall, the PRU0066 printer features easy forms handling, versatile printing characteristics, and a modest price — making it the right choice to match up with your Honeywell microSystem PC for personal as well as small business use.

• Desktop design: small, quiet, and lightweight
• 120-cps draft, 75 cps proportional, or 22-cps correspondence printing
• 5 x 7 dot matrix characters on a 9 x 9 matrix
• Elite or pica pitch printing are operator or program selectable
• Variable size and density printing are program selectable
• IBM PC-compatible block graphics
• IBM PC-compatible, Centronics-like interface
• Double-width elongated, compressed, and other special characters
• Original and two carbonless copies printed
• Seamless, long-life cartridge ribbon
• 80 characters per 8-inch print line standard (132 characters compressed)
• 1024-byte buffer
• 6, 8, or 10.2 lines per inch
• Bidirectional, logic-seeking printing of ordinary characters.
Dot Matrix Printers

PRU0076/0080

Dot Matrix Printers

Honeywell's PRU0076 and PRU0080 dot matrix impact printers are designed for use in offices where heavier duty DP class performance is required. Characters are printed bidirectionally in a logic-seeking mode to optimize system throughput. In standard mode, a maximum of 80 to 132 characters per line can be printed. In special print mode, the number of characters per line can be increased to 132 for the PRU0076 and to 220 for the PRU0080. Operator can select printing at 6, 8, 10 vertical lines per inch.

FEATURES

- 150-cps draft, 50-cps and 22-cps correspondence printing
- 9 x 11 dot matrix
- IBM PC-compatible line and mosaic graphics
- Double-width characters
- IBM-compatible, Centronics-like interface
- Internal print test
- Forms length: switch- or program-selectable
- Printing of original and four copies
- Easy to change, long-life cartridge ribbon
- Device type and status provided on the interface
- 5, 8, 10 lines per inch
- Bidirectional printing and logic-seeking
- 80 characters per 9-inch print line (132 characters in compressed mode) — standard for the PRU0076
- 132 characters per 13.2-inch print line (220 characters in compressed mode) — standard for the PRU0080.
1. Follow Decision Tree
2. Fill in Marketing Identifiers in lower right as you proceed
3. Black dot ● uses – expansion slot (maximum of 8 black dots per system)
# Hardware

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Description</th>
<th>Annual Maintenance Catalog Price</th>
<th>On-Site</th>
<th>Walk-In</th>
<th>Mail-In</th>
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<tr>
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<tr>
<td><strong>Processors</strong></td>
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<tr>
<td>CPX0721</td>
<td>System Unit — 128KB with two 360KB Disks</td>
<td>$2,270*</td>
<td>$330</td>
<td>$218</td>
<td>$185</td>
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<td>CPX0722</td>
<td>System Unit — 256KB with two 360KB Disks</td>
<td>$2,395*</td>
<td>330</td>
<td>218</td>
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<td>CPX0724</td>
<td>System Unit — 256KB with 10MB Hard Disk and 360KB Diskette</td>
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<td>CMC0777</td>
<td>128KB Expansion Card</td>
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<td>CMC0779</td>
<td>384KB Expansion Card</td>
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<td>CMM0777</td>
<td>64KB Memory Expansion Module</td>
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<td>No Separate Charge</td>
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<td>DMU0793</td>
<td>Monochrome Graphics Monitor with Cable</td>
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<td>DMU0794</td>
<td>Monochrome Text Monitor with Cable</td>
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<td>DMU0795</td>
<td>Color Monitor with Cable</td>
<td>595</td>
<td>125</td>
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<td><strong>Monitor Controllers</strong></td>
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<tr>
<td>CPA0791</td>
<td>Monochrome Text Controller</td>
<td>225</td>
<td>No Separate Charge</td>
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<td>CPA0790</td>
<td>Color/Monochrome Graphics Controller</td>
<td>225</td>
<td>No Separate Charge</td>
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<tr>
<td><strong>Printers</strong></td>
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<tr>
<td>PRU0066</td>
<td>Graphics/Correspondence Quality Printer, 80 Column — 120 cps</td>
<td>495</td>
<td>62</td>
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<tr>
<td>PRU0076</td>
<td>Graphics/Correspondence Quality Printer, 80 Column — 150 cps</td>
<td>795</td>
<td>100</td>
<td>66</td>
<td>55</td>
</tr>
<tr>
<td>PRU0080</td>
<td>Graphics/Correspondence Quality Printer, 132 Column — 150 cps</td>
<td>995</td>
<td>125</td>
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<td><strong>Cables</strong></td>
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<td>CBL0797</td>
<td>Parallel Printer Cable</td>
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<td>No Separate Charge</td>
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<tr>
<td>CBL9611</td>
<td>RS-232-C Communications Cable M/M</td>
<td>80</td>
<td>No Separate Charge</td>
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</table>

*Subject to state and local taxes. F.O.B. point of shipment.

*Charges for Honeywell CSD Installation are:
On-Site First Unit — $250; subsequent units at same location and time — $125;
Customer Walk-in Test Services at Designated Service Centers for installation, setup, and test — $60.

To place an order or for more information, call toll-free 1-800-343-6665, (in Massachusetts call 617-392-5246), or contact your local Honeywell Representative.
- **UH BOOKSTORE AND UH COMPUTING CENTER**
- **IBM ACIS PERSONAL COMPUTER SPECIAL OFFER (SPRING 1985)**

### AVAILABLE CONFIGURATIONS -- OAHU PRICES

<table>
<thead>
<tr>
<th>#</th>
<th>Price</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1,850.00</td>
<td>IBM PC System Unit (256kb memory) with keyboard, two 5-1/4&quot; dual sided 360kb diskette drives, <strong>monochrome (green) monitor</strong>, monochrome display and parallel printer adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>2</td>
<td>$2,147.00</td>
<td>IBM PC System Unit (256kb memory) with keyboard, two 5-1/4&quot; dual sided 360kb diskette drives, <strong>color/graphics monitor</strong>, color/graphics monitor adapter, parallel printer adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>3</td>
<td>$2,098.00</td>
<td>IBM PC System Unit (256kb memory) with keyboard, two 5-1/4&quot; dual sided 360kb diskette drives, <strong>color/graphics monitor</strong>, color/graphics monitor adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>4</td>
<td>$2,830.00</td>
<td>IBM PC-XT System Unit (256kb memory) with keyboard, one 3-1/4&quot; dual sided 360kb diskette drive, one 10mb fixed disk, <strong>monochrome (green) monitor</strong>, monochrome display and parallel printer adapter, asynchronous communication adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>5</td>
<td>$3,127.00</td>
<td>IBM PC-XT System Unit (256kb memory) with keyboard, one 3-1/4&quot; dual sided 360kb diskette drive, one 10mb fixed disk, <strong>color/graphics monitor</strong>, color/graphics monitor adapter, parallel printer adapter, asynchronous communication adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>6</td>
<td>$3,078.00</td>
<td>IBM PC-XT System Unit (256kb memory) with keyboard, one 3-1/4&quot; dual sided 360kb diskette drive, one 10mb fixed disk, <strong>color/graphics monitor</strong>, asynchronous communication adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>7</td>
<td>$2,894.00</td>
<td>IBM PC-AT System Unit (256kb memory) with 80286 CPU, keyboard, keylock, clock/calendar, one 5-1/4&quot; dual sided 1.2mb diskette drive and adapter, <strong>monochrome (green) monitor</strong>, monochrome display and parallel printer adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>8</td>
<td>$3,148.00</td>
<td>IBM PC-AT System Unit (256kb memory) with 80286 CPU, keyboard, keylock, clock/calendar, one 5-1/4&quot; dual sided 1.2mb diskette drive and adapter, <strong>color/graphics monitor</strong>, color/graphics monitor adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>9</td>
<td>$4,051.00</td>
<td>IBM PC-AT System Unit (512kb memory) with 80286 CPU, keyboard, keylock, clock/calendar, one 5-1/4&quot; dual sided 1.2mb diskette drive and adapter, one 20mb fixed disk and adapter, asynchronous communication/parallel printer adapter, <strong>monochrome (green) monitor</strong>, monochrome display/parallel printer adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>10</td>
<td>$4,305.00</td>
<td>IBM PC-AT System Unit (512kb memory) with 80286 CPU, keyboard, keylock, clock/calendar, one 5-1/4&quot; dual sided 1.2mb diskette drive and adapter, one 20mb fixed disk and adapter, asynchronous communication/parallel printer adapter, <strong>color/graphics monitor</strong>, color/graphics display adapter, and DOS 3.1 Operating System.</td>
</tr>
<tr>
<td>11</td>
<td>$199.00</td>
<td>IBM Monochrome (green) Display Monitor.</td>
</tr>
<tr>
<td>12</td>
<td>$451.00</td>
<td>IBM Color/Graphic Display Monitor.</td>
</tr>
<tr>
<td>13</td>
<td>$163.00</td>
<td>IBM Monochrome Display/Printer Adapter.</td>
</tr>
<tr>
<td>14</td>
<td>$159.00</td>
<td>IBM Color/Graphic Display Adapter.</td>
</tr>
<tr>
<td>15</td>
<td>$66.00</td>
<td>IBM Asynchronous Communication Adapter.</td>
</tr>
</tbody>
</table>

**Revised Final Prices: 4/4/85**
BACKGROUND The University of Hawaii Bookstore has entered into a volume purchase agreement with the IBM Academic Information Systems Division to allow students, faculty and staff to acquire IBM personal computers at vastly reduced prices. There are 10 fixed system configurations and 5 accessory items available. Systems are priced at approximately a 40% discount and accessories at 30% discount from published standard IBM f.o.b. Honolulu list prices. Orders will be accepted on a first come, first served basis until all 600 available systems are sold. There are 400 PCs, 100 PC-XTs, 50 PC-AT Basic Model 68s, and 50 PC-AT Model 99s.

The agreement with IBM is intended to contribute to the enhancement of computer literacy and academic computer use at UH, in accord with the University's Strategic Plan. With the assistance of authorized representatives at each UH campus, the Computing Center will be responsible for taking applications, verifying eligibility, providing technical information, receiving systems assembly and burn-in, distribution, and warranty support. The bookstore will accept and record all payments for the computers.

ELIGIBILITY Under the UH/IBM ACIS agreement, purchases may only be made by:

* Classified Students of UH who are registered for Spring, 1985.
* Faculty and Staff of UH.
* Certain UH Organizations including RCUH, UH Foundation, and individual staff members of such organizations.

UNIVERSITY DEPARTMENTS MAY NOT MAKE PURCHASES UNDER THIS PROGRAM.

Students, Faculty, and Staff may purchase only one personal computer system configuration. Individual purchasers who participated in the Fall 1984 UH/ACIS program, are not eligible to purchase system configurations at this time. Eligible organizations may purchase more than one system unit. All current and previous purchasers may also select an extra opposite monitor, corresponding monitor adapter, and an asynchronous communication adapter. All purchasers must sign an agreement not to resell purchased units to anyone not already eligible.

COMPONENTS AND WARRANTY All parts and components are standard IBM distribution units. PC-and PC-XT configurations are warranted for 90 days. PC-AT configurations and accessories ordered with such systems are warranted for one year. All systems include Operations manuals, BASIC language manuals, orientation software, and DOS 3.1 operating systems software and manual. Printers and application software are not included as part of the sale.

PURCHASE PROCEDURES Applications will be taken in Keller Hall 111, Manoa, and by representatives at locations announced and posted at each campus. Applications at Keller Hall will commence at 10 a.m., Monday, April 8, 1985 and will thereafter be accepted on weekdays from 9:30 to 11:30 a.m. and 1:30 to 3:30 p.m. until all systems are sold. All purchasers must appear in person with their applications and a picture ID. Students must present their Spring, 1985 registration slips. With their applications, eligible organization purchases must include a purchase order made out to the UH Bookstore for the full purchase amount. Individual purchasers from eligible organizations must present a letter signed by the organization's head certifying their staff status. Fall, 1984 participants ordering accessories, must present their purchase receipts. Application forms are available at the Computing Center, Keller Hall, Manoa, from representatives at each campus, and at the Bookstore.

ORDERING AND PAYMENT If your application is accepted, eligibility and price will be certified. Systems will be reserved at the time a down payment is made and not at the time of application. Your order is actually placed, and all payments are made at the UH Bookstore. AN INITIAL NON-REFUNDABLE DEPOSIT OF $500 RESERVES YOUR PC. The balance of your purchase price must be paid within 7 days from date of downpayment and no later than April 25, 1985. However, purchasers of PC-AT Models 99 systems (Configurations #10 and #11 only), may pay their balances no later than May 15, 1985.

Payment may be made in cash, cashier's check, certified check, travellers check, or credit union check. Checks are to be made payable to the University of Hawaii. Personal checks and credit cards may not be used. You must present your copy of the application form when making payments at the Bookstore. Your receipted application form must be safeguarded -- it will serve as your claim for picking up your system.

DELIVERY AND PICKUP You will be informed by letter and or seminar on pickup procedures and distribution points. To claim your system, purchasers must appear in person with their receipted full payment application form and a picture ID. At this time, we anticipate delivery of all systems except Model 99 PC-ATs' to take place about the 3rd week of May. Model 99, PC-ATs' will be delivered about the 3rd week in June.
QUESTIONS AND ANSWERS

Q: I am a classified registered student this semester, but I am only attending school on a part time basis. Am I eligible to purchase a PC?
A: Yes. Part time or full time, as long as you are a classified, degree seeking student, you are eligible.

Q: I'm broke right now, but will I get another chance at this low price?
A: No.

Q: Will you have the school on a part time basis? Am I eligible to purchase a PC?
A: Yes. However you must obtain a letter from the college indicating your current status. Faculty and staff members holding BOR or civil service appointments need not present such a letter. We have a list of all UH employees.

Q: Will you have the PC Portable available for sale?
A: No. Our agreement with IBM ACIS allows us to have only three types of systems units. We opted for the PC, XT, and AT. The items as listed on the available configuration list are the only items that will be sold.

Q: Will I be able to get education on using the PC that I buy?
A: If you are not experienced in the use of personal computers, we strongly urge you to consider attending one of the many courses offered by the College of Continuing Education, UH Community Colleges, the IBM Product Center, Microcomputer dealers, etc. They offer a wide range of classes on introduction to personal computers, wordprocessing, spreadsheets, data base, and DOS. Joining a PC users group such as Blue Hawaii will also be very helpful.

Q: Help! I can't decide if I should get a monochrome or a color display monitor. Any advice?
A: Don't feel bad -- it's a difficult decision! The monochrome systems offer a higher quality text display which makes for superior wordprocessing, spreadsheet work, and text terminal emulation. The monochrome systems also come with a parallel printer port at no extra cost. The color/graphics systems allow high quality medium resolution for graphics, which is necessary for data analysis and presentation, graphics terminal emulation, or use of many educational programs and games. You need to anticipate how you will use your system in order to make a choice. Of course, for those who want and can afford to buy both a monochrome and a color display, the option is available. With the system that you choose, you have the option of buying an oppositemonitor and/or adapter card from the sale program.

Q: How do I know that I am getting a good deal on prices?
A: The prices for the systems are approximately 40% below IBM list prices, f.o.b, Honolulu, with applicable taxes and transportation charges. Please feel free to shop around. Our goals are to provide an opportunity to students, staff, and faculty to obtain a personal computer that will help them to gain computer literacy. We have attempted to obtain the best possible prices.

Q: Is 256K enough memory for me?
A: That depends on how you plan to use your system. Most applications do not need more than 256K, however, some of the more popular "integrated software" packages require more. You can always buy more memory later if the need arises. The most common way is to buy a multifunction board.

Q: What is a multifunction board?
A: The system that you buy has empty expansion slots that allow you to install additional circuit boards that perform a variety of functions. A multifunction board generally refers to a board that provides an economical way of expanding your system's capabilities with several basic functions that are used by many PC owners, all on the same board, using a single slot in the PC. The more popular boards provide printer ports, serial (asynchronous) telecommunication ports, clock/calendar with battery backup, a game port for connecting up a "joystick", additional RAM memory, and print spooler and RAM disk software. Multifunction boards with fully filled memory of 384K when added to the memory on the PC motherboard enables a total of 640Kb, the maximum addressable on PCs and PC-XTs. Multifunction boards with 64k memory (expandable to 384k) cost about $270. Memory chips can be obtained for $22 per 64k. Multifunction boards for PC-ATs are made differently through use of high density memory chips. Total addressable memory on ATs can be as high as 3 megabytes.
Q: What do I need to be able to connect my PC system to the UH computers?
A: You will need a serial asynchronous communication port and a modem. An asynchronous port is included in the PC-XT and the Model 99 PC-AT, and are commonly included in multifunction boards. You also have the option of buying an internal modem from any vendor you like which fits inside your PC and does not need a separate serial port, or you may buy an external modem to work with an asynchronous port. Finally, you will need a software program to allow your PC to act as a computer terminal. Several such programs may be obtained from the UH Computer Consultant in Keller 218 and copied on to your own diskette.

Q: What about printers?
A: There are so many types of printers with different capabilities in the market that meet individual tastes and size of pocketbook that we did not want to choose one for you. You can spend a few hundred dollars or several thousand depending upon print quality, speed, color, and many special features. Your PC will support, depending upon software used, most printers on the market today including laser and inkjets, thermal, and daisywheel. Printers are classified in a number of ways such as matrix, correspondence quality, near letter quality, and letter quality. Spend some time looking at newspaper and magazine ads, visiting computer stores and checking print quality, speed, noise, and features to make sure that you have the printer with capabilities you need. Make sure that the printer you buy is IBM PC compatible. Although serial printers can be made to run on the asynchronous port of the PC-XT, unless someone gives you one, you should acquire a printer with a parallel interface. Ask the dealer to set the printer dip switch options to run with the IBM personal computers. Remember that if you buy a color/graphics system without the printer port option, you will need to get a printer adapter or multifunction board with that port before you can run a parallel printer. Have fun shopping!

Q: Will all the components be assembled and tested before delivery?
A: System units, adapter cards, monitors, keyboards, etc., will all be received separately. These will all be assembled into ordered configurations and burn-in tested before delivery. However, for Fall 1984 purchasers that order separate adapter cards only, i.e., configuration numbers 14, 15, and 16, the purchaser must perform their own installation into their previously purchased units. Instructions are provided with the adapter cards for performing the installation.

Q: What do I do after I get my system home and it fails?
A: With the exception of PC-AT models, all systems are warranted for 90 days. PC-AT models are warranted for a period of 1 year. At the time you pick up your system, you will be given a handout telling you about warranty service and the telephone numbers to call. The reason that we are able to pass on a large discount to purchasers is because technical support will be provided by the Computing Center. Do not call IBM directly or other IBM PC dealers for warranty service. You should put your system into use as many hours as you can during the warranty period. This will insure that faulty components if any, would be detected and repaired at no cost to you. After the last day of warranty, repair or cost of maintenance programs must be borne by the purchaser.

Q: What Model should I buy -- The PC, PC-XT, AT68, or the AT99?
A: It is very difficult. All the models are powerful computers. Some of us bought the first models of the IBM PC, three years ago, use them everyday for a multitude of applications and still have not used all of the capabilities of the system. Generally, for novice, first time users, you will find the PC model to be more than adequate. For those that require faster operation and more online disk space, the PC-XT will be more convenient to operate. The PC-AT models are approximately six times faster than the PC and PC-XT and are the top of the line systems for the very advanced user. The AT68 referred to as the Basic AT does not include the 20 mb fixed disk or the serial/parallel adapter, both of which are included in the AT99 enhanced model. The AT68 is generally purchased by those who wish to shop around for open market fixed disk with capacities of as high as 80mb, and wish to add their own memories and perform other expansions. The AT99 is a full model package with 512k, 20 mb fixed disk, parallel/serial adapter, plus other goodies that makes it productive from the moment you take it home. Study the configuration list carefully and you will see that each configuration has different features. Obviously you should buy the configuration that has the features that you need. During the Fall 1984 sale program, PCs accounted for 80% of all systems purchased while PC-XTs accounted for 20%. Color systems were 57% versus monochrome systems of 43%.

Q: Do I need a hand truck or a TRUCK to pick up my system?
A: Most any auto will be adequate. Systems will include 3 boxes - one each for system unit, monitor, and keyboard. If you are also buying an opposite monitor, you will need at least a compact instead of a sub-compact.