Using Microcomputer Labs on Campus

For those of you who are just returning to campus from summer vacation, welcome back. We hope you had a pleasant summer. No doubt you have noticed a few changes since your return. We would like to point out one change you may have overlooked. The policy for access to the instructional microcomputer labs run by the University's Information Systems department and subsidiaries has changed a bit. (Information Systems is the parent organization for the West Bank Computer Center, the St. Paul Computer Center, and the University Computer Center, among others.)

Starting fall quarter 1985 (now) the price of a microcomputer lab access card is $20 per quarter. With a lab access card you can use the microcomputer labs located on the West Bank in room 167 Social Science Tower (376-3544), in the St. Paul Campus Library room B50 (376-3910), in room 14 Folwell Hall on the East Bank (376-2741), and in room 148 Architecture (376-9922).

The equipment available in the labs runs the gamut from elderly Apple IIIs and Teraks through IBM-PCs, Zenith Z-100s and Z-150s, and Apple Macintoshes. We suggest you call the labs to find out exactly what equipment they have. Hopefully by late fall quarter there will be a new lab in Walter library. We'll keep you posted. Lab access cards may be purchased from the Williamson Hall Bursar, the St. Paul Bursar, and the West Bank Bursar.

Instructors who wish to use one of the labs as part of a course are welcome to do so. Labs can be reserved for up to two-hour blocks of time for instructional use. Instructors should contact the University Computer Center, the West Bank Computer Center, or the St. Paul Computer Center to reserve a lab. Instructors may also be eligible for free access to microcomputers in the labs to develop instructional software for use in courses. Again, if you are interested you should contact one of the computer centers.
REVIEW: HELIX

Helix, by Odesta Corporation, is a relational data base management program for the Macintosh. Data base programs let you store, organize, retrieve, and sort information (i.e., your data). Helix performs these functions but in a way that is different from other popular data base programs such as Microsoft File and Ashton-Tate's dBase II. Helix does not rely on a structured menu format or a programming language. Instead, you give Helix commands and specify the structure of your data base by working with a series of icons that represent the functions you need to define and organize your data. Rather than typing commands, you use the Macintosh mouse to select and manipulate the icons on the screen.

Requirements
The Helix program consists of three diskettes (a program disk, a resource/work disk, and a guided tour disk), a manual, supplement guide, notepad, and an audiocassette that goes with the guided tour. Helix requires a 512K Macintosh with an external disk drive. The program takes 260K and the system (with three fonts and the new printer driver) takes 132K of disk space. If you want to use the on-line help files (20K) and include extra fonts, you must use space on your data disk. The most elegant solution is to use a hard disk. The resource/work disk (214K) includes the on-line help and five example data bases: an inventory system, a checking account system, a form letter system, a custom help-making system and a library management system.

Icon Terminology
To use (or discuss) Helix you must understand how a data base is organized and learn the Helix icon terminology. A data base is a collection of information which is organized by fields and records. An example of a data base is an employee list, another example is a list of names and birthdates ordered by month. A field is a single unit of information, such as a last name or a birthdate. A record is a collection of fields which refer to one person or thing. An example is a collection consisting of one person's first name, last name, and birthdate. To create a data base you need to define the fields, make a layout of the record, enter your data, and decide how you want the data to look when it is printed. You may also want to make calculations or sort the data in a particular order.

Helix relies on nine icons for organizing and manipulating all of the information in the database. The nine icons are Helix, Collection, Relation, Field, Template, Selection, Abacus, Query, and Index. Each icon is a symbol which defines one part or operation of the data base.

The picture on the right shows a window with a gray area containing seven icons. The trash can icon (located at the bottom of the gray area) is used to delete files. The white area is where you can drag and manipulate the icons.

The icons you see in the gray area are actually wells of icons. With the mouse you pull as many icons as you need from each well into the white area. In the white area there are six icons used to design and manage your data base. The Field icon is a symbol for the field name and data format. The Template icon is a symbol for the structure of any form you want to create: entry, display, report, or summary. You design a new template for every form you want. The Index, Query, and Abacus icons are the means of sorting, asking questions, or making calculations on your data. The Index icon is a symbol for a sort sequence. The Query icon is a symbol for a search on a specific field. The Abacus icon is a symbol for a calculation you construct to act on your data. You can define any number of sort sequences, queries, and calculations. The Selection icon acts like a master switchboard. It allows you to select a form for data entry or to select the criteria and access any form for data display. You can select one form, one sort sequence, and one query or calculation sequence at a time. For example, you can select a query to display a grand total of vacation days used, a sort sequence by last name, and the form that allows you to display these particular fields.

The Field Icon
We will use the Field icon to illustrate in detail how one of the icons works. The Field icon lets you name an entry field, define its data type, and define the data type format. You do not need to define the size of the field. To create a field, click on the field icon well in the gray area and drag a field icon into the white area. Name it by typing from the keyboard. The name can be as long as you like and can contain any number of spaces and special characters. Double click on the field icon. A dialogue box appears to let you select one of four data types: text, number, date, or flag. Text is the default type (and requires no further definition). If you select number, you have the option of selecting a number format as well. By clicking the appropriate button you can specify that the numeric format include commas, a dollar sign, percent, scientific notation, and decimal fractions. The date and flag types also have format options that let you select how the data is displayed. Create all of the fields you need for your record in the same way, using one field icon for each field. Helix lets you change the formats at any time, but once you have entered data or quit the program you cannot change the data type.
Each of the remaining five icons has its own special window, gray pallet area, and sets of icon tools and rules. The icon tools allow you more options. For example, the template icon tools let you choose to display your data either with or without a border or with or without underlining. At first the choice of options may seem confusing, but as you become familiar with Helix, you will be able to manipulate the icon tools very quickly.

How to Create a Helix Data Base
Because the Helix command structure is different from typical data base packages, it is useful to have an overview of how you actually use Helix. Incidentally, if you are experimenting with Helix or any data base program it is a very good idea to begin with a small sample of data rather than entering all your data immediately. If you enter large amounts of data first and experiment later, you may find that there are problems with your data base design that necessitate re-entering all your data. It is generally agreed that re-entering data is not a good thing. We suggest that you define all the fields you need, but enter only about ten records initially.

• Designing A Form
Double click on the template icon. You are presented with a window with ten icon tools and a 14" by 15 1/2" grid for drawing rectangles to hold either labels or data fields. Once you get the hang of using the mouse to draw the rectangles, you can design a form very quickly. There are three fonts to choose from: Chicago, Geneva, and Monaco. If you want to use other fonts you can add any of the Macintosh fonts to the system file. Label names can be as long as 255 characters. Characters per field and fields per record are limited only by disk space. This means that your fields can contain lengthy notes, but limited disk space will prevent you from having very many records. This is an example of why a hard disk is very useful with Helix applications. You can cut/copy and paste only one field at a time. This can be a disadvantage until you discover some of the shortcuts that are not covered in the manual. For example, if you want to display the results of any calculation, the field for displaying the result must appear at the top of the template form. We designed our form before we realized this, so in order to draw our calculation field at the top, we had to move our entire form down on the page, one field at a time. This was very tedious. We learned that by surrounding the entire form with the repeat rectangle icon tool, we could move all the fields at once. You can change field sizes and redesign forms at any time.

• Entering Data
After you design your entry form, you will want to enter your data. To access your form for entry, you must create a selection icon. To do this drag a selection icon into the white window area and name it. Every selection icon you name will automatically contain a list of the names of all forms, queries, calculation queries and sort sequences you have defined. From the Selection window you choose the form you want.

With Helix you enter data as if you were filling in a form. This can cause problems if you accidentally type a space before the first character. On a paper form you wouldn't notice the extra space, but in Helix this can cause problems. For example, if you sort your data the records which have a space before the first character appear out of sequence on the display form. The number of records per file is limited only by disk space. There is no provision for field replication, hidden fields or picture data (as in Microsoft File) or default fields (Blyth Software's Omnis 3). You can add or delete fields from the template whenever you want.

• Displaying the Form
Each time you want a new form, you name and define a new template icon. To create a display form, there is another rule: you must draw a repeat rectangle around all data fields defined on the form. This means you can use your entry form for a display form if you draw a repeat rectangle around it.

• Organizing Data
After you enter your data you can sort it, search for a specific record or range of records, and make calculations. With Helix you can define a one- or two-level sort sequence and display a sorted list in a few seconds. You can define and select a sort sequence before you enter data.

The abacus icon lets you construct calculations with a choice of 52 Calculation Tiles including arithmetic, flag, boolean,
Unfortunately, few examples are given in the manual. One of the biggest problems with this version of Helix is that Calculations are display only; the values cannot be stored into the data base.

The picture on page 3 shows a query made with the Abacus icon Calculation tiles. We asked it to find from our data base all the employees who made $20,000/year or more and took more than three sick days. With Calculation Tiles you don't need a programming language.

Limitations
We created a list of names and birthdates and sorted them by month. We were not able to sort by last name when we entered the first and last names as separate fields to sort by the last name. Note that this is a problem common to nearly all data base packages. Typically you design the fields in your record to work around this kind of problem. Next we wanted to order the list by month of birth. We changed the date from text format to numeric format Helix did not recognize numerical order. For example, 3/17/52 came before 3/7/50. Again, this is a problem in our record structure as much as in Helix. We should have made month a separate numeric field if we wanted to sort by month (or entered dates in the form: 03/07/50).

You can print all templates, calculations, forms and lists as long as they are displayed on the screen. There is a print menu which allows you to select from several paper sizes for labels and envelopes. Alas, there is no report format. This means that at this time you can't have a 10 page report with headers and footers or page numbering. You can print mailing labels, but only 1 row across and up to 128 labels at a time.

Support
Helix offers the user very good support. There is a toll-free number for customer help listed under the Apple desk accessories menu. We called them several times and they gave us useful and friendly service. There is also fairly extensive on-line help with the option of creating your own help files, a resource disk with example data bases, and a detailed guided tour and manual.

The Guided Tour audiocassette and diskette introduce the use of all icon tools with the example of a public library system. It demonstrates how you get immediate feedback when you construct a number of different forms and use the multi-window capability. You see how entering data in one form instantly updates lists or calculations in another. There is also Quick Start, a simple, introductory lesson. It presents one data base named Salespeople with four fields: date, name, sales and quota to show you how to use the six icon tools. It is worth reviewing the Guided Tour after you practice on your own data.

The manual thoroughly documents each icon by chapter. The appendix describes printing, dumping and loading files, and creating custom help files. In spite of the imitation suede cover, the text of the manual does not give enough step-by-step directions or examples. The index is cross-referenced but should be longer. For example, after we entered data we wanted to display it. There is no entry for "display" or "list" in the index.

Conclusions
Helix is for the user who enjoys designing and modifying a database with icons in a visual, free-form environment rather than using the traditional approach of typing commands. Learning Helix takes time and is not worth it if you have only straightforward applications such as mailing lists. The manual is not set up for instructing the beginner who has no experience with data bases.

Version 1.3 of Helix has some limitations. The most noticeable limitation is its inability to store calculated values and its inefficient method of figuring subtotals. You must create a new Calculation Tile for every subtotal you want. For example, to subtotal the amount of money you spend on food per month, you must set up a new Calculation Tile for each month. Helix Version 2.0 is due in a couple of weeks. We have not seen it, but Helix tells us it will overcome many of the limitations we have discovered. Version 2.0 will include 29 additional Calculation Tiles so that you can store calculated values into a field, order dates by month, and use picture data types, and default fields. Updates for all future versions are free. If you are interested in looking at Helix, please visit the Micro HelpLine for a demonstration.

REVIEW: CRUNCH

Paladin Software calls Crunch "The Power Spreadsheet for Macintosh" and its claim is well-founded. Crunch provides almost all of the capabilities of Lotus 1-2-3 (the most popular spreadsheet for IBM machines) plus it takes full advantage of the features of the Macintosh.

Spreadsheet
Crunch uses the standard spreadsheet format. Columns are labelled by letters A-IP (for 250 columns); rows are labelled by numbers 1-9999. The screen displays seven columns and 15 rows using the default font and column-width. You can scroll through the spreadsheet by using the scroll bars to move one cell or row at a time, a screen at a time, or much larger jumps. You can also use the "goto" facility to move the window to a particular cell. Special effects are available like bold, italics, or underline on an individual cell basis. You can also select different fonts, but font changes affect the entire spreadsheet.

Across the top of the screen is the familiar Macintosh menu bar which includes the Apple, File, Edit, Format, Font, Directory, Graph, Database, and Special. A notable feature of Crunch is the row of 21 special icons that appears between the menu bar and the spreadsheet. These icons enable you to select common functions with a single click of the mouse. The icons include print; erase; copy to the right or down; select currency or comma format; center, left, or right justify; increase column width; select bold, italics, or underline; display a pie, bar, area, or line chart; perform data base operations; and recalculate the spreadsheet (if you have selected manual recalculation). Suppose, for example, you have all your column headings in row one. You can make them all bold and centered with just three clicks: click on the row number to select the entire row, then click on the Bold and Centered icons.
Crunch has 74 built-in functions: math functions, logical functions, statistical functions, and financial functions. You can also create your own functions and include them in a directory to be called up at any time. Crunch also allows you to link your spreadsheets. When information changes in cells that are linked to other spreadsheets, the spreadsheets that use the information are automatically updated.

Notes
Crunch provides a word processing window called Notes in which you can enter information about your spreadsheet. Here you would put a description of your formulas, assumptions, anything pertaining to the spreadsheet that you want to have available but not part of the spreadsheet itself.

Graphics
Crunch provides standard graphing options with some added flexibility. Once you have selected your data range by dragging across it with the mouse, you can select a pie chart, bar chart, line graph, or area graph by clicking on one of the four special graph icons. The graph immediately appears in a window which fills about half the screen. By double-clicking anywhere in the graph window, you get a dialogue box with options for formatting your graph. You can give it a one-line title, change its size, add legends, decide to plot by row rather than by column, and, if you are working with a bar graph, choose among stacked, perspective, and side-by-side bars. Further dialogue boxes allow you to choose among 10 patterns and 10 shapes (for line charts), select grid lines and tick labels, and enter titles for the x and y axes. You can then print your graph simply by clicking on the printer icon. Or, using the Clipboard, you can move the graph into MacPaint for further modification or into a MacWrite document.

Data Base
Although Crunch is primarily a spreadsheet package with supporting graphics, it can also perform some very simple data base functions. After defining a range of cells as your data base, you can sort it, and you can tell the program to display or calculate only those rows that fit some criterion. You can delete selected rows or copy them to another part of your spreadsheet. That's about all.

Printing
Crunch supports both the ImageWriter and LaserWriter printers. You can choose to print an entire spreadsheet or only a selected range. You can print your Notes, the graph in the active window, or all the graphs associated with the spreadsheet. You can print down or across the page. If you are printing your spreadsheet, you can choose not to have the grid lines printed, and by selecting 50% reduction, twice as much will fit on a page. Crunch will print with or without page breaks, and give you page numbers if you want them. How much will fit on a page depends on font size and column width.

Evaluation
The menus are a little sluggish, but you don't have to use them very often because most operations are included in the special icons. The spreadsheet itself is extremely fast. Crunch does not support macros (neither does Multiplan or Jazz). Paladin is working on macros and has announced that an upgrade will be available later in the year. The only other limitation is that Crunch will not import files from any other package. You must enter all information directly into Crunch.

Despite these limitations, Crunch has a lot going for it. We particularly liked the row of special icons that enable you to perform the most-frequently-used functions with one click of the mouse. Data entry, graphing, and printing are easy and flexible. Another feature, unique among spreadsheets we have seen, is the ability to protect areas of your spreadsheet with passwords. You can select a range and "hide" it so that only those with the password can see the contents of the range. Or you can "freeze" a range so that those who don't have the password can see the contents but not change them. This could be useful, for example, for personnel information. The person using the spreadsheet could see and access things like name, Social Security number, appointment, vacation, and sick time, but couldn't inadvertently modify or erase formulas. There is an on-line Help facility that you access through the Apple option on the menu bar. You can quickly get a list of all the built-in functions and their parameters, or an information window on each of the commands. Crunch's copy-protection uses the key-disk scheme, but you don't have to use the key disk every time you start up. You need it one time every 20-30 sessions.

The manual is excellent in both layout and coverage. After a short overview, there are chapters on Building a Worksheet, Analyzing and Interpreting a Worksheet, Preparing Worksheet Reports and Presentations, and Reference. The table of contents is so thorough and clear you don't really need the index, though the index is very well done. For each topic there is a short description followed by specific commands and their results. Where appropriate, there is also a picture showing what the screen will look like as a result of your actions. We would like to see Paladin include the spreadsheet examples that the manual uses on the disk. Still, this is one of the best manuals we have seen.

Crunch is a powerful spreadsheet package with far more capabilities than could be covered here. We have a copy of Crunch in the Micro HelpLine if you would like to stop by and try it out. It is available at the Minnesota Bookcenter for $170.

NEWS: WordPerfect Printer Support

SSI (the WordPerfect publisher) sent the UCC Microcomputer HelpLine a disk which contains support for the 116 printers that work with WordPerfect (WP) Version 4.0. This includes support for the HP LaserJet Cartridges A, B, C, D, E, F, G, H, L, M, N, and Q, for the HP ThinkJet, IBM Proprinter, and IBM Color Jetprinter. If you are using WP and want to print with a printer that is not on your "Select Printers" list, call the Micro HelpLine (376-4276) or stop in to see if the printer you want to use is on our list. If it is, we can copy WP's printer support onto one of your formatted diskettes.
MICROCOMPUTER TIPS: Protect Your Disks

Few things in life are more frustrating than losing days or weeks of work when your only copy of an important disk is lost or destroyed. We are hearing from entirely too many of you with complaints about your diskettes going bad. We would like to remind you that this disaster should never happen! Save yourself an anguished call to the Micro HelpLine. By following a few simple precautions, you can ensure that it won't happen to you.

A floppy disk is a thin, circular, fragile plastic disk, housed in a protective shell which may be flexible or rigid. The disk is a magnetic medium. By magnetic medium we mean that your computer's disk drive uses a magnetic field to place information on the disk and remove information from the disk. It is essential that you protect your disks from other magnetic fields. If a disk comes in contact with anything magnetic, it will be erased. Some sources of magnetic fields are immediately obvious, such as the small household magnets we use to post messages on our refrigerator doors. Other magnetic fields are less obvious, but equally dangerous when placed near floppy disks. They include electrical motors, such as those contained in small desk-top fans, electric pencil sharpeners, or children's toys. Your telephone produces a magnetic field when it rings, and speakers and earphones contain magnets. Computer monitors also produce magnetic fields when operating; therefore, it isn't a good idea to throw your disks on top of your monitor. It is wise to store your disks at least 2 feet away from anything containing magnetic fields.

It is also important to protect your disks from temperature extremes. The plastic diskette may be damaged at extremely high or low temperatures. So it is not wise to leave your disks in a hot car in the summer. The plastic may melt or deform and become unusable.

You can ruin your disks if you touch the magnetic medium on the diskette that is exposed through the oval cut-out in the disk's protective shell. The oil and perspiration on your fingers will destroy this fragile material. Dust and other air-borne contaminants (like cigarette smoke) will also damage disk media, so flexible floppy disks should always be placed in their covers and stored in a protective case when not in use.

In general, you should remember to handle disks carefully. Never throw them around or place heavy books on top of them. Flexible floppy disks must always be stored in a rigid container, such as a disk file. When transporting flexible disks carry them in a cardboard or plastic container to avoid bending them. You can't crumple up disks in your backpack and expect them to give you good service.

Unfortunately, despite your best efforts to protect them, all of your disks will go bad eventually. Therefore, you should plan for that sad day. Make frequent backups of all your important disks. In fact, it is wise to have more than one backup of important files on two or more different disks that you will store in at least two different locations. Then if disasters such as fire or theft occur at one location, you will have a backup copy elsewhere. As they say on Hill Street Blues, "Hey, let's be careful out there."

NEWS: Microcomputer Discount Program

- AT&T Truckload Sale

The Minnesota Bookcenter is holding a one day sale of the AT&T PC 6300 microcomputers on October 9, 1985. Both the floppy and hard disk versions of the PC 6300 will be available. To refresh your memory, the floppy disk version of the PC 6300 is an IBM-PC compatible with an 8086 processor, 256K memory (expandable to 640K), seven vacant expansion slots, two floppy disk drives, a 12" diagonal monochrome monitor, one RS-232 serial interface, one Centronics-style parallel interface, and the MS-DOS operating system. The hard disk version is the same as the floppy disk PC 6300 except that it has six vacant expansion slots, one floppy disk drive, and a 10 MByte hard disk drive.

On October 9th you will be able to get immediate delivery of both versions of the PC 6300 and the price will be reduced (for one day only). The floppy disk version of the PC 6300 is normally $1810, and the hard disk version $2700. During the truckload sale the floppy disk machine is $1776 and the hard disk PC 6300 is $2676. You may also qualify for AT&T's Opportunity Calling program. Opportunity Calling is a program that allows you to get a rebate from AT&T for certain purchases (including the PC 6300). Depending on the amount of long distance calling you have done through AT&T, you may be able to get a rebate of up to $500. According to the local AT&T salesman, students who buy machines under both they and their parents names can use their parent's long distance bill for Opportunity Calling. If you want details about Opportunity Calling, call AT&T at 1-800-345-4345.

- New HP Laser Printer Products

Good News: Hewlett-Packard (HP) has reduced the price of their LaserJet Professional, and introduced a new laser printer called the LaserJet Plus and extended the warranty to one year. HP offers an upgrade kit so current LaserJet Professional owners can upgrade their printers to the new LaserJet Plus. HP says all existing Professional software can be used with their Plus. As far as we have been able to determine, the only important difference between the LaserJet Professional and the LaserJet Plus is print resolution for graphics. The LaserJet Plus can print a full page of graphics at 150 dots per inch resolution. The LaserJet Professional's full-page graphics resolution is limited to 75 dots per inch. Both the Plus and the Professional print text (alphanumeric characters) at the same resolution: 300 dots per inch. The University's price for the LaserJet Professional is $1715, the LaserJet Plus is $2286, and the Professional to Plus upgrade kit is $855.

Bad News: We don't know yet who will install the upgrade, how
much installation will cost, what the delivery time is for the LaserJet Plus and upgrades, or when we will have a LaserJet Plus in the Microcomputer HelpLine. So far we have only read advertising material about the LaserJet Plus. Since we haven’t tested a real LaserJet Plus ourselves, we cannot comment on its features.

• Special Price on Lisa and Zenith Z-100 Microcomputers

The Minnesota Bookcenter has 2 Apple Lisa microcomputers in stock. Recall that Apple has discontinued production of the Lisa. Also recall that Apple will support the machine for five more years. This is almost certainly your last chance to buy a Lisa through the Microcomputer Discount program. If you are interested, phone Colleen at the Minnesota Bookcenter (373-5734) and you can purchase Lisa for only $2615.

The Minnesota Bookcenter also has two Zenith Z-100s in stock. Both machines are model ZF-111-32 with two floppy disk drives, 8085 and 8088 CPUs, 192K memory, one parallel printer port, two RS-232 serial ports, CP/M and Z-DOS operating systems. If you are interested, phone Colleen at the Minnesota Bookcenter (373-5734) and make an offer.

NEWS: Software Update for Tecmar MacDrive

If you purchased a Tecmar MacDrive hard disk through the University Microcomputer Discount program, you should know that we now have the new Version 2.2 of the MacDrive software. MacDrive Software Version 2.2 allows the MacDrive to co-exist with the LaserWriter and AppleTalk Network. It also allows you to use the current version of the Finder (Version 4.1). You can obtain a copy of this software and the new manual by bringing your receipt and a blank disk to 125 Shepherd Labs during regular Micro Help-Line hours.

USER'S COLUMN: Real-Time Data Acquisition on the Mac

by Neil Stuber and Jim Pirie
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We are collecting and analyzing gel permeation chromatography (GPC) data with our Apple Macintosh. GPC is an analytical technique for separating polymers of various sizes and measuring the concentration of each size so that the average size can be found. This system on the Macintosh has worked very well. The data collection has been done without problems and the users have found operation greatly simplified by the Macintosh's graphic interface.

The A/D collection is done using the Lynx system made by Prolog. This system consists of a 13 slot card-cage using the STD bus and a circuit board with a Z-80 CPU microprocessor, support chips, timer chips, 4K RAM, 2 serial ports, and 4K ROM containing programming for serial communications. We are using a 12 bit analog to digital (A/D) card from Data Translations for collecting GPC sample data and a digital input/output (DIO) card from prolog for reading a signal from the GPC marking the beginning of a sample. Here is a functional diagram of the system:

MacIntosh Computer

Lynx card-cage

CPU card

DIO card

A/D card

Waters Model 150-C GPC

We chose the Lynx system for two reasons. First, the STD bus used by Lynx is a very common bus and circuit boards exist for A/D, DIO, thermocouples, stepper motor and power control, and many other uses. Second, since Lynx communicates through an RS-232 serial interface we can connect it to almost any other computer that has a serial interface.

The programs for data collection and analysis were written with Microsoft BASIC Version 2.0. The data collection program continuously collects data at an interval set by the user and plots the data using the Macintosh screen like a strip-chart recorder. The screen has a scroll bar which allows the user to scroll backward and forward through the data to see baselines and compare runs. User-specified GPC data is stored onto disk for later sample analysis. The analysis program plots the GPC data and allows the user to select sample peak(s) and the baseline by clicking the mouse on the screen plot.

The data collection and analysis system on the Macintosh replaced another system on a PDP 11/60 which was more difficult and expensive to use and not always available for real-time data acquisition. Real-time data monitoring was impractical on the PDP 11/60; the user didn't know if the data was being successfully collected. Also, GPC data analysis requires more than number crunching. It involves viewing and manipulating plotted data, which is not readily accomplished from a terminal keyboard.

The major limitation to the Macintosh-based system has been the 9600 baud communications rate between the Lynx and the Macintosh. This speed limitation forced us to write an assembler program for the Lynx's CPU to use the Lynx timers and microprocessors. This small Z-80 assembler program collects data at desired intervals, performs signal averaging, and sends the results to the Macintosh. If fast communications are not required, commands could be sent from the Macintosh to request analog data conversion and to receive digital data results.

We are very pleased with the Lynx system and have planned more uses for it. We are considering minor modifications to the communications ROM to increase the baud rate to 38400 baud. Ultalink International also makes interface cards for the STD bus and for the IBM-PC that allow very high speed communications. We are considering using this for controlling and collecting data from our reaction injection molding laboratory equipment.

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