Volume 5, Issue 4 April, 1983
$1.50

TRS-80® Microcomputer News

- Database Issue
- Model 100
- PC-2 Assembly Language-Part 2

View from the Seventh Floor

Jon Shirley
Vice President
Radio Shack Computer Merchandising

I am told this issue is devoted to communications and databases. I happen to be one of those who feel that communications will involve more and more microcomputers and will move from the office to the home. Today you can subscribe to CompuServe, Dow Jones, The Source, and some small local bulletin boards. Tomorrow the sky's the limit.

Staying with today, if you are a TRS-80 owner who has never talked to a remote database, you are missing out on one of the real utilities of your computer. For example, both CompuServe and Dow Jones have encyclopedias online. Need information on bats? Call up either service, type in bat, and you will get every reference to bat in the encyclopedia, and you can read the article you want. Remember, this is not just for the kids, this is a fine reference for everyone.

Going on a trip? Dow Jones can tell you the weather and forecast around the U.S.A. And in a few months, the O.A.G. (Official Airline Guide) will start a new database service allowing you not only to get flight schedules but to get the most elusive data of all, air fares. In fact, they intend to let you ask for the cheapest way to get from point A to point B. Of course, you might be surprised by the results. I once found that to get from New York to Portland the cheapest way was to fly from N.Y. to Chicago to Dallas to Portland.

The OAG is an ideal example of a database that needs to be available online rather than in the books they publish today. The reason is that they make about a million changes per month, so their book has errors the day it is printed.

Of course, there are many other online things to do. To name just a few, there are games, news, sports, stock information, electronic mail, the special interest electronic mail groups that infest CompuServe, shopping services, electronic banking, and, of course, C.B. (For the novice, C.B. on CompuServe works just like a citizens band radio except you are USA wide when you sign on.)

What will be available in the future? Certainly learn at home and work at home will be major uses of the home computer connected to the telephone or cable line. Work at home is already being done by a few enlightened companies to help employees avoid long commutes. Online medical assistance could help save many lives in remote areas. How about online voting or car registration renewal or all the many other things that Uncle Sam makes us do by going to some building with indifferent employees and without parking.

The possibilities are endless. If this has made you a little interested, why not go to your local Shack and get online yourself? We can demonstrate CompuServe or Dow Jones and let you cruise through the menus. We can also show you one of the largest online computer systems in America, the Radio Shack SOS system.

SOS means store operating system, and it works with every one of the 4500 or so Radio Shack stores in America going online to Fort Worth every day using a standard Model III and a direct connect modem. They send us the daily sales information, their payroll records, and merchandise orders. We send them inventory data and program updates. And all of this is fully automatic.

All it takes for you to go online is a modem, an RS-232 interface which is built in to most of our computers, and some Videotex software. The Videotex software includes the sign up information for CompuServe and Dow Jones and a free hour on each to get you started. I hope you don't think all this neat stuff is free? While not free, it's not very expensive. And it is popular, with Dow Jones now having about 60,000 subscribers and CompuServe about 36,000.

And I would be remiss not to mention our newest online service, AgriStar. This is a fantastic service for the farmer or investor in farm products. If farming is a part of your life, come in for a demonstration. All computer centers and most rural Radio Shack stores can give you a real run through the power of AgriStar.

You Model III disk owners might take a look at a new package, Videotex plus. I use this one at home every night as it supports our auto dial modem. All I do is put in my diskette, answer the date and time, and stand back. Videotex plus dials up Dow Jones, logs me in, asks for some quotes on stocks I follow, and then lets me check the news. I can store what I receive in RAM or save it to disk or print it. I can store call up routines for several different services, and I can define certain keys to send a message. This is really the no hassle way to communications. Model II owners, your version will be out soon.

Of course, if you want the ultimate communicating computer, you need our new Model 100. It is featured elsewhere in this issue, but I do want to put in a proud pitch for what I believe is a breakthrough product. With a Model 100, you can move a cursor over a file name, press enter, and the 100 will call a database with its auto dial modem, log you in, download the information you want, sign off, disconnect the phone line, and turn itself off! The information will be waiting in memory for you to see whenever you want.

And the Model 100 is one of several reasons that my column has not been too regular lately. There are a bunch of other neat new products in the works, and I need to get back to work on them.

Until next month (I hope).

TRS-80 Microcomputer News
Volume 5 Issue 4
APRIL 1983

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TRS-80 Microcomputer News is published monthly by Radio Shack, a division of Tandy Corporation. A single six month subscription is available free to purchasers of new TRS-80 Microcomputer systems with addresses in the United States, Puerto Rico, Canada and APO or FPO addresses. Subscriptions to other addresses are not available.

The subscription rate for renewals and other interested persons with U.S., APO or FPO addresses is twelve dollars ($12.00) per year, check or money order. Single copies of the Microcomputer News may be purchased from Radio Shack Computer Centers or Computer Departments for $1.50 suggested retail each.

The subscription rate for renewals and other interested persons with Canadian addresses is Fifteen dollars ($15.00) per year, check or money order in U.S. funds. All correspondence related to subscriptions should be sent to: Microcomputer News, P.O. Box 2910, Fort Worth, Texas 76113-2910.

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TRS-80® Microcomputer News

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New Disk Videotex for the Model I/III

by Annette Zamberlin-Main

Back when I first started in this business, about a year ago, I found that logging-on to any of the commercial data bases offered by Radio Shack, with my Model III, was a bit of a chore. But being the young neophyte that I was, I dutifully went through my log-in routines and was able, after a period of time, to get on-line with a steadily increasing amount of ease.

The TRS-80 Model I/III Disk Videotex system is easy to use, yet provides a high level of versatility. The whole idea here is the efficient and flexible handling of information.

There are three major modules in the Videotex system:

VIDTEX A general purpose communication program, for use with most information services and host computer systems. This module is used to set your system up for a particular host and then perform the communications function. A special set of function keys (the "Control" and "Meta" keys) allow you complete communications control and provide the flexibility necessary to utilize a variety of host systems.

A special feature of VIDTEX is that it allows you to use the computer's memory, or RAM buffer, for information retrieval. Information can be saved, printed, or stored on diskette for later reference or editing.

VIDTEX S If you subscribe to a "Store and Forward" information service, you can save on connect time by utilizing the Advanced Storage Mode option of Videotex. This module allows you to load a program, select your menu choice, log-on to the service, and receive and store up to 48 pages of text on a 48K system or up to 28 pages of text on a 32K system.

VIDEDT The preparation of Auto Log On and Auto Dial procedures can be accomplished with this module.

Let's take a short walk through the package to see how it works.

My main components in this tour are a 48K 2-Disk Model III (26-1066), Modem I (26-1172), telephone (43-340), and the Videotex package (26-2225).

After the initial power-up procedure and at TRSDOS Ready type:

VIDTEX ⟨ENTER⟩

A screen should appear with the appropriate copyright information and just below it,

Data Carrier Lost!

My next procedure would be to manually dial the local access number of the data base, and after receiving a high pitched tone, flip my modem switch to ORIG.

The screen should now read,

Data Carrier Restored!

If I had chosen to do so, I could have created an auto dial program (for an auto dial modem) and/or an auto log on procedure with the VIDEDT module before going into the VIDTEX module.

And that's it! I would next go through the standard log-on procedures for the data base.

I may utilize a whole spectrum of options, called Meta functions, to control the VIDTEX module. For example, I can open a RAM buffer, save a RAM buffer to disk, and turn my printer on or off.

To execute a Meta function, simply hold down the ⟨↑⟩ key and press the key corresponding to the function you want. The Meta key functions are:

RAM Buffer	Local Control	Miscellaneous
C Close	B Break Words	A Abort
D Display	E Enable Clean	F Function Keys
G Get Screen	N Narrow	H Help
L Load	R Printer On	I Init Auto Dial
O Open	T Printer Off	M Menu
P Print	W Wide	Q Query Status
S Save	* Print Screen	X Exit
U Unedited Save	CLEAR Clear Screen	
V Transmit		
Y Transmit W/Prompt		
Z Zero		

CHANGING THE DEFAULTS

VIDTEX sets the communication hardware to the following settings:

Baud rate:	300
Data bits:	8
Stop bits:	1
Parity:	None

If you find that you need to change any of these settings, or a few additional ones such as LOG ON TIMER, LOG ON RETRY, LOG ON DEFAULT DRIVE, DUPLEX or XON/XOFF SUPPORT, the Meta-Q function is designed with just this in mind. By typing ⟨↑⟩ Q, you are given a menu which will prompt you for the items you wished changed. The first three settings are changed with hexadecimal values. The software documentation should also be consulted at this time for further discussions on the above settings.

SCRIPSIT AND VISICALC

If you have SCRIPSIT or SuperSCRIPSIT software, you can work with the Videotex RAM buffer contents that were previously saved on a TRSDOS disk file. Both the 1-Disk system or 2-Disk system have this capability.

(Continued on Page 6)

Data Bases and Communications For Starters

The words data base have a host of different meanings depending on the user and application. The meanings range from an integrated system of software accessing a large common data area to a small computer with a limited scope of information. The element which all data bases have in common is that programs can access multiple stores of data and information. This information is called a data base. Since this issue of the *TRS-80 Microcomputer News* is devoted to Communications/Data Bases, the focus of this article will be to explain various data bases and give you an idea of where to start if you wish to access one.

The information on a data base can encompass everything from games to mailing lists and from programs to a chat mode with the system operator. These data bases will fall into three broad categories: commercial, business, and recreational.

The Commercial data base is usually a large collection of programs, data, or information services which allow the microcomputer user to perform beyond the scope of a microcomputer. A commercial data base differs from other data bases, in so much as its users will be charged per minute of use. The price of the service is worth it, if you consider what can be done on the large information data bases.

CompuServe is possibly the best known of all the commercial data bases. It is a data base which will allow the user almost unlimited access to information. For example, CompuServe has a news service for information on current events, weather, electronic mail, games, services for special interest groups, stock quotes, an upload section, and much more. It will also allow users to create their own programs using various languages (COBOL, BASIC, FORTRAN, etc.). This is just a sample of what is available through CompuServe. For further information and a demonstration contact a local Radio Shack Computer Center.

Dow Jones is another well known commercial information data base. It provides users with up-to-date information on the stock market. The service updates the information on common and preferred stocks, corporate and foreign bonds, mutual funds and options, plus selected U.S. treasury issues traded on popular exchanges. This information is updated every 15 minutes to make sure the user receives current information.

A third commercial data base is Westlaw; this is a service operated by West Publications Inc. which provides information to the legal profession. The service consists of a large library of federal and state laws plus access to the U.S. Code and the Code of Federal Regulations. This is an invaluable research tool to a law firm. It will save hours of searching thru law books for information.

The foregoing is but a small representation of the number of commercial data bases available. There is a growing number of services which offer everything from mailing lists for retail purposes to computer time sharing for the enhancement of your micro.

Another type of information data base is set up for a specific type of business purpose. There is an unlimited array of data base designs which can be accessed with a TRS-80 microcomputer. The reason for setting up and accessing a business data base is twofold. First, it allows the Host computer to off-load small, local jobs to the microcomputer, and, second, it allows the microcomputer to take advantage of expanded memory capabilities on the host. For example, the microcomputer could do jobs such as accounts payable and accounts receivable for the local office or a mailing list for local customers. Plus, the microcomputer can do word processing and keep track of information which is unique to a particular office or region. Then, when the storage and memory of a mainframe is needed for something like company-wide planning or a job which encompasses the entire company, the power of the mainframe is there. Furthermore, the manager of a remote location may keep a smaller data base on the microcomputer plus receive large blocks of important data from the mainframe. This will give the user more timely information and allow greater control of the local office.

Consider what a good business data bases will do. As an example, a large retail company could use it for recording daily transactions. During the working day information is entered into a microcomputer at the local stores. This information might include employee time calculations, inventory decrease from sales, and the daily sales summary. Then, during the middle of the night, the mainframe at the home office (anywhere in the world) calls the microcomputer. The microcomputer transmits the information to the home office; the weekly stock order is placed, the daily time for the employees is entered, and the sales summary is computed. The store then receives back price changes, electronic mail, and inventory activity for the month. All this is done in just a few minutes. It allows the use of a mainframe to do computing not possible or practical on a microcomputer while minimizing the expensive price tag of a mainframe.

The last type of data bases is the recreational or personal data bases. This is a data base that is created by a local user or microcomputer club for the enjoyment of the operator, and any microcomputer user which might access the system. Most of these small data bases are free to the user and offer an almost unlimited amount of enjoyment and information to fit any personality from matchmakers to byte heads. There is a multitude of information at your finger tips. To find one of these data bases which are accessible from most major cities look in any microcomputer magazine. Also, once you get on

a local data base, you can use it for referrals to other data bases across the U.S.

Now that you know what to expect from various data bases, I'll try to explain how they are accessed. The first thing you need is an RS-232 port on your TRS-80 microcomputer (Model I users can use the cassette port with special software). The Model II and Model 16 have two RS-232 ports, while the Model I and the Model III have one. (The RS-232 port is an option on the Model I and Model III) Next, you need software to operate your system, and, depending on your application, the software will differ greatly. Large commercial data bases will usually have software which will run on your microcomputer. The Radio Shack software called Videotex is for CompuServe and Dow Jones, and the Westlaw software will allow you to contact the West Publication's data base. If there is no application software for your data bases, you may use a terminal program such as Radio Shack's communication package (26-1149) for Model I and III or the terminal program which comes with TRSDOS on a Model II and 16. If you're not sure of the software requirements, contact a representative at your local Radio Shack Computer Center.

Once you have the software, you must determine the communication parameters. You must know the baud rate, the word length, the parity, and the number of stop bits of the system you are going to access. This information can be obtained from the data bases you wish to contact. (The most popular settings are 300 baud, 8 bit word, even parity, and one stop bit or 300 baud, 8 bit word, no parity, and one stop bit).

In order to make one computer communicate with another computer over telephone lines, a modem is necessary. Modems differ widely; there is a wide range of speeds and options. They all, however, perform the same function. They take an electrical pulse from the computer, change it to an audible signal which can be transmitted through the phone lines and change it back again on the other end. In order to determine which one will fit your needs, you should contact your computer representative.

That is about all that you need to know to start contacting data bases. They offer everything from general information, to high speed business communications and from off loading large programs, to meeting other users through the local bulletin boards. Further, microcomputers used in conjunction with data bases will open up a new world of mainframe power at microcomputer prices. If you try it, or at least see a demonstration, you will be amazed at the world of information it will open up.

Videotext (From Page 4)

If you have VisiCalc software, you may receive VisiCalc data into your buffer and save it to disk. You can edit this file using SCRIPSIT or SuperSCRIPSIT prior to loading into VisiCalc.

In the SCRIPSIT, SuperSCRIPSIT, and VisiCalc cases you should consult the Videotex documentation for further details as well as your *SCRIPSIT Reference Manual* and *VisiCalc User's Guide.*

CONCLUSION

The Videotex Model I/III package is much more versatile than many of its predecessors. Is it time for a new Videotex package in your Model I or III's life? Perhaps this is the one.

Color Computer ROM Version 1.0 or 1.1?

by Linda Miller

How do I tell which version of the Color BASIC ROM I have in my machine? I upgraded to 32K with Extended Color BASIC and the screen says Extended Color BASIC 1.0. What happened to the 1.1 version of ROM I thought I was getting?

Questions like these are indicative of the confusion that still exists concerning what the version number displayed on the Color Computer screen means.

IN REVIEW

Maybe some of the misconceptions can be cleared up by taking a quick look at the brief (but colorful!) history of the TRS-80 Color Computer. The first Color Computers on the market came with Color BASIC ROM version 1.0. When the 32K upgrade became available, all upgrades to 32K done by authorized Radio Shack service departments included, as part of the 32K upgrade, version 1.1 of the Color BASIC ROM. The 1.1 ROM was necessary because version 1.0 was not capable of addressing the full 32K of memory. Therefore, all Color Computers which have the Radio Shack installed 32K upgrade will have the 1.1 version of ROM. Later, the 1.1 ROM was installed in all newly manufactured Color Computers.

LANGUAGE VERSION NUMBER?

So far only two Color Computer ROMs, Color BASIC 1.0 and 1.1, have been discussed. There are two additional ROMs for the Color Computer, which you may have—the Extended Color BASIC ROM and the Disk BASIC ROM. Extended Color BASIC ROM is version 1.0. After Extended Color BASIC is installed, the ROM version number that will be displayed on the screen is 1.0, even if the version of Color BASIC ROM in the machine is version 1.1. The current version of Disk BASIC ROM is 1.0, so if the computer has been upgraded to disk, then the screen will display 1.0. which is the Disk BASIC ROM version. The version number that is displayed on the screen is the version number of the highest level language in the computer, NOT the Color BASIC ROM version number.

Language	ROM Version
Color BASIC	1.0
Color BASIC	1.1
Extended Color BASIC	1.0
Disk Color BASIC	1.0

HOW CAN YOU TELL WHAT YOU HAVE?

If you're not sure which version of the Color BASIC ROM you have (maybe you've upgraded to Extended Color BASIC in a 16K machine), here are two ways to find out.

The first method is to type PRINT PEEK(41301) (ENTER). The computer will return the number 48 indicating a 1.0 ROM or the number 49 for the 1.1 ROM.

Alternately, type EXEC 41175 (ENTER). This procedure returns the message COLOR BASIC 1.1 or COLOR BASIC 1.0 depending on the version of ROM in the computer. It is recommended that the computer should be reset after using this method.

ARCNET—Revisited

Editor's note: This article is a revised reprint of an article which originally appeared in the November 1981 Microcomputer News.

Tandy will utilize the Datapoint ARCNET (Attached Resource Computer NETwork) protocols—and a new Datapoint LSI circuit network interface component—to provide high speed, very low cost common data base and peripheral systems using common-resource networking. Datapoint developed ARCNET as a part of its highly reliable, field proven ARC system, in use since 1977.

The network is built from four relatively inexpensive hardware components—thanks to Datapoint's LSI design. First, the ARCNET interface card is needed in each computer on the network to enable it to communicate with the network—this card installs in existing card slots in the rear of the MODEL II/12. The card, 26-6501, retails for $399.00 (not including required installation) and includes the sofware needed to run an application processor. For your file processors, you need the ARCNET Interface card (26-6501) and the file processor software. The file processor software (26-6502 $499.00) is a one-time purchase for your ARCNET system. These prices are substantially less than competitive network offerings.

If you are using Model IIs in your ARCNET system, you may need to add a 16K memory board (26-6503 $189.00 plus required installation) to the Model IIs. This 16K board is NOT needed if the individual Model II has the VisiCalc 64K memory board (26-4105), has a Model II hard-disk interface installed, or has a Model 16 upgrade installed. This 16K memory board is not required for Model 12s.

The second element is coaxial cable which you buy by the foot to meet your needs. Radio Shack has the following cables to meet your needs:

A 20-foot cable for $15.95 (26-6510)
50-foot cable for $24.95 (26-6511)
100-foot cable for $39.95 (26-6512)
or you can buy cable by the foot (26-6513 $0.21/foot)

Third, you need a junction box or port hub for up to four processors. This "passive hub" or junction box is stock number 26-6504 and retails for $79.00.

Fourth, for larger systems and distances, an active junction box or port hub that will cost $995.00 (26-6508) and is designed to support eight terminals.

Literally, this is all you need to simply plug TRS-80s together. In fact, you can just keep on plugging until you have up to 255 processors in the system. A very big computer resource from very small computers.

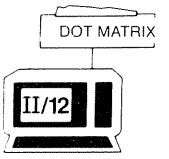
The ARCNET operates at 2.5 million bits per second so that it is transparent to the user, i.e., the user normally does not know that anyone else is on the network. From a technical viewpoint the ARCNET local network for Tandy products is identical to the Datapoint network component of ARC. The interface card installed in the TRS-80 MODEL II/12 uses the same LSI, the active and passive hubs are the same, as is the cable. The software is very similar but has been configured to operate with our standard TRSDOS disk operating system to provide software compatibility with existing MODEL II/12 software and hardware.

ARCNET will permit multiple TRS-80 MODEL II/12 computers, and future TRS-80 computers, to be linked into effectively large scale networks or systems never before possible with personal computers. In fact, ARCNET is the lowest cost network implementation for the office of the future. The owner of a TRS-80 MODEL II/12 does not obsolete his investment. His existing MODEL II/12's are easily modifiable to become part of the network.

Lets trace how a typical TRS-80 user could grow using ARCNET. Many TRS-80 users are now doing their accounting on a floppy disk based TRS-80 MODEL II/12 system with a printer.

1

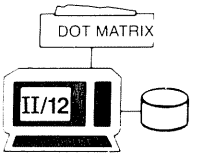
ACCOUNTING DEPARTMENT



This requires a sizeable quantity of floppy disks to change programs and to store data. By adding our new 12 megabyte hard disk, a single MODEL II/12 can operate all the standard accounting functions of General Ledger, Accounts Receivable and Payable, and Payroll without the need for this quantity

2

ACCOUNTING DEPARTMENT



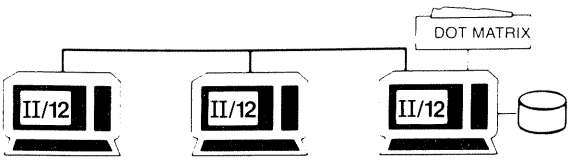
GENERAL LEDGER
ACCOUNTS PAYABLE
ACCOUNTS RECEIVABLE
PAYROLL

of floppy diskettes. As the business grows, however, the time required to enter all the data will exceed the capability of one operator at one keyboard. Today, while a second MODEL II/12 could be added, that would not be a good solution as the data files on the hard disk and the printer could not be shared by both computers.

The solution is ARCNET. By installing an ARCNET interface board in the existing TRS-80, it becomes a file processor and by adding two more TRS-80s as applications processors, a low cost interconnection hub and some cable we have a starter ARCNET system.

3

ACCOUNTING DEPARTMENT



APPLICATIONS PROCESSOR
• ACCOUNTS RECEIVABLE
• PAYROLL

APPLICATIONS PROCESSOR
• ACCOUNTS PAYABLE
• GENERAL LEDGER

FILE PROCESSOR

The accounting tasks will now be split between the two applications processors, each of which is a TRS-80 computer running its own program but sharing the hard disk files and the printer. The accounting department has now doubled

its processing ability at a cost significantly less than adding another entire TRS-80 system and without any reprogramming.

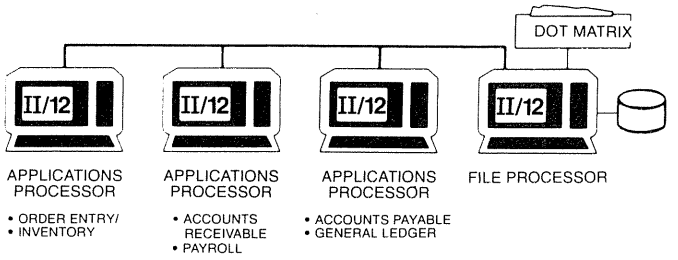
Since ARCNET can be reconfigured by the user at any time by plugging in another TRS-80, as you exceed the capacity of this network you can simply add another TRS-80 application processor or file processor.

In concept and operation ARCNET is very similar to Ethernet, but, unlike Ethernet, ARCNET is based on a proven, reliable technique with over four years of field operation. Today, adding one computer to an Ethernet system would cost 3 to 5 times the cost of the same addition to ARCNET. We selected the ARCNET local network because of its proven ability to handle large business networked applications using hundreds of processors.

Our small business, who happens to be a Widget distributor, now decides that accounting is under control and it's time to get the inventory on the computer.

4

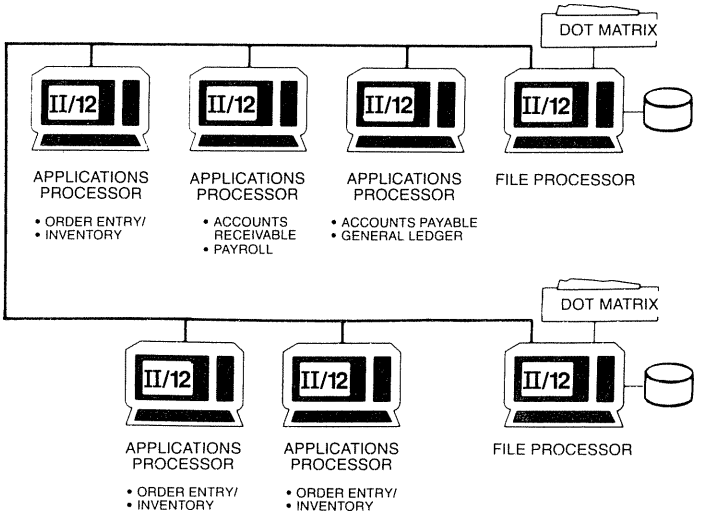
ACCOUNTING DEPARTMENT



By plugging in one more MODEL II/12 our distributor adds order entry/inventory control. At this point the total cost of this system is still less than $20,000. As the widget business thrives, more TRS-80 work stations are needed to handle the increased order volume. Two more TRS-80s can be added to the network, but by now the size of the files and the printing volume pass the ability of the original file processor. Another TRS-80 file processor with hard disk and printer are also added, and our final configuration looks like this.

5

ACCOUNTING DEPARTMENT



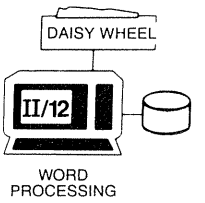
The widget distributor system has grown from a $10,000 system to about a $45,000 system in easy, affordable steps.

The additional equipment was added without down time as any unit in the ARCNET system can be added or removed without affecting the system. And since the TRS-80s in the system are interchangeable, the loss of any one unit for service does not affect the ability of the system to operate. Perhaps most important of all, this growth has been accomplished without rewriting any software. The system, as shown, has 5 independent applications processors which can not only be used for the specific applications shown but can be used interchangeably for any of the applications shown when required. There is about 24 megabytes of disk storage which can be increased to 96 megabytes without adding any additional file processors, and there are two 60 line per minute printers.

Let's go back to our original starter TRS-80 system, but now it is in an office of a large corporation as a word processor. The hard disk is the same, but the printer is a letter quality daisy wheel.

6

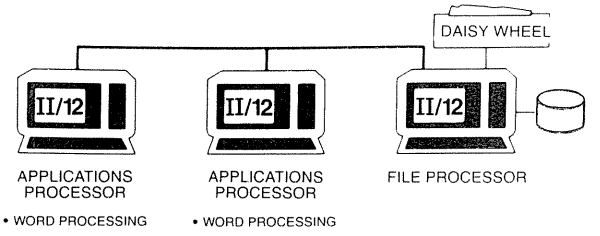
ADMINISTRATIVE OFFICE



Typically word processing is very keyboard intensive with only light duty printing. By going to an ARCNET local network, additional secretaries can have TRS-80 workstations and share the same daisy wheel printer which can be equipped with an automatic paper sheet feeder.

7

ADMINISTRATIVE OFFICE



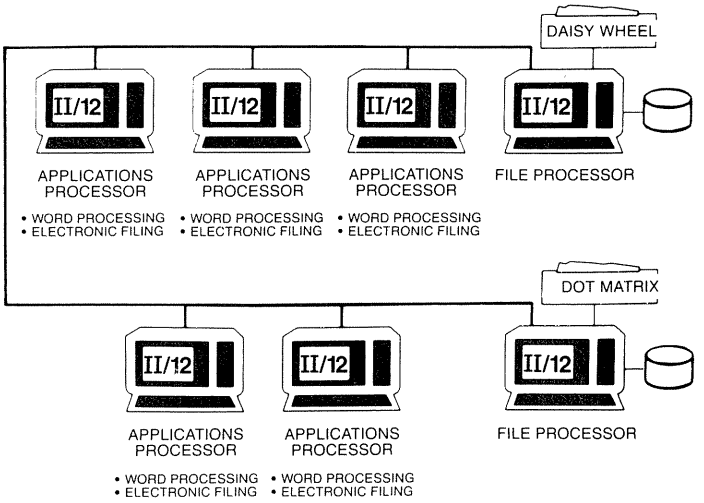
Another application which could be used on this network is electronic filing which would be available to all the TRS-80 workstations. Again we have the software today to support these applications, and both our word processing and electronic filing software include a high degree of security to prevent unauthorized access. Clearly TRS-80 and ARCNET can now be integral components of the office of the future.

Just as with our widget distributor, this office system can grow as requirements change, and a typical growth pattern would be to add a second file processor as the number of workstations increase, but this time a high speed dot matrix printer is added to produce draft documents to leave the letter quality printer free to produce final documents.

In the system shown, five workstations share the resources of the two hard disks and the two printers. Of course, additional workstations can be added at any time.

8

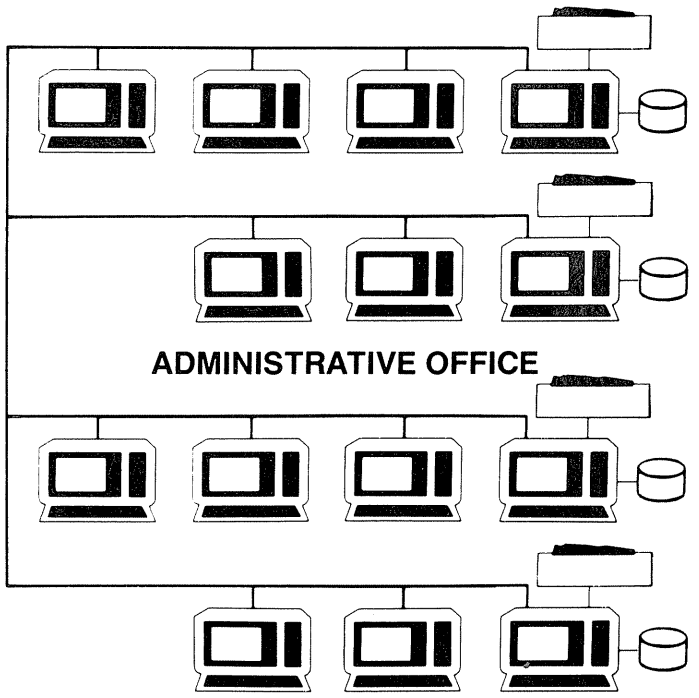
ADMINISTRATIVE OFFICE



If this office was not in a large company but was the office of our widget distributor, the two systems could be connected into one network for only the cost of the cable.

9

ACCOUNTING DEPARTMENT

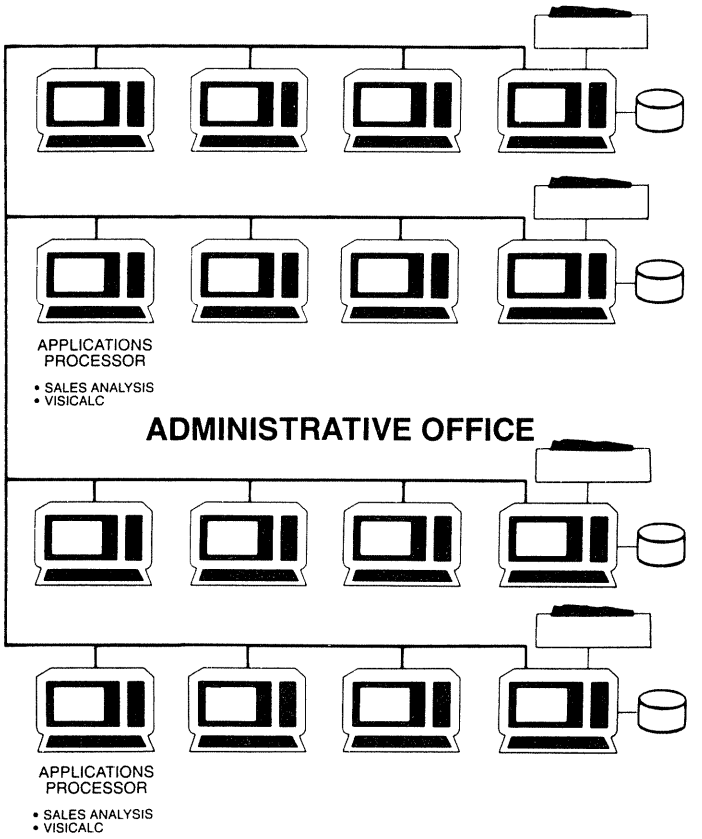


The entire company now has a network with a common database accessible to all users but with security restrictions as needed. To make use of this database, let's go one more step and add two more TRS-80 workstations for the sales manager and president.

These stations can operate our sales analysis program which can query both the order entry and the accounts receivable data bases to provide customer, salesman, or product sales results. They make the power of VisiCalc available to the manager for forecasting and planning as well as making word processing available to ease writing of the keynote speech for the annual convention of widget distributors.

10

ACCOUNTING DEPARTMENT



To sum up the advantages of ARCNET:

- It gives both our existing base of TRS-80 owners as well as new buyers a clear path to expand as their needs dictate without obsoleting of present software or hardware and with the assurance that our future hardware and software will be compatible.
- It provides a common data base to all users, allowing implementation of sophisticated software to help managers monitor their business.
- It provides more computing power than is possible with a minicomputer of similar cost.
- It provides system redundancy since the failure of any one unit will not halt operations.
- It can be installed at a low cost, yet its high-speed, reliable operation is already well proven.
- And most important it provides an easy growth path to a large powerful data processing system in affordable steps.

In the decade of the 80's, networking of computers will become commonplace. We believe the Datapoint networking experience has resulted in a reliably proven, low cost networking system which will speed the implementation of networks into common use. Therefore, we will implement ARCNET in some of our future product offerings which implies a high degree of compatibility between these future products and the TRS-80 MODEL II/12.

REKORD: A Data-Based Education Management System for Administrators, Counselors, and Special Programs Coordinators

REKORD (pronounced "ri-kord") is a data-based education management system that was developed for Radio Shack by the Psychological Corporation, a Division of Harcourt, Brace, Jovanovich Publishers. Three different packages, designed for different record-keeping needs, are available for use with the 48K Model III disk system. One version is for the school administrator; another is for the specialist in guidance and counseling, and the third is for the coordinator of special programs.

STRUCTURE OF THE REKORD SYSTEM

REKORD lets you file student data, print out student and school records, and generate reports. Each version of REKORD is a menu-driven system that lets you set up a data management system to meet your own specifications. The table below lists the ten data categories available in each version:

Administrative	Guidance & Counseling	Special Programs
PERSONAL	PERSONAL	PERSONAL
EMERGENCY CONTACTS	CLASS SCHEDULE	EMERGENCY CONTACTS
MEDICAL	ACADEMIC	MEDICAL
SOCIAL	PSYCHOLOGICAL EVALUATION	CLASS SCHEDULE
FINANCIAL AID	COUNSELING CONTACT	PLACEMENT AND SERVICES
CLASS SCHEDULES	CAREER	ASSESSMENT
FATHER	MEDICAL	IEP INFORMATION
MOTHER	SOCIAL	PERFORMANCE
GUARDIAN	FATHER	MOTHER
SIBLINGS	MOTHER	FATHER

Each of these ten categories is subdivided into detailed "descriptors," making a total of about 100 data fields available for each version of REKORD. The program also allows you to type in custom descriptors to create data fields that meet your school's particular needs.

USING REKORD TO SET UP A DATA BASE

Let's look at how you'd go about setting up a data base using the Administrator's version of REKORD.

Once the program is loaded and running, you'll see the main REKORD menu as shown in Photo 1.

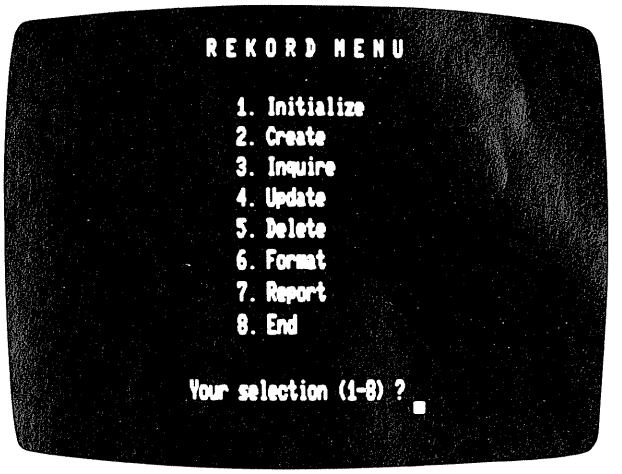


Photo 1. REKORD Main Menu

Option 1, "Initialize," lets you set up the structure of your data management system. Selecting option 1 brings to the screen a list of the ten descriptor categories available for your system.

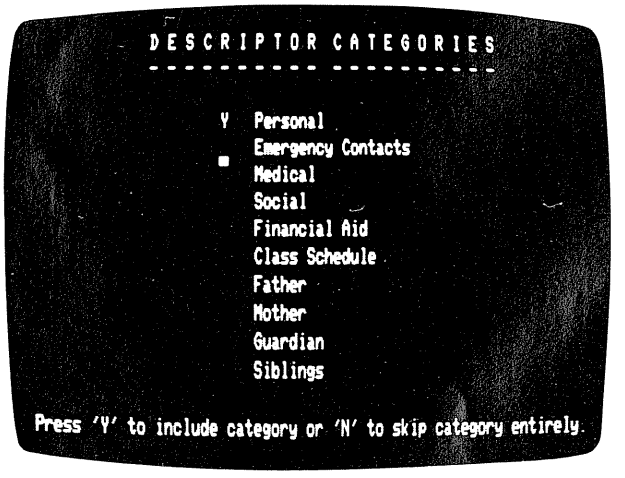


Photo 2. The Ten Descriptor Categories

You select which categories you will include and which you will omit by typing "Y" for "YES" or "N" for "NO" beside each category.

Next, you'll see a list of descriptors for the "Personal" category—the first category that was on the list. Including the student's name as a field in the data base is required, but all other fields are optional:

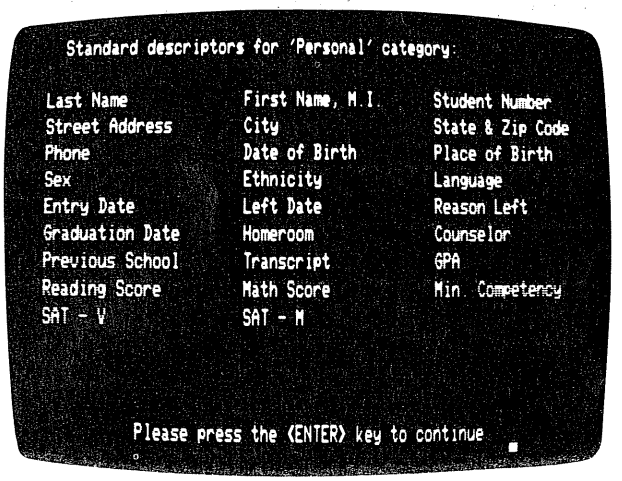


Photo 3. The Descriptor List

Once you have reviewed the descriptors and pressed ⟨ENTER⟩ to continue, the screen clears, and the computer presents these descriptors one at a time. You type "Y" to include or "N" to omit each descriptor as it is displayed. (If you want to have the complete list of descriptors in a category in front of you as you work, you'll find a list in the reference section of the user's manual for that version of REKORD.)

Once you have selected descriptors from the list, you'll see the question, "Do you have any custom descriptors for this category (Y/N)?" If you answer with "Y," you'll be able to enter as many as thirteen custom descriptors of up to eighteen characters each. (For example, you might want to add a space for license plate numbers, if there are students who drive to school and park on campus, or you might find it useful to add descriptors related to students' after-school employment.)

Once custom descriptors have been selected, the computer will display all descriptors and ask you to confirm that they are all correct. The structure of the "Personal" category of your file will then be written to the diskette, and you'll repeat the process for the other categories you selected.

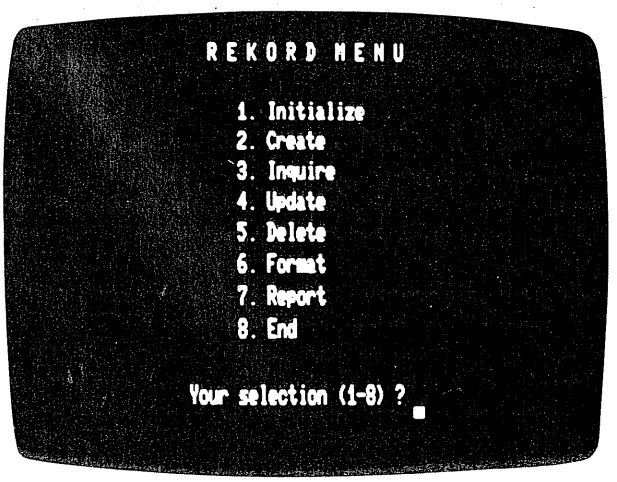


Photo 4. The Main Menu Options

When you have selected descriptors for all of the categories you are using, you'll see a message telling you that the system is now ready for you to use and telling you how many student records can be stored on the diskette. The number of student records that can be stored on one diskette depends on the number of descriptors you selected. For example, a file with 5 descriptors will hold 600 student records; with 15 descriptors a file will hold 200 student records, and a file with 40 descriptors will hold 75 student records. The REKORD user's manual contains hints for organizing your data when using more than one diskette.

Once you've set up your file system, you can start using the other options on the main REKORD menu shown again in Photo 4.

Option 2, "Create," lets you enter student data for the descriptors you chose. "Create" also lets you review the data for accuracy, edit data to correct mistakes, and store the data in the form of a permanent file.

Option 3, "Inquire," lets you find and display complete information about any student in your file. Option 4, "Update," enables you to selectively change the data in any student record, while option 5, "Delete," lets you erase an entire student record from your file.

Options 6 and 7, "Format" and "Report," are used together to organize and print out reports. "Format" lets you specify which descriptors you want to include in the report and then save the report format. For example, you might want to design a report format called "READ" that would include First Name, Last Name, Middle Initial, Student Number, Sex, Graduation Date, and Reading Score. Within the "Format" option, you can also examine existing formats, print existing formats, or delete existing formats.

"Report" lets you print out a report in any format that you designed using the "Format" option. You can even choose to include only data in a particular range—for example, for a report based on the "READ" report format, you might include only students whose reading scores were between 75% and 100%. You can also select the sort field for the report and specify whether you want information printed in ascending or descending order based on that sort field.

The user's manual for each version of REKORD guides you through a step-by-step demonstration of the program's options, using sample data. The detailed Reference Section in the user's manual provides checklists for planning your REKORD system and permanent record sheets for noting duplicate student names, abbreviations, and so on. The Reference Section also includes a summary of the features of each program option.

Catalog numbers for the three versions of REKORD are as follows: Administrator's Version (26-2725), Counselor's Version (26-2726), and Special Programs Version (26-2727). Each version is listed at $499.00, although prices may vary at individual stores and dealers.

For more information about how your school can benefit by using REKORD, contact your local Radio Shack store or Computer Center, or contact the Radio Shack Regional Educational Sales Coordinator for your area. Radio Shack has a team of 23 Coordinators around the country to help schools and districts meet their computing needs.

New Printer Protocol–Information for Printer Driver Authors

by Linda Miller

Radio Shack printer protocol definition has previously made it impossible to determine when a printer was physically attached to the computer. Whether the printer was busy printing, attached but turned off, or just not there, it all looked the same to the TRSDOS printer driver. The information in this article is provided for the benefit of those who will be writing their own printer drivers.

THE PROBLEM AS IT EXISTS

In earlier Radio Shack printers—Those without the DMP or DWP prefix in their names—the following printer status lines are used to inform the computer of the printer status.

ACK (Active low)—This line indicates that the printer is no longer busy.

BUSY (Active high)—This line indicates that the printer is busy and cannot accept a character to be printed due to any of the following conditions.

Printer is busy printing.
The printer has not been initialized.
The printer is off line.
The printer is in an error state.
There is a ribbon fault.
The printer cover is open.

PE (Active high)—This line indicates that the printer is out of paper.

SELECT (Active high)—This line goes high to indicate that the printer is on line. It goes low when the printer is off line.

FAULT (Active low)—This line indicates a printer error condition or a ribbon fault state.

Historically, TRS-80 printer drivers have been driven by BUSY.

Since BUSY is an active high signal, if the printer is busy then BUSY is high. FAULT is active low, so, if a fault condition exists, then FAULT is low. When there is no error condition, then FAULT is high meaning everything is fine, and the printer is legitimately busy. So the computer waits until the printer is no longer busy before sending the next character. A problem arises when, for some reason, the printer is disconnected from the CPU, turned off, etc. Then BUSY floats high telling the computer that the printer is busy. The printer looks busy, but since FAULT remains high in a "no fault" condition, the printer can look busy forever, and the computer is left in a infinite loop waiting for the printer to become "un-busy."

In the Model I, the only solution has been to reset the computer and start over (a solution with obvious drawbacks). Things have improved in the Model III where the (BREAK) key can be used to break out of the infinite loop.

The Model II (BREAK) key can be used to break out of the loop, but another problem arises when the Model II (BREAK) key has been disabled by software so the user cannot break out of the loop. The Model II could find itself in an endless loop "thinking" that the printer was busy printing, when in fact an error condition existed. To eliminate this fatal endless loop, the Model II driver has a time out loop so if the printer is busy too long then the computer generates an error.

Dropping out of the program with an I/O error has been a problem in Model II COBOL programs which use the standard TRSDOS printer drivers. If the software has no error trapping to control the error, then when the Model II printer driver time out loop is completed, the computer drops out of the program, gives an I/O error, and returns to TRSDOS. So much for all the work that has gone before.

Some conditions which can generate this problem include ribbon out, a sheet feeder that takes a long time to feed, or a large printer buffer where the time necessary to empty the buffer exceeds the allotted time of the time out loop. While these error conditions can be trapped by software, this still is not an ideal solution.

The problem became more significant with the introduction of the DMP/DWP series of printers. In order to increase throughput, these printers handle top of forms (TOF) differently than previous Radio Shack printers. When a TOF was received in earlier printers, it was accomplished by the printer driver sending a series of single line feeds with the printer accepting and executing each line feed one at a time until it completed the TOF. In the DMP/DWP printers, the line feeds can be accepted as a group and executed all at once, and

because of the additional time that the printer appears busy completing the TOF, the computer times out. Suddenly the problem took on greater proportions. (For further information on testing printer status refer to the article "A Program to Start Your Printer," TRS-80 Microcomputer News, January 1983, page 25.)

The problem can be solved, in a fashion, for Model II users by performing the LPII patch to TRSDOS 2.0 when using any of the new DMP/DWP printers. The LPII patch is stored as a DO file on TRSDOS 2.0. Typing DO LPII ENTER will execute the patch. The LPII patch increases the time out loop in the Model II printer driver. When the printer stays busy too long, the computer will eventually time out and return an I/O error, but the length of the time out where the computer is waiting for the printer to become available is increased. This is a partial solution, but it still does not solve the problem completely.

THE NEW PRINTERS

In the new DMP/DWP series of printers, the printer interface protocol has been redefined. The new protocol makes it possible to determine if the printer is not attached, if the printer is attached and off line, or if it is ready to print. The SELECT pin, which formerly indicated an on-line/off-line condition, is now $\overline{\text{BUSY}}$ and is redefined to be the logical complement of BUSY. If BUSY is high then $\overline{\text{BUSY}}$ goes low or if BUSY is low then $\overline{\text{BUSY}}$ goes high. BUSY and $\overline{\text{BUSY}}$ are logically complementary except when the printer is not there. Then BUSY and $\overline{\text{BUSY}}$ are both high and a hard error flag is set indicating no printer.

The new printer drivers will first check to see that BUSY and $\overline{\text{BUSY}}$ are the logical complement (one is positive and the other is negative) of one another. If BUSY is high and $\overline{\text{BUSY}}$ is low then the computer knows that there is a printer on line.

This redefinition enables future versions of TRSDOS, yet to be released, to be able to return a hard I/O error only when the printer is not actually present.

TO SOFTWARE AUTHORS

The status ports on the new printers are defined as follows:

$\overline{\text{ACK}}$—Same

PAPEROUT (PE)—Same

BUSY (Active high)—A BUSY condition exists if:

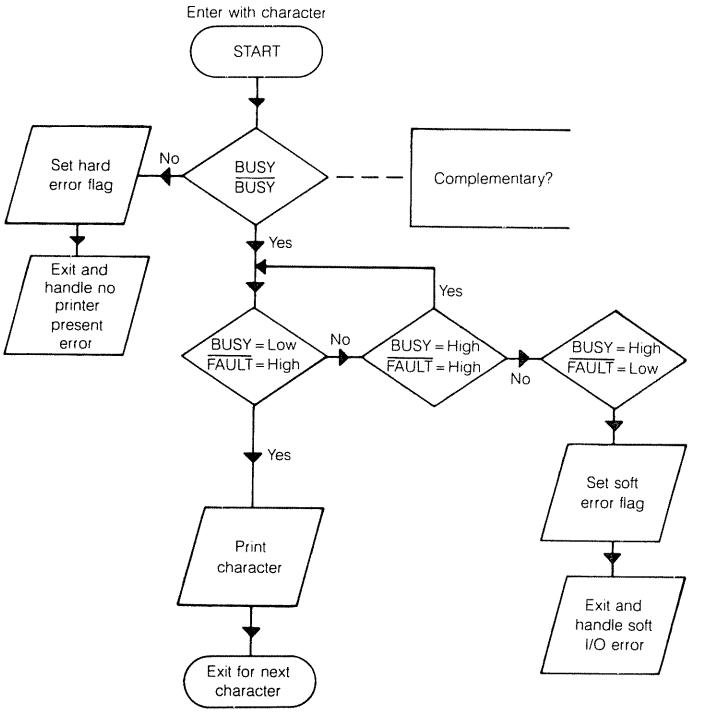
Data is still in the printer buffer.
The printer has not been initialized.
The printer is off line.
The printer is in an error state.
There is a ribbon fault.
The printer cover is open.

$\overline{\text{BUSY}}$ (Active low)—$\overline{\text{BUSY}}$ is the logical complement of BUSY. If a printer is connected and on, then BUSY and $\overline{\text{BUSY}}$ will always be complementary. If a printer is not connected then BUSY and $\overline{\text{BUSY}}$ will both be high which indicates a true error condition. A printer off line condition causes $\overline{\text{BUSY}}$ to go high and $\overline{\text{FAULT}}$ to go low.

$\overline{\text{FAULT}}$ (Active low)—This signal indicates that the printer is in an error state or in a ribbon fault state.

THE DRIVER

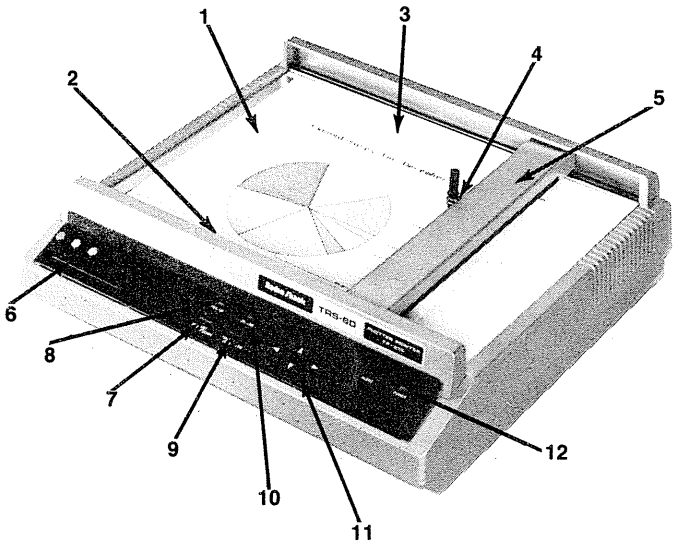
The printer driver should poll the printer port to read the status. If BUSY and $\overline{\text{BUSY}}$ are the same, then there is an error condition (The printer is not connected; it is turned off, or some other major disaster has occurred.), and the hard error flag is set. If BUSY and $\overline{\text{BUSY}}$ are complementary, then the driver checks BUSY and $\overline{\text{FAULT}}$ to see if the printer is busy printing, or if an error condition exists. If BUSY is high and $\overline{\text{FAULT}}$ is high, the printer is busy printing and the driver keeps checking for the printer to become "unbusy" before sending the next character to be printed. If BUSY is high and $\overline{\text{FAULT}}$ is low, then a soft error flag is set. The flow chart is included to give an indication of what happens as the driver checks printer status. It is not an exact representation.



The FP-215—A Super Plotter

By Linda Miller

The FP-215 printer/plotter is so easy to use! Since my first efforts to use anything new are usually rife with hair pulling and teeth gnashing, it was very gratifying to have the FP-215 work on the first try.



1 Magnetic Plotting Surface
2 Paper Clamp
3 Paperweight
4 Pen Holder
5 Beam
6 Pen Storage
7 Pen Up/Down Switch
8 Pen Up Indicator
9 On/Off Line Switch
10 On Line Indicator
11 ◄✦► -four arrows
12 Power On Indicator

Before reading the manual, I plugged the FP-215 into a power strip, set the power switch to on, and recklessly inserted a piece of plain typing paper by raising the paper clamp, placing the paper edge against the edge, and releasing the clamp. Sliding the paper weight from a position next to the clamp to the top of the paper removes any slack in the paper. (A subsequent reading of the manual revealed that this is the recommended procedure. What can this technological world be coming to when the thing to do becomes obvious to the first time user?) Next I chose the black pen from the four available pen colors of black, blue, red, and green. After pulling off the pen cap, I slipped the pen into the pen holder. So far so good.

MANUAL MODE

Cautiously at first, I tried what I later found out is called the Manual Mode. This mode lets the user control the movement and paper contact of the pen by using the four arrow keys and the pen up/down switch. The pen up/down switch controls when the pen actually makes contact with the paper. In the down position, the pen is in contact with the paper and ready to "draw." In the up position, the pen can be moved freely over the paper without making a mark. An arrow key will send the pen in the direction of the arrow pressed, until the outer edge is reached or the pen up/down switch is depressed. Once I had this figured out, I stopped the pen to change colors, drew boxes within boxes, triangles, rectangles, octagons, straight lines, and miscellaneous designs. In my doodling, I also discovered that by combining the left or right arrow key with either the up or down arrow key, it was possible to draw diagonal lines. Using the four arrow keys and combinations of them, it is possible to move the pen in eight different directions.

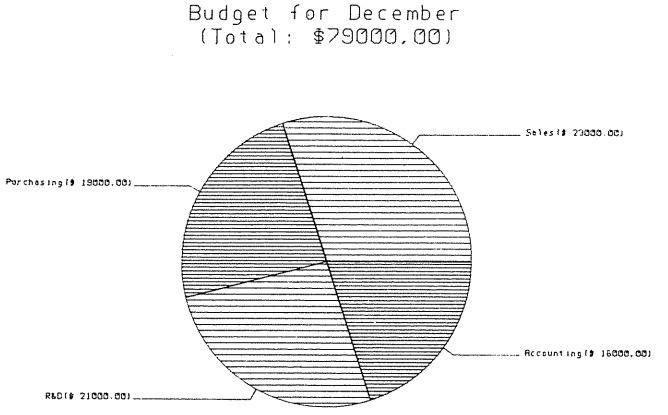
THE VIEW FROM THE OTHER SIDE

When I turned the FP-215 around to look at its back side, I found that, in addition to the power switch, the FP-215 has both a serial and a parallel port which means that the FP-215 can not only be used with a Model II/12, Model I/III, or Model 16, but it can also be used with the Color Computer. Next it was just a matter of unplugging the parallel printer cable from my daisy wheel and plugging it into the FP-215. Also located on the back is a dip switch which lets the user set the FP-215 for a parallel interface, a serial interface at 600 baud, or a serial interface at 1200 baud.

Besides the Manual Mode, the FP-215 also has a graphic mode for plotting and a print mode for printing.

THE GRAPHIC MODE

In the graphic mode, you have to visualize the pen moving on a Cartesian coordinate plane (on the plotting surface) with the X-axis running left and right (horizontally) and the Y-axis running up and down (vertically). Positive is up and to the right; negative is down and to the left. The origin may be set anywhere on the paper, and the pen can move two different ways—relative and absolute.



With relative movement, the pen can move from the current pen position to another position that has been specified relative to the current pen position. Absolute movement means that the pen is moved from the current pen position to a point that is relative to the previously defined origin.

Characters may be printed in the graphic mode using the P command, but, more importantly, bar charts, pie charts, line charts, geometric shapes, histograms, and a multitude of other figures can be created using the graphic mode.

PRINT MODE

In the Print Mode, the plotter works as a line printer, printing both upper and lower case characters. The BASIC commands LPRINT and LLIST perform the same functions that they do on other line printers. The print mode has horizontal and vertical formats which can be entered via hardware when powering up the printer or by sending the appropriate CHR$ to select the vertical or horizontal format through software.

Use **Boldface...**

And even print...**Fancy!**

PEN MOVEMENT

Just how far does the pen move? Pen movement is measured in "steps." Each step is 0.1 mm long (about the size of a period). There can be up to 2980 steps (equivalent to 11.73") horizontally and up to 2160 steps (equivalent to 8.5") vertically. 254 steps equal one inch.

A SUMMARY OF FP-215 PLOTTER COMMANDS

No special drivers or arcane instructions are needed to use this printer, just BASIC LPRINTs. Each command described below is implemented with an LPRINT statement.

B scale

In this command, "scale" is a number from 1-127 which specifies the size of the dots used in making dotted or dashed lines. The greater the scale number, the farther apart are the dashes.

D destination

The D command draws a line from the current pen position to the "destination" point.

If the starting position is x = 100, y = 100, line 20 will draw a square.

```
2Ø LPRINT "D1ØØ,6ØØ,6ØØ,6ØØ,6ØØ,1ØØ,1ØØ,1ØØ"
```

Fn

The F command is used to select the plotting area. If n = 0 the plotting area is 10.63 x 7.32 inches. If n = 1 the plotting area is 11.73 x 8.5 inches. The default setting of n is 0.

H

H is the home command, and it causes the pen to be moved in an up position to the home position (lower right hand corner of the plotter).

I x,y

Without x,y, I resets the origin to the current pen location. With x,y the origin can be set at any position on the plotting surface.

J x,y . . . x,y

J draws a line from the current pen position to the first x,y coordinate, from the first x,y coordinate to the second x,y coordinate, etc.

Ln

L0 indicates a solid line, and L1 indicates a dotted line.

M x,y

M moves the pen relative to the home position to the specified x,y coordinate without drawing a line.

N n

N indicates a marker type where n is a number from 0 to 5. There are six marker types as seen in the Figure 1.

Code Marker Symbols

Code #	Marker
0	
1	
2	
3	
4	
5	

Figure 1.

P characters

The P command makes it possible to print characters in the graphic mode.

Q n

Where n is an integer from 0 to 3, the Q command is used to determine the print direction.

Q0—Left to right
Q1—Top to bottom
Q2—Right to left
Q3—Bottom to top

R x,y

R is the relative command and moves the pen without drawing a line from the current pen position to the coordinate specified by x,y.

S n

S is used to select character size. "n" is a value from 1 to 255; 1 is the smallest character possible (0.4 mm x 0.6 mm), and 255 is the largest character posssible (102 mm x 153 mm).

X n,n1,n2

Using the X command, the plotter can be instructed to draw coordinate axes (n = 1 for the x axis, n = 0 for the y axis), divide the axes into specific units of measurement (step (n1) = a numeric expression between 0 and 9999), and tell the plotter that the step is to be repeated n2 times (n2 = a numeric expression between 1 and 255).

The FP-215 is catalog number 26-1193 and has a suggested retail price of $995.00.

The Nature of Associated Fields

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Profile III+ Section by Ivan Sygoda, Director, Pentacle

Associated fields are one of Profile's most powerful features. Yet to judge by the questions we've been getting, they aren't being used to their fullest extent. Many new users are uncertain about what associated fields are exactly—not to mention what they do and how they work. This month we'll examine associated fields in some detail and try to dispel some of the mystery surrounding them.

THE FUNDAMENTALS

Computers are a powerful tool in data management; they don't lose information the way you and I do. Information can be any piece of data—a client's phone number, a price quote, an order quantity, a reminder to do something. Without the computer, we put that information on a piece of paper—a Rolodex card, a pre-printed form, a leaf from a memo pad or the corner of a napkin. Even if you're better organized than I and unfailingly put that piece of paper in its proper folder, box, basket, bin or drawer, you still have the problem of rummaging through a quantity of like pieces of paper to retrieve the information when you need it.

What Profile does is to put that piece of information into a grid or array so that it always knows where to find it. This grid is like the wall of mailboxes at your local post office. Each piece of data is assigned to a "unique" address in the grid. When you define files, you are really telling Profile what you want these addresses to be and where you intend to place each item in the grid.

I'll use an abbreviated version of my dance presenters contact information file, which I call SPONSTAT, to illustrate the use of associated fields. When I defined my files, I started off this way:

Field Number	Heading	Length
1	State	2
2	Zip	5
3	Last Name	15
4	First Name	12
5	Area Code	3
6	Institution	25

Consequently, as I entered records, my grid began to look like Figure 1.

Rec.#	State(2)	ZIP(5)	Last Name(15)	First Name(12)	A/C(3)	Inst.(25)
1	NY	10011	White	David	212	Dance Theatre Workshop
2	MA	01238	Thompson	Liz	413	Jacob's Pillow Dance Fest.

Figure 1.

Inherently, a grid is perfectly well-ordered, stable, and consistent. Whatever Liz Thompson's area code is, it will always be found second row from the top and beginning 35 spaces in, in the fifth "mailbox" in that row. The beauty of Profile is that I don't have to worry about any of this. The program does it for me—automatically. Later on, when I inquire what dance presenters there are in area code "413," Profile goes to the "post office" for me, so to speak, looks in the relevant mailboxes, and brings back the stack of mail that matches my criteria. Ms. Thompson at Jacob's Pillow will never be left out.

REAL LIFE

Thus, Profile and Profile Plus bring to data management the immense power that comes from structure and order. But, of course, life is not always as well ordered as a grid. Anomalies exist that must be dealt with. This is where associated fields come in.

Returning to our example, each of my dance presenters has only one area code. And so assigning that item to a mailbox is no problem. But each presenter might be interested in hiring an unpredictable assortment of my dance companies, each of which is represented by a three-character code. While they are still shopping around to see what's available, they may tell me that five or six of my troupes interest them. Then they'll narrow it down to one or two. Or maybe they'll add one they hadn't considered before. When you're dealing with items and information that vary all the time, you need associated fields. It's an associated field's job to keep track of these kinds of changes.

But another problem is the order in which the information is received and entered. Ms. Thompson at the Jacob's Pillow Dance Festival may first reveal her interest in James Cunningham's Acme Company (ACM), but later decide she is also interested in Nina Wiener and Dancers (WNR) and Gus Solomon's Co./Dance (SOL). Or vice versa. And so the mailbox assignments might be "ACM WNR SOL" or "SOL ACM WNR" or "WNR SOL ACM" or any other permutation.

And yet another problem is that Ms. Thompson might change her mind and decide that she can't use Jaimie this year after all. So Jaimie gets zapped from the grid. (Don't

worry, his Acme Company has lots of other work.) But this leaves an empty mailbox: "--- WNR SOL" or "SOL --- WNR" or "WNR SOL ---."

You can see how tricky it could be to retrieve this information. When I need a report listing all the presenters interested in Nina Wiener and Dancers, for instance, I wouldn't know where to look for "WNR." But Profile knows. The associated fields function groups a specified number of mailboxes together. When you tell Profile to look for a particular item, it knows to look into all the mailboxes in the group. Clever, eh?

STARTING OUT

It's easy to set up a group of associated fields. When planning my associated fields, I decided that 99% of all likely cases would be covered if I made room for each presenter in my file to declare an interest in eight of my troupes. (If they're interested in more than eight, I declare "ALL".) Since each company has a unique three-character code that identifies it, I needed to define eight fields, each three bytes long. These are assigned to fields 8-15. The fields being associated with one another are identified by an upper-case letter followed by a close-parenthesis and, optionally, by any heading I choose. The identifying letter and the close-parenthesis must come first, however, or the associated function won't work. My file definition now looks like this:

Field Number	Heading	Length
1	State	2
2	Zip	5
3	Last Name	15
4	First Name	12
5	Area Code	3
6	Institution	25
7	Budget	6
8	A) Interest	3
9	A)	3
10	A)	3
11	A)	3
12	A)	3
13	A)	3
14	A)	3
15	A)	3

And the grid grows as in Figure 2:

Rec.#	State(2)	Zip(5)	Last Name(15)	First Name(12)	A/C(3)	Inst.(25)	Int(3)	Int(3)	Int(3)
1	NY	10011	White	David	212	Dance Theatre Workshop	**SOL**	**---**	**WNR**
2	MA	01238	Thompson	Liz	413	Jacob's Pillow Dance Fest.	**ACM**	**WNR**	**SOL**

Figure 2.

IF ONE IS GOOD, MORE IS BETTER

You can have more than one group of associated fields in a file. But each group must be identified by a different upper-case letter. I need a record of which of my companies these presenters have booked over the years, and the specific year in which they were booked. Associated fields are needed here, too, because the number and sequence of companies varies from presenter to presenter. I allot room to record six bookings for each record along with the year in which the booking occurred:

Field Number	Heading	Length
16	B) Co. Booked	3
17	B)	3
18	B)	3
19	B)	3
20	B)	3
21	B)	3
22	C) Year	2
23	C)	2
24	C)	2
25	C)	2
26	C)	2
27	C)	2

On my screen and report formats, the three-character company code is placed next to the corresponding two-digit year. For example, field 16 is next to field 22, yielding "ACM 79" if the presenter booked the Acme company in 1979.

But I have to be careful! This contiguity is the only thing that ties the company code to the year the booking occurred. I can inquire which presenters booked Acme and which presenters booked any of my companies in 1979, but I can't inquire which presenters booked Acme in 1979, as opposed to 1978.

At least not the way I set up my file. I was so eager to get going when I first acquired Profile III + that I didn't study the manual carefully beforehand, and so I didn't know about all the things it could do. It would have been easy to enable Profile III + to answer that last question and to conserve fields in the process.

Here's how: Make use of Profile's wild card feature, "=." When scanning, sorting or selecting, the "=" can replace any character (letter or digit) that is either unknown or irrelevant. Any character appearing in that position will then "match." So instead of using two groups of six associated fields, I could have used only one group:

Field Number	Heading	Length
16	B) Co. Booked/Year	5
17	B)	5
18	B)	5
19	B)	5
20	B)	5
21	B)	5

If Liz Thompson booked Acme in 1979, my field entry would be "ACM79." Then, if I wanted to know which presenters booked Acme in 1979, I'd search for "ACM79." But if I wanted to know which presenters booked Acme over a period of many years, I'd search for "ACM==." And, if I wanted to know who booked any of my companies in 1979, I'd search for "===79."

The moral of the story: Read the manual at least once all the way through. So many users don't take the time to do it. I don't mean to imply that you have to be afraid of the program.

Plenty of users get good use out of Profile and Profile Plus by forging ahead with confidence. But the program is so powerful and flexible that it's a shame when users inadvertently deprive themselves of some of its capabilities because of impatience.

There are two more points to cover before moving on. Associated fields give you the means to search, sort, and select among types of data not otherwise amenable to this sort of manipulation. Since Profile III + only performs these operations on key (segment 1) fields, associated fields function in segment 1 only.

You can add more fields to your group of associated fields if you decide later on that the group is not large enough for your application. But they can only be added at the end of segment 1. The fields associated by a capital letter do not have to be contiguous, but they must all be in the same segment. See your manual for the procedures and ramifications of changing segment size after entering data in your file. This won't be much of a problem if you left expansion bytes at the end of segment 1 when you defined files.

Remember, it's the fields that are associated, not the data. First and last names are "associated" but not in the technical sense involved here. You wouldn't use associated fields to link them together.

AN ACCESS STORY

Now that our associated fields are set up, it's time to use them. We'll compare accessing a regular field with the procedures involved in accessing an associated field.

To do a screen inquiry of all my presenters in area code 413, select Profile III + Runtime Menu item 3, "Inquire, Update, Add." Skip the record number prompt by pressing [ENTER]. If you've set up a user index, the next prompt asks for your search criteria. For instance, since searching by area code is my most frequent means of accessing records, I've set up a user index sorted by area code. This prompt reads "AREA CODE" and requests a three-digit entry. Press [ENTER] to skip this feature.

The next screen lists the key field numbers and headings, twenty at a time. After paging through the fields, you are prompted for the scan field. Since I want to scan for area code, I press (field) "5" and [ENTER]. Then I type "413" and press [ENTER] for the default relationship—"EQ." Then I press [ENTER] again because I'm not using a connective. The computer scans each record in record number order, stops when it reaches the first one in which the area code matches "413," and displays it on the screen. Pressing [ENTER] brings up each successive matching record until the matches are exhausted, at which point the program returns to the record number prompt.

Exactly the same procedure is used to scan for a certain associated field entry—"WNR" for presenter interest in Nina Wiener and Dancers, for instance. I simply enter the number of one of the fields in my associated group, then type "EQ" and "WNR". This time the computer scans each record and stops at the first one for which "WNR" is found in fields 8 through 15. That is, in any one of the fields associated by the identifying letter "A." Just as with the scan for area code, each matching record will be displayed on the screen until the matches are exhausted.

This leads to the part that has confused some Profile users. After entering the desired field number, the program prompts you for the Boolean (logical) relationships like the regular scan operation (EQ, NE, GT, LT, GE, LE, RG). But given the purpose and operation of associated fields, no logical relationship other than "EQ" (equal to) is likely to be logical. Consider what happens if I choose "NE" (not equal to) as my Boolean relationship in the previous example. "WNR" appears at most only once in each record in my file.

Since I have eight associated interest fields, this means that each record has at least seven and perhaps eight associated interest fields that do not equal "WNR." Scanning for "NE WNR," then, calls up every record in the file, even those that do indicate interest in Nina Wiener.

BOOLE-BOOLE

The remaining Boolean relationships (LT, GT, LE, GL, RG) are based on the alphabetical or numerical ordering of elements. It doesn't matter whether the selected elements are plucked from an ordered (sorted) or random list. For example, take the letters A, B, C, D, and E. They can be arranged alphabetically or arbitrarily,—C, D, A, E, B, for instance. Specifying the logical relationship "GT C" selects "D" and "E" in either case.

However, given the often random nature of the data with which associated fields are designed to deal, scanning that involves Boolean relationships other than "EQ" will make sense only in specialized applications. Here's a possible example. Suppose you were using Profile to record customer purchases. You could enter the stock or serial numbers of the items involved in an associated fields group. If numbers were logically assigned to begin with, retrieving records based on this logic would make sense. For instance, most Radio Shack customers have probably noticed that computer items in the catalogue are prefixed by "26-" followed by a three- or four-digit number. Model III business software seems to have been assigned numbers between 26-1550 and 26-1600. Consequently, the store manager using the program might specify "RG" between these two numbers if he wanted to access all Model III business software purchasers.

You must be careful, though, especially if you are accessing numeric fields. These are right-justified by Profile when you enter data in your records. In our Radio Shack example, if the field for "part number" has seven spaces allotted to it (e.g. 26-1592), and the part number being sought is 26-506, you could get into trouble. If you originally enter "26-506", Profile III + stores it in the seven-character field as follows: "26-506". If you subsequently scanned for "26-506" [ENTER], Profile III + searches for "26-5060", which is a different item. To retrieve "26-506", you would have to right-justify your scan entry manually by entering "[SPACE]26-506". The problem is alleviated if you consistently enter items from the beginning in the form "26-0506". And, of course, you must be rigorously consistent about the use and placement of any hyphens and decimal points. We'll deal with scanning, sorting, and selecting in a future column.

One more fact about Boolean relationships and associated fields. Less-than (LT) and less-than-or-equal-to (LE) present a special problem. Since empty associated fields are filled with "blanks" (ASCII code 32), they qualify as a match for "less-than," no matter what you enter. You should use the connective "AND" and then specify "NE" [SPACE] [ENTER] to eliminate selection of blank associated fields.

By the way, these caveats about the use of Boolean relationships do not apply to the use of connectives. It is perfectly valid to scan for "WNR" AND "ACM" as well as for ""WNR" OR "ACM".

MOVING AHEAD

Let me summarize what we've discussed up to this point: Records are accessed using associated fields in exactly the same way they are accessed using regular fields—by entering a field number when prompted to do so. The entire difference lies in the way Profile III + behaves if the field specified happens to belong to an associated group.

We've examined the scan function in screen operations (Inquire, Update, Add). The selection function in report and label operations works the same way, but with an extra option. The Extended Selection feature "turns off" the associated fields function. (Extended Selection is entered by pressing the [SPACE BAR] once when the Runtime Menu is on the screen. An "X" appears next to "4 - Print Reports" and "5 - Print Labels", the two operations for which extended selection is available. "6 - Select Records (S)" always uses extended selection.)

Consequently, when you specify a field number in the extended selection mode, Profile III + does not examine the data in the group's other fields. This can be useful if you have entered information into your associated fields in some ordered fashion. For instance, since I have eight associated "interest" fields with which to work—fields 8-15—I can enter (into field 8) the code for the company that the presenter is most interested in hiring. Their second choice would be entered into field 9, and on down until either their interests or my fields were exhausted. I am then able, while in extended selection, to select only those presenters "seriously" interested in presenting a particular company. Only they receive a packet too expensive to send to everyone. In my application, the re-entering of data needed for each announced change of preference is not worth the trouble. In your application, it might well be.

SORT OF COMPLICATED

It's sorting on associated fields that has most people puzzled—including me. Until I got the hang of it, the program kept doing things I didn't expect. But don't give up—it's a beast that can be tamed.

Sorting is involved in a number of Profile III + functions: (1) the user index, which lets you access a desired record more quickly during screen operations; (2) the sort utility, which is used in ordering records for printing reports and labels; and (3) the control break option, which is used in printing reports. Only the first of these is "visible" to the user, in the sense that a file called "Userfile/IX1" is generated. (This is the index file; its operation is explained below.) The other two perform their sort "in-memory" each time the operation is called for. Nevertheless, the way each works is similar. In all cases, the user specifies a field to sort by. But if the field is one of an associated group, the program behaves in a special way. It behaves the same way in all three cases and, above all, it behaves predictably. In order to know what to expect, it helps to understand something about Profile III + 's innards. When one does, the manual's instructions concerning these operations are much easier to understand.

Profile III + stores your data in the way described at the beginning of this article, record by record, in the order in which you arbitrarily enter them. These "physical records" come one right after another in "record number order", like so many school children in line for lunch. This is the way you see them in screen scan operations and in reports and labels when you skip over the sort function.

But more often than not, you want your records arranged in more rational ways. That's probably why you bought Profile III + to begin with. The program has only one way of sorting—by rearranging your records in alphabetical-numerical order, based on the ASCII codes of the data in the sort field you specified when prompted for a sort field number. It does this quickly (in machine language) and efficiently. Instead of taking the time and space to rearrange every one of your physical records, it creates an index that works the way an index to a book does. The ordered entries each have a "pointer" that directs you to the place the complete information is stored. For Profile III +, this "pointer" is the record number.

This is why your user index (filename/IX1) takes up so many fewer granules of disk space than your data segments. It usually has as many records in it as your data base does, but each record is only as long as the sort field length, plus two bytes for housekeeping (the "pointer"). Furthermore, the records in "filename/IX1" are sorted according to the criteria you requested. So they are called "logical" records as opposed to the physical records in the data segments.

When the sort field used to build "filename/IX1" (or to sort records for reports and labels) is an associated field, something happens that is the source, reason and explanation of every subsequent activity: Each record is included in "filename/IX1" (or in the "in-memory" sort for reports and labels) as many times as there are non-blank associated fields in the record.

Here's a simplified example modelled on my dance presenter data base. Assume my records are constructed as follows:

Format	Data
1 Presenter	1 Jacob's Pillow
2 A) Interest	2 WNR
3 A)	3 ACM
4 A)	4 SOL

If I sort on one of the associated fields, the program behaves as if I had entered not one record but three separate records:

Format	Index Record 1	Index Record 2	Index Record 3
1 Presenter	1 Jacob's Pillow	1 Jacob's Pillow	1 Jacob's Pillow
2 Interest	2 ACM	2 SOL	2 WNR

Any listing sorted on the interest field includes Jacob's Pillow three times. The first appearance is in record 2 (ACM), then 3 (SOL), and finally, 1 (WNR). But thanks to Profile III + 's associated fields function, I don't have to enter information on Jacob's Pillow three times. The one and only Jacob's Pillow entry will be duplicated automatically for me by the program.

TOO MUCH OF A GOOD THING

The price I pay for this convenience is that "Jacob's Pillow" crops up in places I've forgotten to expect it. This example is instructive.

I have a report format that gives contact information on each presenter. Since I often want to let the companies know who is interested in them, I specify a control break on field 8 (interest). I use the "?" field in the title of my report. When I print this report, Profile automatically sorts all the records on the associated interest fields. The first page of the report tells me that it includes all the presenters that are interested in "ACM". Page two is headed by "BLS". Then come the other companies, one by one and page by page, through to "WNR". If Liz Thompson at Jacob's pillow has told me she is interested in three of my companies, then she appears on three different pages.

After printing my report, I remember that I've forgotten to enter some information concerning another presenter's interest in the Acme Company. And so I update the record involved. I only need to reprint one page of my rather long report—the one that pertains to "ACM". And so I run my report again, but select only "ACM" instead of all records. To my surprise, some records were printed three, four, even five times on the one page for Acme! A nasty surprise, to say the least.

Here's what happened: The control break instructed Profile to sort all my records on the interest fields, which it did being obedient. The forgotten presenter was interested in four of my companies, and so his name was included four times in the in-memory sort file activated by the control break function. Or to put it another way, even though there is only one "physical" record for this presenter, there are four "logical" records involving him. Each time his name came up, the program found "ACM" in one of the associated fields in his "logical" records. And so the report printed the name four times on the "ACM" page. Perfectly logical, when you think about it. I should have either gone back into my formats and deactivated the control break, or created a parallel report format without one.

As you can see, once a file has been sorted on an associated field, you can't remove the multiple entries simply by using the selection function to weed out duplicates. The trick is to think twice when sorting in the first place.

Another place to be wary of multiple entries is any place you are using Profile's math capabilities. My field 7 holds the estimated yearly budget of my presenters. Using the "=" field indicator in a report format causes Profile to total the amounts contained in this field for each record. If the report being generated involves a sort on associated fields, the totals are grossly overstated. For example, if a presenter has a budget of $50,000 and happens to have expressed an interest in five of my companies, Profile will add $250,000 to the total.

IN SUM

These are the most important points to remember:

1) When you sort on an associated field, any physical record will be included in the sort as many times as there are non-blank associated fields in that record. For example, if physical record no. 5 has data in five of its eight associated fields, then record no. 5 will appear five times in the sorted list of logical records generated by the sorting process. Any numerical data contained in the physical record, even though it is not itself in an associated field group, will also appear five times and therefore be counted five times in the accumulating grand total.

2) Once you do sort your records on an associated field, you cannot depend upon the selection function to weed out unwanted duplicate entries in your sorted list. This is because ordinary logic does not apply. With associated fields, a particular record can both "be equal to " and "not be equal to" a particular match criterion.

3) The way to control duplication of entries and over-calculation of totals is to control sorting operations, since these are the source of the problem. Don't mix operations involving math and associated field sorts. The same caution applies to the printing of mailing labels, because you only want one label for each person on your mailing list. Don't forget that specifying a control break in report formats results in an automatic sorting operation. If your control break is on an associated field, records will be duplicated the way I have described.

Are these problems worth the fuss? I think so. Associated fields add so much flexibility to Profile that I can't imagine the program without them. All it takes is a little bit of caution when specifying sorts. The beast isn't so hard to tame after all.

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PROFILE Editor's Note: This is Mr. Sygoda's seventh article in a series of 'how-to' Profile III+ articles. Other articles in the series will be published over the next few issues in this column. We hope that you enjoy this feature, and we look forward to your comments and questions on Profile III+.

Pentacle is a New York City-based non-profit service organization specializing in administrative services for performing art groups.

ERROR 30: NO MORE EXTENTS AVAILABLE

After using your Profile III+ data base for a while, you may be surprised by the appearance of an error message, "NO MORE EXTENTS AVAILABLE", during expansion. This can happen even if you have plenty of room on your diskette for additional records.

An extent is a section of a file that is stored in a particular place on the diskette. After you've used a diskette for awhile, especially after you've killed, added or expanded many files, your files will be stored on the diskette in a fragmented way. If you decide to expand a file at this point, it may require too many extents. This is when the error occurs.

The number of extents a file may have is 13 on a Model III diskette. You can check on the number of extents a file has accumulated by examining the directory listing for the drive involved.

Until now, this problem has gone undocumented. If you get this error message, the solution is reasonably simple. Copy your files one by one onto a fresh diskette. This puts the groups of data together and reconsolidates each file to a manageable number of extents. This process does not occur during Backup, which only duplicates the entire diskette as is.

TRS-80 Model 100

THE HIGHLIGHTS

- Largest Liquid Crystal Display available anywhere—8 lines of 40 characters each. Full screen dot graphics are available with every dot (240 by 64 dot matrix) individually addressable.
- Full size "QWERTY" keyboard.
- 8 Programmable Function Keys conveniently located above the keyboard.
- 4 Command Keys located above the keyboard which perform the same operations regardless of the application in use.
- 4 Cursor Control Keys located above the main keyboard logically grouped for convenient operation.
- The 8th line of the LCD display is available to either display the labels assigned to the function keys, or to act as an 8th normal display line.
- Two sets of internal batteries. Four replaceable "AA" batteries power the Model 100 for 20 hours during operation and internal Nickel-Cadmium batteries (rechargeable from either the "AA" operations batteries or through an optional external AC power supply) will retain all information in memory for up to 30 days.
- Built-in Real Time Clock.
- Built-in Interfaces for:
  Cassette Recorder at 1500 baud
  RS-232C, programmable from 75 to 19,200 baud
  Standard Radio Shack Parallel Printer
  Built-In Direct-Connect, Auto-Dial 300 Baud Modem
  Bar Code Reader
- 8K of Random Access Memory, internally expandable to 32K.
- Operating system and Applications software included in 32K of Read Only Memory—ready for instant use.
- Built-In Applications Software

TEXT—A super text preparation program with features such as automatic "word-wrap" so that the [ENTER] key is unnecessary when entering text except to break paragraphs. Ability to define blocks of text by character, word, line, above or below current cursor position. Easy manipulation of defined text blocks makes this one of the best mini-word processors going. Full user prompts are provided on the 8th line of the display and all commands, and functions are performed using the command keys, function keys and cursor control keys.

SCHEDULE—Turns your Model 100 into a "mini-data base." You enter information which you wish to keep track of (such as schedules, appointments, notes or even personnel data) into a free form text file. The schedule program allows you to search the entire file for any character or set of characters you wish to find at a speed you just won't believe!

ADDRESS—Excellent for keeping up with those names and addresses everyone needs to have at hand. It's especially valuable for any outside salesperson or anyone who has to call on clients of any type. The Address file is also used with the built-in communication program to provide auto-dial capabilities.

TELCOM—One of the most complete telecommunications programs available anywhere. This multi-purpose program is the controller of the built-in Direct-Connect, Auto-Dial Modem. You can find and call names or numbers already stored in the Model 100 and even automatically "log-on" to your data service (such as CompuServe) with just a few keystrokes. It's so versatile that it can function as an automatic phone dialer, too! The Model 100 will operate in full or half duplex, upload or download text files, and even echo all received information to a printer.

BASIC—A complete version of Microsoft's best! Formatted printing, Full String Handling, Complete File Operations, Multi-Dimension Arrays, Binary Coded Decimal Math operations with 14 digit precision and the most accurate transcendental functions ever from Microsoft! Virtually identical to Model III Extended BASIC with special commands also provided to enable you to easily take advantage of the Model 100s many features (like graphics, sound generation and more).

DETAILS

There are so many features of the new Model 100 that it is almost impossible to know where to begin. But, since we have begun, maybe it would be best to start with a few "laps around the computer"—let's see what we really have here!

DISPLAY

We've already talked about the character set and the eight line 40 character screen, so let's discuss graphics! Yes, graphics. The display is formed by a matrix of 240 dots (horizontal) by 64 dots (vertical) and each dot is individually addressable from within BASIC. In fact, BASIC even includes commands to draw lines and boxes. A small dial on the right side of the Mod 100, just behind the ON/OFF switch, controls the display viewing angle so that it can be easily adjusted to suit an individual at most normal viewing angles.

THE KEYBOARD

All 256 ASCII characters are capable of being generated directly from the keyboard. The LCD will display all but 32 of them (it won't display character codes 0 through 31), which includes standard upper/lower case characters, international characters, graphics characters and block graphics. The character set is identical to the Radio Shack standard printer character set (except for the special graphics characters). Here is a table showing the characters (and their decimal codes) generated by the keyboard for each of the following key combinations: [KEY], [SHIFT] [KEY], [CTRL] [KEY], [GRPH] [KEY], [SHIFT] [GRPH] [KEY], [CODE] [KEY], [SHIFT] [CODE] [KEY].

	Key	Shift Key	Ctrl Key	Grph Key	Shift Grph Key	Code Key	Shift Code Key
a	97	A 65	1	133	235	ä 182	Ä 177
b	98	B 66	2	149	—	—	—
c	99	C 67	3	132	255	ç 162	171
d	100	D 68	4	—	237	é 187	E 215
e	101	E 69	5	143	233	è 198	E 214
f	102	F 70	6	130	238	—	£ 191
g	103	G 71	7	—	253	—	—
h	104	H 72	8	134	251	—	—
i	105	I 73	9	142	243	ì 199	I 213
j	106	J 74	10	—	244	u 203	U 219
k	107	K 75	11	155	250	ì 201	I 217
l	108	L 76	12	154	249	ò 202	Ò 218
m	109	M 77	13	129	246	—	µ 165
n	110	N 78	14	150	—	ñ 205	—
o	111	O 79	15	152	242	ö 183	Ö 178
p	112	P 80	16	128	241	¼ 172	—
q	113	Q 81	17	147	231	a 200	A 216
r	114	R 82	18	137	234	—	170
s	115	S 83	19	139	236	169	B 185
t	116	T 84	20	135	252	—	T M 186
u	117	U 85	21	145	240	ü 184	Ü 179
v	118	V 86	22	—	—	è 189	E 222
w	119	W 87	23	148	232	—	—
x	120	X 88	24	131	239	à 161	A 223
y	121	Y 89	25	144	254	ý 204	Y 220
z	122	Z 90	26	—	224	â 206	—
1	49	! 33	49	136	225	â 192	A 208
2	50	@ 64	50	156	226	—	—
3	51	# 35	51	157	227	ê 193	E 209
4	52	$ 36	52	158	228	—	—
5	53	% 37	53	159	229	—	—
6	54	^ 94	54	¢ 180	230	—	—
7	55	& 38	55	¥ 176	—	u 196	U 212
8	56	* 42	56	£ 163	—	ì 194	I 210
9	57	(40	57	{ 123	—	ò 195	Ò 211
0	48	) 41	48	} 125	—	¶ 175	° 166
-	45	— 95	45	\ 92	| 124	· 197	▼ 167
=	61	+ 43	61	± 141	—	190	† 168
[	91	] 93	27 (shft 29)	\ 96	126	- 181	—
;	59	: 58	59 (shft 58)	↕ 146	| 245	¾ 173	—
'	39	" 34	39 (shft 34)	≈ 140	—	· 160	· 164
,	44	< 60	44 (shft 60)	153	⊥ 248	ù 188	U 221
.	46	> 62	46 (shft 62)	⁰/₀ 151	⊥ 247	ò 207	—
/	47	? 63	47 (shft 63)	≠ 138	—	½ 174	—

CODES PRODUCED BY OTHER KEYS

ESC	27	CTRL→	18
TAB	9	↑	30
CTRL	—	SHFT↑	20
BKSP	8	CTRL↑	23
DEL	127	↓	31
←	29	SHFT↓	2
SHFT←	1	CTRL↓	26
CTRL←	17	ENTER	13
→	28	SPACEBAR	32
SHFT→	6		

FUNCTION KEYS

These 8 keys are used extensively by the applications programs which are included in the Model 100. You can see their "definitions" at any time by pressing the LABEL command key. The 8th (bottom) line of the display will show the currently assigned definitions. The programmer can redefine these keys from within BASIC to make any BASIC program easier to use!

COMMAND KEYS

Four keys, two with dual purposes:

PASTE—It may sound funny, but that's exactly what this key does. It "pastes" text, which has been saved in a special location in memory, to the current position of the cursor. PASTE is most often used in the TEXT applications program to insert a block of text which has been defined at some other point in the document. PASTE can easily be used to copy selected portions of one BASIC program to another BASIC program, or to copy material from one text document to another text document.

LABEL—This key is a "switch." Pressing it once will display the current definitions of the 8 function keys on the 8th line of the LCD and leave them there. The Model 100 will respect that you want to see the key definitions and so will only use the top 7 lines of the display for showing you whatever else it has to say. Pressing LABEL again will remove the definitions and restore all 8 lines to the screen.

PRINT—the PRINT key is the first of the two dual purpose command keys. If you have a printer connected to the Model 100, pressing PRINT will send a copy of the current display to the printer. Pressing SHIFT PRINT will do slightly different things, depending on which of the Model 100's programs you are in:

PROGRAM	ACTION
BASIC	LLIST the current BASIC program if you are at BASIC's Ok prompt
TEXT	Prints the entire current file
TELCOM	—
ADDRSS	—
SCHEDL	—

BREAK / PAUSE—This is the second dual purpose command key. In most programs, pressing SHIFT BREAK / PAUSE will cause whatever is in progress to stop.

Pressing BREAK / PAUSE while in BASIC with a program running, will cause the program to stop running. Pressing BREAK / PAUSE again will allow the program to continue execution.

CURSOR KEYS

All 4 cursor keys are fully operational in the TEXT program while only left and right operate in BASIC.

SPECIAL KEYS

DEL / BKSP—If you are in the TEXT program, pressing the DEL / BKSP key alone, will cause the character behind the cursor to be erased and the cursor will back up one position. When pressed with the SHIFT key, the character *under* the cursor will be erased.

If you are entering a BASIC program, using the DEL / BKSP key with or without the SHIFT key will cause the character *behind* the cursor to be erased and the cursor will back up one position.

LOW BATTERY LIGHT

This small LED will come on when approximately 15 minutes of power-on operation time remains. You should change batteries or go onto external power at this time. If you are located such that both of these options are impossible, simply turn the Model 100 off, all your programs and data will be retained by the internal Ni-Cad batteries for between 8 to 30 days depending on how much random access memory you have installed. 8K of RAM can be maintained for approximately 30 days while 32K RAM can be maintained for approximately 8 to 10 days.

OPERATING THE MODEL 100

When you first power up the Model 100 you will be presented with a "menu" which shows you the Date, Day, Current time and a listing of all programs in the unit. At first it will show:

```
Jan 1, 1900 Sunday 00:00:00
  BASIC        TEXT        TELECOM        ADDRSS
  SCHEDL       -.-         -.-            -.-
  -.-          -.-         -.-            -.-
  -.-          -.-         -.-            -.-
  -.-          -.-         -.-            -.-
  Select:      xxxx        Bytes Free
```

When you wish to have one of the internal applications programs operate, simply press the space bar until the shadow cursor is over the application you want and press [ENTER]. You can also use the cursor keys, or type in the name of the application, each time pressing [ENTER] to cause execution.

TEXT

If entering the TEXT application program directly (by positioning the shadow cursor over TEXT at the main menu), once you have pressed [ENTER] you will be asked for a "file name." This name can be up to 6 characters in length. The Model 100 will automatically assign an extension of ".DO" to any text file to indicate that it is a "Document" when the name is displayed on the MENU.

Alternatively, if you already have a text document that you wish to edit, you simply position the shadow cursor over the name of the file you wish to work on and press [ENTER]. TEXT will automatically load, and then automatically load in the desired file to edit—simple?? You bet!!

In the TEXT applications program, any letter or number key typed will be displayed at the current location of the cursor and will shift any text which is ahead of the cursor to the right. This is equivalent to what is called the "insert mode" in one of our versions of SCRIPSIT. That is, any character typed will appear at the current cursor position and will cause any existing text to shift over. For this reason, the TEXT program is a "modeless" editor. Everything is done one way, there is no way to "strike-over" existing text and the user doesn't have to worry if he/she is in the "insert" or "strike-over" mode. You know that anything typed will be inserted into the text.

Deleting text can be done a character at a time with the DEL/BKSP key. BKSP is for backspace, just like on your typewriter, it will delete the character prior to the cursor position and back up the cursor. The DEL key is for Delete and it erases the character *under* the cursor, and causes all text after the cursor to be moved backwards one character.

Blocks of text can be defined very simply—

In TEXT, [F 7] is labeled "SELECT." When you want to define a block of text, you first press SELECT to indicate the starting point of the block of text. Then use the cursor positioning keys to select the text that you want to include in your "block." This "block" of text will be displayed in reversed characters (white letters on black background, instead of normal black letters on white background) so that you know at all times exactly what you have included in your "block." If you accidentally define too much, just back-up and un-select the material that you didn't want to include.

The cursor control keys have some extra power added to them to make your movement through documents easier. We've shown how they will move around in the following table:

	ALONE	[SHFT]	[CTRL]
[←]	left one character	left to beginning of prior word	to left end of current line
[→]	right one character	right to beginning of next word	to right end of current line
[↑]	up one line	up to top of display	to beginning of document
[↓]	down one line	down to bottom of display	to end of document

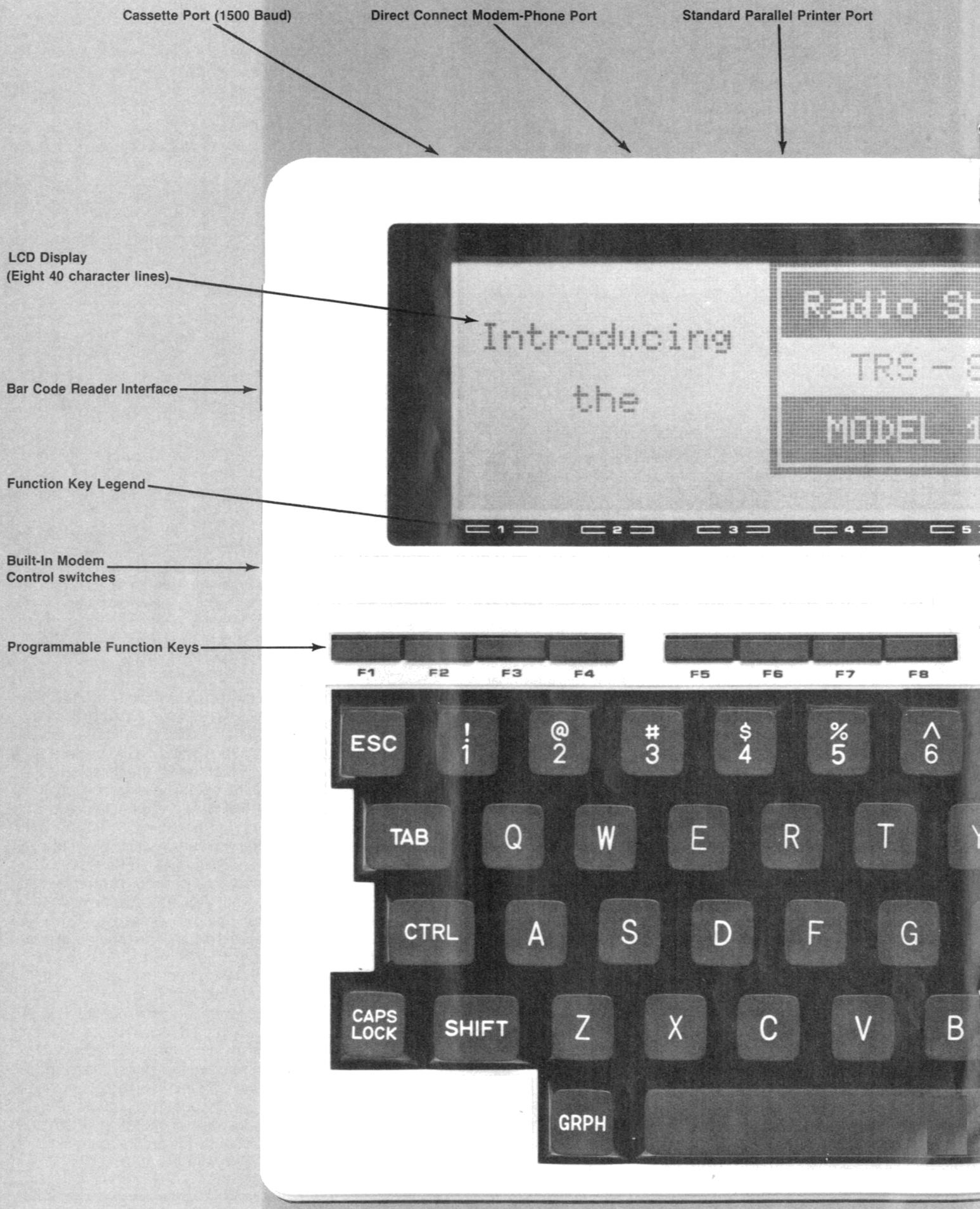
So that it is easy to make the following association . . . By itself, the cursor control keys move the cursor left or right one character and up or down one line. When used with the [SHIFT] key, the cursor moves left or right one word and up or down one full screen (after reaching the top or bottom of the LCD, the next subsequent command in the same direction will display the next screen either above or below the current one, depending on which direction you are moving the cursor). With [CTRL], the cursor moves left to the beginning or right to the end of the line or up to the beginning or down to the end of the document.

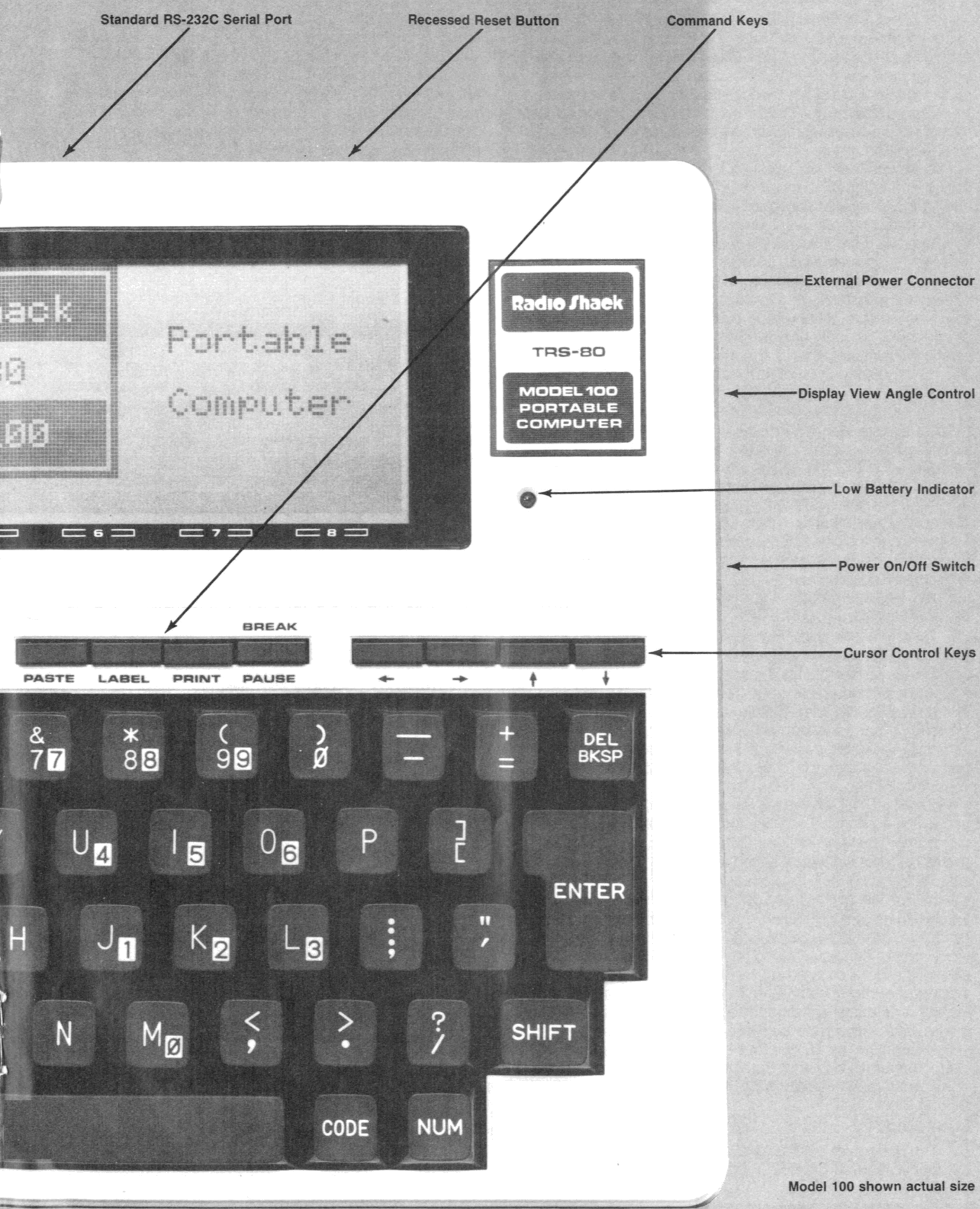
After "Selecting" the block of text, well, what now? Either one of two operations. The first is COPY.

The [F 5] key is defined as COPY in the TEXT applications program. After you have selected your "block," pressing the [F 5] key (labeled COPY) will cause the text displayed in reverse letters to be copied into a special area of memory. The computer will then return the selected text to normal lettering to indicate the operation is completed. More about where the "copied" text went and what to do with it in just a little bit . . .

The other operation that you can do with a block of text is to delete it. The [F 6] key is defined as CUT because that's just what it does—it "cuts-out" the defined block of text and removes it from your document. Again, operation is similar to COPY. After defining your "block," pressing [F 6] key (labeled CUT) will cause the text displayed in reverse letters to be copied into a special area of memory. The text displayed in reverse letters will then be erased from your document. The deleted text isn't really gone forever as you'll see.

But where-did-it go? To an area called the "PASTE BUFFER". Think of this area in the Model 100 as an empty bucket that can hold whatever information you last put into it, from *either* a CUT or a COPY command. Since an area had to be allowed to retain the "block" of text in a copy operation to allow for later re-insertion, we thought it only good sense to allow the same thing for a cut (delete) operation. That way, if you make a mistake (who, me?) you can un-do the error by simply re-inserting the block and trying again.


Cassette Port (1500 Baud)
Direct Connect Modem-Phone Port
Standard Parallel Printer Port
LCD Display
(Eight 40 character lines)
Introducing
the
Radio Sh
TRS-8
MODEL 1
Bar Code Reader Interface
Function Key Legend
1
2
3
4
5
Built-In Modem
Control switches
Programmable Function Keys
F1
F2
F3
F4
F5
F6
F7
F8
ESC
!
1
@
2
#
3
$
4
%
5
^
6
TAB
Q
W
E
R
T
CTRL
A
S
D
F
G
CAPS
LOCK
SHIFT
Z
X
C
V
B
GRPH



Model 100 shown actual size

All of this nifty re-insertion of text contained in the "paste buffer" is accomplished by the PASTE command key. Notice that this key is located with the four command keys. This is because the PASTE key functions exactly the same way, no matter which of the applications programs you are using. At any time, pressing the PASTE key will cause whatever is stored in the "paste buffer" to be entered, just as if you had typed it in from the keyboard.

Now you know why the TEXT applications program is called a "CUT, COPY and PASTE" text editor. It is exactly analogous to the old fashioned method of editing by "cutting" out text that we want to get rid of, or "pasting" text in where we want it to be. Only you have the advantage now . . . Your scissors and glue-pot are electronic and will fit easily in your hands—without any mess!

There is another way to position the cursor besides with the cursor control keys when you are using the TEXT program. The [F 1] key has been defined as FIND and that is what it will let you do.

If you want to search your document, from the current cursor position all the way to the end, for an occurrence of a letter, number, symbol, word or any combination of them, you simply press [F 1] for FIND and you'll be prompted by the word "String" on the last usable line of the display. If you do not have Label function enabled, this will be the 8th line and if you do have Labels displayed, this will be the 7th line. By "String," the Model 100 wants to know what combination of characters, etc., that you want to locate. It will search your text for this string of characters, and if a match is found, the display will shift to show the surrounding lines with the cursor positioned at the beginning of the string of text you searched for. The FIND command is also usable when you are defining blocks of text for a CUT or COPY operation.

Three other function keys are defined in the TEXT program and they are:

LOAD—[F 2] function key. When this key is pressed, you will be prompted by "Load from: " on the last usable line of the display. You may specify a named file (6 characters maximum) that you want to be loaded from cassette or, to load the first text file found, type the general device specification for the cassette, which is "CAS:". More on the power of "general devices" later.

SAVE—[F 3] function key. When this key is pressed, you will be prompted by "Save to: " on the last usable line of the display. You may specify a named file (6 characters maximum) that you want to be saved to cassette or, to save to a specific allowable device type, enter the general device specification for the device that you want the file saved to.

MENU—[F 8] function key. In all of the provided applications programs, pressing [F 8] will return you to the point you were at when you entered the application. In the specific case of the TEXT program, since it is usable as a stand-alone word processor *or* from within BASIC to edit programs this feature is especially important. All other applications programs will return you to the main menu level.

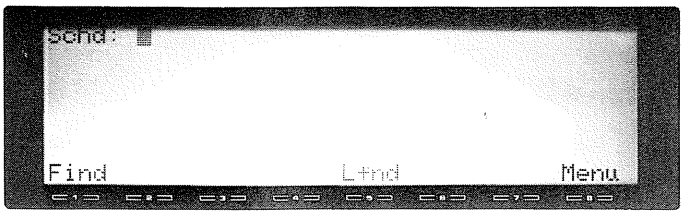
The use of the TEXT program from BASIC is covered later, but the main point is that you have the full power of all TEXT features when editing BASIC programs.

SCHEDULER

The Scheduler applications program is abbreviated on the main menu as SCHEDL. This is a very powerful, free-form, mini-data base that you can use to keep track of virtually any type of information that you desire.

This program uses information kept in a special file that has the required name NOTE (which is short for "notepad," if you want to think of it that way.) You use the TEXT program to create, add, change or update your "notepad" and the SCHEDL program will extract information from your notes in just about any way that you want.

When you enter SCHEDL you are presented a screen which looks like this:



Pressing **FIND** ([F 1] function key) will prompt you with the word "Find" and wait for you to enter any character, number, symbol, word or group of words that you want to search for. SCHEDL will then scan the entire NOTE file, character by character, from beginning to end, and display all items that match your request. The display will pause when 7 lines of information is presented and prompt you for "More or Quit", which will be displayed immediately above the legends [3] and [4] (The original label display will disappear). All you have to do to see the next screenful of information is press the [F 3] function key. If you want to look for something else, just press [F 4].

If you've forgotten exactly what it is that you have in your notebook and want to "scan" through it, just press [ENTER] after pressing FIND. The Model 100 will then display your entire notebook, pausing at the end of each screen just as before.

LFIND ([F 5] function key) will perform exactly as the FIND command, except that all the found items will be printed on a printer if one is attached, without pausing. LFIND and [ENTER] without any search criteria will print your entire notebook file to the printer.

MENU ([F 8] function key) Pressing this key signifies that you want to exit the scheduler program and you will be returned to the main menu.

The most obvious use for the SCHEDL program is as an appointment reminder. You might enter the following into NOTE:

```
1/2  0800  Meeting with Bruce
1/2  1000  Advertising meeting
1/2  1300  Dentist appointment
1/3  0930  Budget due
1/3  ****  Anniversary today!
1/4  0845  Update project status
1/9  1630  Update report due
1/10 ****  Vacation Begins
```

But that's not all, actually you can track anything that has to be tracked—times, people, events, etc.

TELECOMMUNICATIONS

The Model 100 has one of the easiest to use, yet most sophisticated, communications programs available.

The communications program exercises control over the internal 300 baud auto-dialer and direct-connect modem. It

allows you to search a file for a name and will dial the associated telephone number. It will automatically "log-on" to your data service if you want it to! Also, since RS-232 is built-in, provisions are included to allow full use of the telecommunications program at speeds up to 19,200 baud through the RS-232 interface.

FUNCTION KEY USES

FIND—(F 1) This key will cause the Model 100 to search a particular text file, named ADRS, for a match to your request. If a match is found, you will then have the option to CALL that number, find the NEXT occurrence of your request, or QUIT and return to the command mode of TELCOM.

CALL—(F 2) This key will let you manually enter a telephone number that you want the Model 100 to dial for you. Simply press CALL ((F 2)), type the number and press (ENTER).

STAT—(F 3) This function key controls the setting of the communications parameters. Simply press STAT ((F 3)) and type in your desired parameters and the Model 100 will re-configure itself to your specifications. These parameters are:

Baud Rate

M Modem (Internal)—operates at 300 baud
1 75 baud
2 110 baud
3 300 baud
4 600 baud
5 1200 baud
6 2400 baud
7 4800 baud
8 9600 baud
9 19200 baud

Word Length

6 6 bits
7 7 bits
8 8 bits

Parity

O Odd parity
E Even Parity
N No Parity
I Ignore Parity

Stop Bit

1 One Stop bit
2 Two Stop bits

Line Status

E Enable XON/XOFF
D Disable XON/XOFF

Pulse Rate

10 10 Pulses Per Second
20 20 Pulses Per Second

Perhaps the most significant item to point out is the inclusion of XON/XOFF. If this is "Enabled", the Model 100 terminal program will request the "Host" computer to pause in sending data whenever the Model 100 needs some time to "catch up" to the speed of the incoming data. The reverse is also true, if the "Host" needs to pause for a few seconds, it may (this depends upon the particular system you are using, check your user's guide) send XOFF, which means, "stop sending temporarily," followed by XON, "O.K. to transmit again." when it is again ready for information. If you have XON/XOFF enabled, whenever the host pauses the Model 100, the word WAIT will appear above (F 6) to let you know what is happening.

TERM (F 4) Pressing this function key will cause the Model 100 to enter the terminal mode of operation. When successful connection to another computer is accomplished, the function key labels will change as the terminal mode is entered.

TERMINAL MODE

Once in the terminal mode, you have six labeled functions which can be used:

Prev (F 1)—In the terminal mode, the Model 100, actually retains 16 lines of text (broken into two eight line segments) at all times. You can think of the displayed eight lines as being the bottom half of a page of text. To view the previous eight lines, all you have to do is to press the (F 1) key. Pressing (F 1) again returns the last eight lines to the screen. Note: if you have the eighth line displaying labels, you will toggle seven lines at a time.

Down (F 2)—Pressing (F 2) allows you to download incoming information into memory for viewing or printing later. When you press (F 2), you will be asked for a filename which can be assigned to the file you are about to download. Type in a filename and press (ENTER). To stop the downloading process, press (F 2) again.

Up (F 3)—Pressing (F 3) allows you to send information that has been previously prepared in the TEXT Application Program to a host system.

When you press (F 3), you are asked for the name of the file to upload and the width (10 to 132 characters) to be used for uploading the file.

Full (F 4)—Pressing (F 4) lets you switch between Full and Half Duplex.

Most host systems require you to use Full Duplex. This means that any character typed is sent to the host before it appears on the Model 100 Display. If the characters typed are the same ones that appear on the Display, good communication with the host has been established.

Half Duplex, on the other hand, shows what was typed directly on the Model 100 display. This means that you have no way of knowing if the host received the same characters.

Echo (F 5)—Pressing (F 5) enables you to obtain a printout (or "hard copy") of incoming information (if a printer is connected.)

Bye (F 8)—Pressing (F 8) exits Terminal Mode and disconnects (or "hangs up") the telephone lines.

When you press (F 8), you will be asked to confirm that you want to disconnect. If you press (Y), the Model 100 will release the phone line, otherwise you will be returned to the Terminal Mode.

An additional feature gives you the ability to have "one-touch" entry (almost) into virtually any host computer system.

Appending the "greater-than" and "less-than" symbols after a telephone number signifies that you want to enter the terminal mode of operation after dialing the number. You can add "auto-log-on" by inserting appropriate commands and responses inside these two symbols.

LOG ON COMMANDS

? Wait for a specified character
= Pause for 2.0 seconds

! Send a specific character

^ Causes the character after "^" to be sent as a "control character", i.e., ^ M is the same as "Control-M" which is the same as pressing (ENTER)

All other characters in the auto log-on command will be sent out the communications line. If, for example, we are going to log onto CompuServe manually, the dialogue might look like this (CompuServe's questions appear underlined)

(Pick up phone, dial 123-4567)
(User waits for tone, then connects modem)
^C
User I.D.: 12345,123 (ENTER)
Password: Atom Age (ENTER)

On the Model 100, you can save the sequence in the ADRS file, never to have to manually key it in again!

CIS:1234567〈=^C?U12345,123^M?PAtom Age^M〉

Let's see just how you would use this and what the Model 100 will do with each command character:

1. Enter TELCOM
2. Press FIND, type CIS, and press (ENTER)
3. CIS:1234567〈〉 will be displayed (yes, the Model 100 will "hide" your log-on sequence for security in case anyone is watching); note that the label line display prompts will change at this time to "CALL MORE QUIT" above legends for (F 2) (F 3) (F 4).
4. Press CALL ((F 2))—You will see the call dialed as each number appears and then you will hear (yes, hear) as the phone ring (or a busy signal) and the first sound of the host computer's tone as it connects.
5. =—to pause for 2.0 seconds before continuing
6. ^C—send to the host a "Control-C"
7. ?U—Wait until host sends capital "U", when received, send back the sequence:
   12345,123(ENTER)
8. ?P—Wait until host sends capital "P", when received, send back the sequence:
   Atom Age(ENTER)
9. Log on complete, begin interactive terminal program, look for input from keyboard.

UPLOAD/DOWNLOAD

Terminal also provides you the ability to send and receive (Upload or Download) text files from a host computer system. Downloading is straightforward, when you want to save some information for later viewing, simply press (F 2), and the system will ask you for a filename to save the information under. Respond with a 6 character (or less) name. Sending (Uploading) is not much more difficult. After connection is made with the host and appropriate arrangements are made for it to receive and store the information, press (F 3). The system will ask you for a filename to send. You must enter a 6 character (or less) filename which already has the extension .DO. It is not necessary for you to type the .DO, but the Model 100 sends only text files (DOcuments, remember?). Next, you will be asked for a WIDTH?. Here is a very subtle, powerful feature . . . When you typed your document with TEXT, you did not use the (ENTER) key except to break paragraphs. This makes very long lines without any carriage returns ((ENTER)). Some computer systems "require" that (ENTER) be pressed "at least" every 132 characters (CompuServe is one of these). So, if the Model 100 didn't give you the opportunity to add (ENTER)'s every so many characters, you would have to remember to do so when you prepared the text and that could be a real pain in the neck. In fact, the Model 100 takes it one step further—it will not split a word just to add an (ENTER) key. Yes, you set the width, but the receiving computer will not get any partial words because of it.

If you don't want to set a WIDTH, say, because you're sending it via RS-232 to your Model II to be loaded into SCRIPSIT, simply press (ENTER) without setting a WIDTH. The file will be sent just "as-is" without any extra (ENTER)'s. This feature is there for just that reason.

ADDRESS

Address functions similarly to SCHEDL but uses information stored in the file called ADRS. By appending a colon after the telephone number, you can add full address, city, state, zip and any notes that you want to keep track of. All information after the second colon (remember, the first colon goes before the phone number) will be displayed *only* from within the ADDRS program.

Pressing **FIND** ((F 1) function key) will prompt you with the word "Find" and wait for you to enter any character, number, symbol, word or group of words that you want to search for. ADDRS will then scan the entire ADRS file, character by character, from beginning to end, and display all items that match your request. The display will pause when 7 lines of information is presented and prompt you for **More or Quit**, which will be displayed immediately above the legends [3] and [4] (The original label display will disappear). All you have to do to see the next screenful of information is press the (F 3) function key. If you want to look for something else, just press (F 4). If you've forgotten exactly what it is that you have in your address file and want to "scan" through it, just press (ENTER) without typing any characters to find after pressing FIND. The Model 100 will then display your entire address list pausing at the end of each screen just as before.

LFIND ((F 5) function key) will perform exactly as the FIND command, except that all the found items will be printed on a printer if one is attached, without pausing. LFIND and (ENTER) without any search criteria will print your entire address file to the printer.

MENU ((F 8) function key) Pressing this key signifies that you want to exit the scheduler program, and you will be returned to the main menu.

MODEL 100 BASIC

DATA TYPES

Model 100 BASIC can handle two kinds of data:

- Numbers—can be the default double precision (14 significant digits), single precision (6 significant digits) or integers (−32768 to 32767)
- String data—may vary in length from 0 to 255 characters.

DEFDBL—defines variables as double precision.
DEFINT—defines variables as integer.
DEFSNG—defines variables as single precision.
DEFSTR—defines variables as string.

ARRAYS

Model 100 BASIC supports multi-dimension numeric and string arrays. Array size is limited only by the amount of available memory in your Model 100. Single dimension ar-

rays larger than 11 elements, and all multi-dimension arrays must be declared using the DIM statement.

NUMERIC EXPRESSIONS

In the Model 100, the following numeric, relational and logical operators are available, and they are evaluated in the order shown. (Parentheses are evaluated from inner-most to outer-most. Operators shown at the same level in the hierarchy are evaluated left to right:)

Parentheses
^ (exponentiation)
+, – (unary plus and minus)
*,/ (multiplication and division)
\ ,**MOD** (Integer division 10 \ 3 = 3 and modulus division 10 MOD 3 = 1)
+, – (addition and subtraction)
<, >, =, = <, > =, >< (relational operators)
NOT
AND
OR
XOR
EQV
IMP

NUMERIC FUNCTIONS

ABS—Returns absolute value
ASC—Returns ASCII code of a string
ATN—Computers arctangent
CDBL—Convert to double precision
CINT—Convert to integer
COS—Compute Cosine
CRSLIN—Return vertical line position of cursor
CSNG—Convert to single precision
EOF—Returns End-of-File status
ERL—Returns the line number of latest error
ERR—Returns the error code of latest error
EXP—Compute natural exponential
FIX—Truncate to a whole number
FRE—Return current amount of available memory
INSTR—Search a string for a substring
INT—Convert to integer
LEN—Compute length of a string
LOG—Compute natural logarithm
LPOS—Return column position of print head within the printer buffer.
MAXRAM—Return Model 100 RAM size
PEEK—Return value at a memory address
POS—Return column position of cursor
RND—Return pseudo-random number
SGN—Return algebraic sign
SIN—Compute trigonometric sine
SQR—Compute square root
TAN—Compute Tangent
VAL—Convert string to numeric value
VARPTR—Return memory address of a variable

STRING FUNCTIONS

CHR$—Returns ASCII character
LEFT$—Returns left portion of a string
MID$—Returns middle portion of a string. May also be used on the left side of the equal sign to replace the middle characters in a string.
RIGHT$—Returns right portion of a string
SPACE$—Returns a string of spaces
STR$—Converts a numeric value to string
STRING$—Returns a string of characters

SIMPLE CONTROL COMMANDS

CALL—CALL is used to execute a machine language subroutine from BASIC. Allows more parameters than USR.
IF . . . THEN . . . ELSE—Test relational expression. Perform THEN clause if the expression is true, perform ELSE clause (if present) if expression is false.
FOR . . . NEXT—This command gives BASIC a looping structure. An optional **STEP** value may be included.
GOSUB—Causes the BASIC program to execute the subroutine beginning at the line indicated, and then return to the statement following the GOSUB when a **RETURN** statement is encountered.
GOTO—Causes the BASIC program to branch to the line number indicated.
ON . . . GOSUB—Branch to appropriate subroutine.
ON . . . GOTO—Branch to appropriate line.

INTERRUPT COMMANDS

The Model 100 recognizes five interrupt commands:
ON COM GOSUB—Calls a subroutine when the computer receives data over the RS-232C line.
ON ERROR GOTO—Branches to an error handling routine if some error occurs while the program is executing.
ON KEY GOSUB—Calls a subroutine if you press one of the eight definable function keys.
ON MDM GOSUB—Calls a subroutine when the computer receives data over the modem.
ON TIME$ GOSUB—Calls a subroutine when the real-time clock reaches a certain time.
RESUME—Resumes program execution after an error. RESUME ends the error handling routine.

GRAPHIC/SOUND COMMANDS

BEEP—Causes the sound generator to emit a tone for about 1/2 second.
LINE—Draw a line on the screen. Optionally may draw a box (outline or filled.)
PRESET—Turn off an LCD pixel.
PSET—Turn on an LCD pixel.
SCREEN ON/OFF—Lock or unlock the screen label line.
SOUND—Outputs a tone of specified pitch and duration.
SOUND ON/OFF—Enables or disables sound during cassette loads and while the Model 100 is waiting for a carrier signal from the telephone modem lines.

OTHER COMMANDS

CLEAR—Clears all variable values, closes all open files, and optionally reserves string and high memory space.
CLS—Clears the screen
CLOAD—Loads a BASIC program from tape.
CLOAD?—Verify a cassette load of a BASIC program.
CLOADM—Loads a machine language file from tape.
CLOSE—Closes open files by number, or all files.
COM ON/OFF/STOP—Enable or disable communications interrupt.
CONT—Continue program execution after a STOP command or [BREAK]
CSAVE—Save a BASIC program on tape. Program may be saved in compressed or ASCII formats.
CSAVEM—Save a machine language program on tape, using start, end and entry addresses.
DATA—Defines a data set within a BASIC program.

DATE$—Prints or sets current date in MM/DD/YY form.
DAY$—Prints or sets current day of the week.
DIM—Define array size.
EDIT—Edit a BASIC program.
END—End BASIC program execution.
ERROR—Simulates an error in a program.
FILES—Prints the names of data and program files stored in RAM.
FRE—Returns the amount of memory available to BASIC
HIMEM—Returns highest memory address available to BASIC
INKEY$—Returns any keyboard key currently pressed
INP—Return a value from a CPU port
INPUT—Input data from keyboard.
INPUT #—Input data from a file.
INPUT$—Inputs a number of characters from keyboard or from a file.
IPL—Defines a BASIC program to run whenever the Model 100 is powered up.
KEY—Define function keys.
KEY LIST—List function key definitions.
KEY ON/OFF/STOP—Enable or disable function key interrupts.
KILL—Erases a RAM file.
LCOPY—Copies the screen text to the printer.
LET—Optional assignment statement.
LINE INPUT—Input a string from the keyboard.
LINE INPUT #—Input a string from a file.
LIST—Lists the current program to the screen.
LLIST—Lists the current program to the printer.
LOAD—Loads a BASIC program from RAM, CAS, COM, or MDM for execution.
LOADM—Load a machine language file from RAM or CAS.
LPRINT—Print data to the printer.
LPRINT USING—Print formatted data to printer.
MAXFILES—Specifies the maximum number of files your program may have open at one time.
MDM ON/OFF/STOP—Enables or disables modem interrupt.
MENU—Returns to the Model 100 menu.
MERGE—Combines two BASIC programs. One of the programs will be in current memory, the other will come from RAM, CAS, COM, or MDM.
MOTOR ON/OFF—Turns the cassette motor on or off.
NAME . . . AS—Renames a RAM file.
NEW—Erases the current program.
OPEN—Open a RAM, CAS, COM, LCD, LPT, or MDM file for I/O.
OUT—Output a byte to a port.
POKE—Load a value into memory.
POWER—Controls the automatic power off feature.
POWER CONT—Prevent automatic power down.
POWER OFF—Turn power off. If optional RESUME is added, execution continues where it stopped before power was turned off.
PRINT—Print data to the screen. ?—Abbreviation for PRINT.
PRINT @—Print at specified position on screen.
PRINT #—Print data to a file.
PRINT USING—Print formatted data to screen or file.
PRINT # USING—Print formatted data to a file.
READ—Reads a data set within a BASIC program.
REM—Indicates an unexecutable comment.
RESTORE—Allows DATA items to be reused. The optional line number specifies which line the DATA pointer is to be set to.
RUN—Run a BASIC program. May include loading the program from RAM, CAS, COM, or MDM. The ,R option tells BASIC to leave open files open.
RUNM—Load and execute a machine language program from RAM or CAS.
SAVE—Saves the current program to RAM, CAS, COM, LCD, LPT, or MDM. Optional ,A may be used to store an ASCII file to RAM or CAS. Other devices automatically save in ASCII.
SAVEM—Save a machine language file to CAS or RAM.
STOP—Stop program execution.
TAB—Skip to specified column with PRINT or LPRINT.
TIME$—Displays or sets the current time.
TIME$ ON/OFF/STOP—Enables or disables the time interrupt.

THE BOTTOM LINE

The Model 100 will come in two standard versions:
Model 100 with 8K RAM (26-3801 $799.00)
Model 100 with 24K RAM (26-3802 $999.00)

The following accessories will also be available for the Model 100:

AC Adaptor/Charger—this unit lets you power the Model 100 from the AC line, as well as charging the internal Ni-Cad batteries. The charger does not charge the 4 AA batteries. (26-3804 $5.95)

8K RAM expansion—Depending on the amount of RAM in your Model 100 when you buy it (8K or 24K), you can add from one to three 8K RAM expansion kits. This gives you the ability to have up to 32K RAM in the Model 100. (26-3816 $119.95 + $15.00 installation—only one installation charge will be made if you have more than one RAM kit installed at the one time)

Printer Cable—This cable will let you use any of Radio Shack's standard parallel printers (26-1409 $14.95).

Direct Connect Modem Cable—This cable lets you connect the Model 100's built-in direct connect modem to a phone line. Included with this cable is a sign-up package for CompuServe and Dow Jones, including one free hour non-prime time usage on each system. (26-1410 $19.95)

Hardshell Custom Carrying Case—This case is large enough for the Model 100, Radio Shack's CCR-81 Computer Recorder, cables, extra cassettes, and more. (26-3809 $49.95)

Cassette Cable—If you already have a tape recorder, the standard Radio Shack Cassette Interface Cable will let you connect the Model 100 to a cassette recorder. Even though the Model 100 uses an 8 pin socket for the cassette in, the 5 pin 26-1207 will work correctly. (26-1207 $5.95)

Cassette Recorder—If you don't have a cassette recorder, the Radio Shack CCR-81 is designed for use with your Model 100. Included with the CCR-81 is a cassette cable similar to 26-1207 which will work with your Model 100. (26-1208 $59.95)

RS-232 Cables—Check with your local Radio Shack store for Radio Shack's Universal RS-232C Accessories like Extended Cables, Cable Extenders, Null Modems and others.

Retail prices shown here may vary at individual stores and dealers.

CP/M PLUS and CBASIC for the TRS-80 Model II and Model 12

CP/M Plus is a high performance single-user, single-tasking operating system designed for microcomputers that use the Intel 8080 or Zilog Z-80 family of microprocessors. CP/M Plus was designed with the business user in mind—it is easy to learn and use. CP/M Plus also features a flexible application program interface and powerful system utilities to facilitate software development.

CP/M Plus includes a fast, sophisticated file system. It has a time tested, modular design which allows it to be easily customized to run in a particular hardware environment. It supports our bank-switched memory. And CP/M Plus is small, residing in about 10K bytes of memory.

CP/M PLUS FEATURES

- High Performance File System
- CP/M 2.2 Compatible
- Time and Date Stamps on Files
- Automatic Disk Login of Removable Media
- Console I/O Redirection
- Easy to Use System Utilities with HELP Facility
- Powerful Batch Facility
- Systems Primitives Designed for Applications Programmers
- Resident System Extensions
- Sophisticated Programmer Utilities

(Catalog number 26-4740, suggested retail price $249.00)

HIGH PERFORMANCE FILE SYSTEM

In CP/M Plus, hashed directory access, record buffering, and multi-sector disk I/O support a high performance file system. CP/M Plus uses a hashing technique to directly access directory information, eliminating the need for directory searching. Record buffers maintained in memory on a LRU scheme give the application program fast access to a working set of directory and data records. Multi-sector I/O allows application programs and the operating system to read or write up to 16K of program or data records in one operation. The operating system uses multi-sector reads to load programs at high speed.

CP/M 2.2 COMPATIBLE

The CP/M Plus file system is upward compatible with CP/M 2.2 and MP/M II files. All files generated by CP/M systems can be read under CP/M Plus. Application software which runs under CP/M 2.2 will run under CP/M Plus without modification.

TIME AND DATE STAMPS ON FILES

Time and date stamping options allow the user to record in the disk directory two entries for time and date stamps for each file. The user can select the time and date of the last update to a file and either time and date of the file's creation or last access. The DIR command displays time and date stamp information.

AUTOMATIC DISK LOGIN OF REMOVABLE MEDIA

CP/M Plus automatically logs in a disk when it detects a media change. The user need not inform the operating system when a disk is changed. If files are open and CP/M Plus detects a media change, CP/M Plus performs no further file I/O for these files.

DISK DRIVE SUPPORT

CP/M Plus supports up to sixteen logical drives. Space is dynamically allocated and released. A single volume can be partitioned into sixteen logical areas identified by a user number. All files on user area 0 can be made available under the other user areas.

CONSOLE I/O REDIRECTION

The CP/M Plus GET and PUT utilities allow application programs to redirect serial device input/output to or from a disk file. Programs do not need to be modified to use this facility.

SYSTEM UTILITIES

CP/M Plus utilities have a consistent syntax and accept optional English words to make commands easier to use and remember. A HELP command displays concise information on all system commands and available options. The HELP input file can be expanded to include information about application programs.

BATCH FACILITIES

The batch facility, SUBMIT, allows the user to perform repetitive tasks without re-keying the command sequence. SUBMIT input files can include both program and system input. SUBMIT input files can include commands to execute additional SUBMIT files. A sequence of CP/M Plus commands can also be entered with one console input line.

SYSTEM PRIMITIVES

CP/M Plus is upward compatible with CP/M 2 at the operating system functional level. Added system primitives allow the application program to determine the amount of free space available on a drive, truncate files, and chain to another program. An additional primitive allows application programs to intercept and process system errors.

RESIDENT SYSTEM EXTENSIONS

The CP/M Plus RSX facility allows customization of the operating system on a selective basis. RSX modules are attached to the base of the operating system where they intercept operating system functions and either perform the

function or forward the function to the operating system. RSX modules can remain permanently in memory or be removed when a transient program terminates.

SOPHISTICATED PROGRAMMER UTILITIES

The CP/M Plus package includes Digital Research's symbolic instruction debugger (SID), macro assembler (MAC), relocating macro assembler (RMAC), and linkage-editor with overlay capability (LINK-80). These utilities simplify systems level programming.

Memory Organization of Non-banked CP/M Plus System

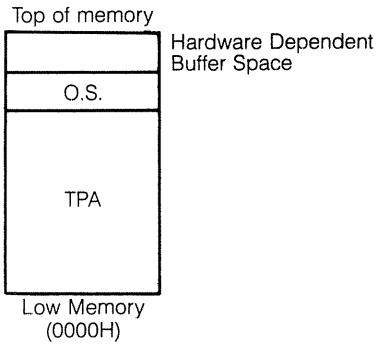


Figure 1

Memory Organization of Banked CP/M Plus System

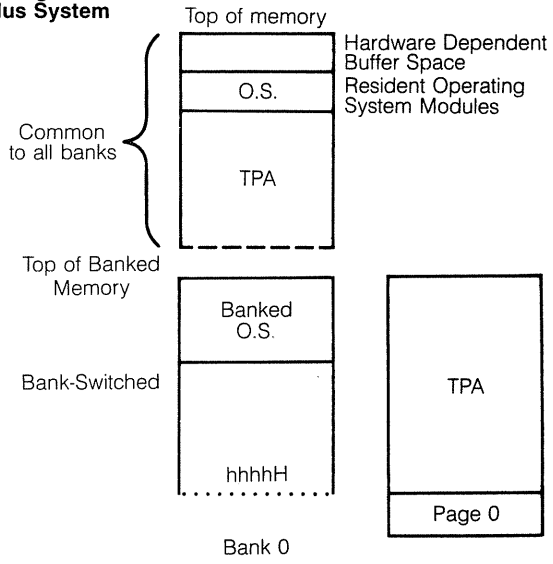


Figure 2

CP/M PLUS UTILITIES

CP/M Plus includes utilities to list file directories, transfer files, edit files and create and debug 8080 assembly language programs. The following utilities are also part of the CP/M Plus package.

DEVICE: The DEVICE command sets communication protocols and baud rates for character I/O devices. It also allows the user to change device assignments and to assign program output to multiple devices.

GET: The GET command redirects console input to be read from a disk file. The input file can contain both standard CP/M Plus input and input to the application program.

PUT: The PUT command complements the GET command by allowing application programs and CP/M Plus system output to be directed to a disk file.

SET: The SET utility allows the user to set various file attributes and time and date recording mode. The file attributes include Read-Only and System.

SETDEF: The SETDEF command displays and defines the disk search order. With this command, the user can cause CP/M Plus to search more than one drive for a command file. The user can also direct CP/M Plus to search for files of type SUB as well as type COM.

SHOW: The SHOW utility displays information about the characteristics of a logical drive such as capacity, number of directory entries, and directory label information.

SUBMIT: The SUBMIT command lets the user execute a command sequence stored in a disk file. The file can contain both CP/M Plus system input and application program input.

CP/M PLUS PACKAGE

CP/M Plus is shipped on two 8-inch single-sided, single density diskettes.

SOFTWARE PERFORMANCE REPORT

CP/M Plus is supported by Digital Research's Software Performance Report (SPR) system. This service provides a prompt response to technical problems associated with CP/M Plus. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user-identified problems.

CBASIC OVERVIEW

CBASIC is a commercial dialect of the popular BASIC language implemented as a compiler/interpreter. CBASIC is designed specifically to develop business applications. A source code file, created by a text editor or word processor, is compiled by CBASIC into an intermediate file composed of pseudo-code (P-code) instructions. During program execution, the CBASIC run-time monitor interprets each P-code instruction and.performs the operation. This process enables CBASIC to use less random access memory (RAM) space, providing more memory area for the application program.

Due to its efficient use of RAM, precision arithmetic capability and high level file management, more software packages have been written in CBASIC for commercial business applications than in any other microcomputer language.

DECIMAL ARITHMETIC

CBASIC maintains real numbers in a binary coded decimal (BCD) floating point format, retaining 14 significant digits. Decimal arithmetic assures that fractional parts of dollar amounts will be exact and that ledgers will balance to the penny.

CBASIC supports integer arithmetic. By using integer variables whenever possible, program speed and throughput will be increased tremendously.

CBASIC FEATURES

Extended Precision Decimal Arithmetic
Expanded File Processing
Comprehensive String Processing
Efficient Use of Memory
Reduced Software Development Time
Assembly Code Interface
Debugging Capabilities
Cross Reference Lister

CBASIC PACKAGE

CBASIC is shipped on an 8-inch single-sided, single-density diskette. The diskette contains the following machine-readable files:

CBAS2.COM
CRUN1.COM
XREF.COM

(Catalog number 26-4742, suggested retail price $99.00)

CP/M is a registered trademark of Digital Research
CP/M Plus, RMAC, SID, MAC, LINK-80 and the Digital Research logo are trademarks of Digital Research
Z-80 is a registered trademark of Zilog Corp.

The DC-1200–A 1200 Baud Modem

By Linda Miller

The DC-1200 may appear a little complicated with all its indicator lights and switches, but it is very simple to use and, best of all, the DC-1200 makes it possible to transfer data at 1200 baud. (Catalog number 76-1005, suggested retail price $699.00).

THE EIGHT INDICATORS

The indicators give the user information about what is happening during the communicating process.

TR (Terminal Ready). If this indicator is not on, the modem won't operate. TR indicates that the DC-1200 is ready to transmit and/or receive data.

OH (Off Hook). OH indicates that the modem has control of the phone line.

TD (Transmit Data). When the DC-1200 is transmitting data to another modem, TD will blink on and off.

RD (Receive Data). This indicator lights up when it receives a space and goes off when the modem receives a mark.

HS (High Speed). When the DC-1200 is in the high speed mode, this indicator lights up.

RI (Ring Indicator). When the DC-1200 receives an incoming call, then RI lights up.

CD (Carrier Detect). When the DC-1200 detects a carrier tone from a remote modem, CD lights up.

ON (Power On). ON is illuminated when the power is on, and everything is connected properly.

THE THREE SWITCHES

Pressing the local test switch puts the modem in the local test mode. Local test is used to verify that the modem's modulation/demodulation circuits are working correctly, the computer's transmit/receive functions are correct, and the modem/computer interface is operating under proper conditions.

The high speed switch is just that—a high speed switch. If it is pressed in, then transmission can be done at 1200 baud. When the high speed switch is out, then a 300 baud rate is engaged.

The originate mode switch is pressed before originating (placing) a call.

ORIGINATE OR ANSWER?

The DC-1200 can be used two ways: to originate or to answer calls. As a call originator, the DC-1200 is used to call a host computer or information service such as CompuServe. The originating modem selects the transmission speed (high = 1200 baud, low = 300 baud).

The DC-1200 will also answer a call from another terminal. Since the DC-1200 is always in the Auto-Answer Mode, no switches have to be set, no buttons need to be pressed, and the phone doesn't have to be picked up manually because the modem will answer it automatically.

TECHNICAL INFORMATION

When the HS switch is pushed in, the DC-1200 is end-to-end compatible with Bell 212A modems or comparable products. With low speed, the DC-1200 operates in a format compatible with Bell 100 series modems or acoustic couplers.

If called by a 300 bps modem, the DC-1200 will automatically adapt to the speed of the calling modem regardless of the position of the HS switch. To originate calls to other 300 bps modems, the HS switch must be out.

AUTO CALL MODULE—AN OPTIONAL EXTRA

The Auto Call Unit (ACU) makes it possible for the DC-1200 to actually dial a phone number. Either a single 48 character buffer containing one phone number or two 24 character buffers, each containing a single phone number, may be set up. In addition to dual number storage, the DC-1200 ACU also features a menu; short, medium, and long pause commands; the ability to select rotary or tone dialing, and many other enhancements. The ACU for the DC-1200 (Catalog number 76-1009, suggested retail price $149.95) is an optional extra.

FULL OR HALF DUPLEX

The DC-1200 is preset for full-duplex operation. Setting it for half-duplex operation must be done by a qualified Radio Shack technician.

SIGNING OFF

The DC-1200 has 1200 baud communication capability; it is simple to use, and, with the Auto Call Unit, it offers programability and versatility.

Bugs, Errors, and Fixes

NOTE TO USERS:

The following changes and corrections are provided for your information. If you have an applications program which is working correctly, you should probably NOT make any changes to it, unless we specifically direct you to by mail. All Customer Service Bulletins will contain the phrase "This is a Required Modification" or "This is an Optional Modification". It is up to you to decide whether or not to apply an optional modification, however, you should always implement a required modification regardless of your past experience with a package. The error it prevents may be just around the corner and the modification could save you many hours of frustration.

If you feel that changes should be made, but you do not feel qualified to make the change yourself, please contact your local Radio Shack Computer Center or Expanded Computer Department for assistance. If you do not have access to one of these stores, then you may want to call Computer Customer Service in Fort Worth for assistance.

PATCHES

PATCHes are entered from TRSDOS READY and are used to make corrections to files stored on the disk.

1. Before making a PATCH, back up the diskette that requires modification and make the PATCHES to the backup copy of the diskette.
2. Apply PATCHES according to the information given in your TRSDOS manual.

Color Computer

EDTASM + MANUAL (26-3250)

Make the following changes to the Color Computer EDTASM + Manual:

Page 6. Note in the upper left corner of the page states that ZBUG will display the A1 through FF as ASCII characters. It should read, "Note: ZBUG will also display the 80 HEX through FF as ASCII characters. However, they are not the true characters which these codes represent."

Page 12. It is stated that "You can use the Editor to edit your BASIC programs . . . ", but no explanation is given about how to get that BASIC program into the Editor. It should be stated that the BASIC program must be saved out in ASCII before it can be loaded into the Editor.

Page 13. /NO, last paragraph on left hand side of page, listing description says: "No object code in the listing." It should say "No object code in memory or to cassette".

Page 26. The first paragraph, top right column of page, states that the BASIC ROM routines are listed in Appendix E. They are really listed in Appendix F.

Page 42. Both BVS and CLR are left out of the listing of the 6809 Instruction set.

BVS Branch on Overflow Set
Source Forms: BVS dd; LBVS DDDD
Operation: TEMP ← M1
IFF V = 1 then PC' ← PC + TEMP
Condition Codes: Not affected
Description: Tests the state of the V (overflow) bit and causes a branch if it is set. That is, branch if the twos complement result was invalid. When used after an operation on twos complement binary values, this instruction will branch if there was an overflow.
Addressing Mode: Relative

CLR Clear
Source Form: CLR Q
Operation: TEMP ← M
$M \leftarrow 00_{16}$
Condition Codes: H - Not affected.
N - Always cleared.
Z - Always set.
V - Always cleared.
C - Always cleared.
Description: Accumulator A or B or memory location M is loaded with 00000000. Note that the EA is read during this operation.
Addressing Modes: Inherent
Extended
Direct
Indexed

Page 55. In the last line of the page (−) should be (←).

Page 56. At the end of the first paragraph the (−) should be (←).

Page 57. The W filename is missing. W writes program to tape. If filename is omitted, the default name NONAME will be assigned.

Page 59. "Pages discussed" for U and V commands are missing. Should be 19.

C command, operand is missing.

Page 60. Single step command is missing from ZBUG command list. It is a //B,//B.

READER SUBMITTED FIXES FOR EDTASM +

Joseph Kohn
1343 Blossom Avenue
Redlands, CA 92373

Generating sounds is a frequent part of machine language programs. There is a potential for problems when using the EDTASM + ROMpac with the sound routines that commonly appear in articles.

(Continued on Page 36)

AgriStar: America's Agricultural Information and Computing Network

by Annette Zamberlin-Main

There are several data bases currently on the market that have been designed for a specific group of individuals. For example, Westlaw has a data base specifically geared for members of the legal community. The Dow Jones News Retrieval Service originally began as a specialized data base for the financial/investment community and has since grown to include much more than just pure financial/investment type information.

To this list of specialized data bases we now add AgriStar, the agricultural information and computing network, dedicated to the professional farmer, professional rancher, farm manager, ag banker, elevator operator, extension specialist or agribusiness executive.

AgriStar meets all the qualifications for a data base and much more. It is an interactive (two-way) dial up electronic information and on-line data base service, which also offers electronic mail capabilities and computer time-sharing services.

The American agricultural business is just that, a business. And because of the high level of sophisticated technology which is practiced by the various groups involved in it, AgriStar offers an incredible spectrum of information and services. For example:

AgriScan A continuous business information service. Over 12,000 electronic pages are continuously updated with business, financial, marketing, weather and price information. A wide range of analyses and recommendations of reporters, analysts, economists, meteorologists and researchers from throughout the U.S. and 48 foreign countries is offered.

StarGram An electronic communications service. The AgriStar user will be able to send and receive messages from other farmers, consultants, dealers, distributors and commercial companies.

AgriStar is continually expanding its services and updating its system. Here is a glimpse at some upcoming services:

AgriCompute An on-line computing service which will be a combination of online timesharing and a library of microcomputer software programs which can be accessed for downloading. The system allows the user to use on-line farm management modeling, analysis and forecasting programs. All the programs have been extensively tested by farmers and proven successful.

AgriGuide A how-to business encyclopedia. Some 25,000 entries are planned, ranging from simple marketing principles to sophisticated price forecasting methods and breakeven analysis models for various enterprises. A selection of entries from the editorial library of *Farm Futures* and other major agricultural publications will be included along with high quality information from private and university agricultural economists.

AgriTech This service is a how-to library of agricultural product information. Commercial data bases will be created and maintained as an electronic customer support service by agricultural, chemical, fertilizer, equipment, seed and feed companies; noncommercial data bases will also be available from land universities, government sources, and several major agricultural publishers.

AgriMart Commercial companies will use these electronic "yellow pages" to communicate to farmers about their products and services.

SYSTEM REQUIREMENTS

Radio Shack is the exclusive electronic retail distributor for AgriData Resources, Inc.'s AgriStar service. The system requires:

1. A TRS-80 Model I or III microcomputer with at least a 32K memory, RS-232-C interface capability and one disk drive. A TRS-80 Model II microcomputer could also be used or a Data Terminal 1.
2. An acoustic coupler or modem, such as:
   TRS-80 Telephone Interface II
   Acoustic Coupler
   Modem I or II
   DC1200 High Speed Modem
3. A telephone
4. And, optionally, any compatible Radio Shack printer.

COST

The basic client service fee includes:

1. Annual AgriStar User Manual
2. Quarterly AgriStar System Index
3. Biweekly AgriStar Review
4. AgriData Network Audio System (24 hours)*
5. Toll-free User Support (24 hours)

* as described in the User's Manual.

AgriStar (Cat. No. 26-2227) documentation and six months of support services (not including connect time or information source fees) is available for $199.95 at Radio Shack Computer Centers, participating Radio Shack stores and authorized dealers.

A WORD ABOUT DESIGNING AN INFORMATION SERVICE

The information contained within AgriStar is vast and the user will not need to access all of it. AgriScan will allow the user to custom design his subscription to exactly fit his particular agricultural business. It also allows the user to access the service on the user's own particular schedule.

By developing a customized information service with AgriScan, AgriStar will become a powerful management and decision-making tool which can be accessed quickly, easily, and economically.

Bugs, Errors, and Fixes (From Page 34)

The generally accepted practice is to use the following codes to 'turn on' the sound:

```
LDA #$3F
STA $FF23
```

This can cause problems when trying to run a program using ZBUG, because $FF23 contains ROMpac signals as well as the sound enable. Running this routine will cause the program to crash and dump the edit buffer.

This problem can be eliminated by using the following program, which is probably more correct than the above, since it only affects the sound:

```
LDA $FF23
ORA #8
STA $FF23
```

Troy C. Meyers
408 S 60th Ave. #B
Yakima, WA 98908

I am a happy new owner of a DMP-100. I also have an early Extended BASIC 1.0 16K Color Computer. Therefore in order to make the combination work, I purchased the PTFX Cassette Program (Cat. No. 70-2013).

This works great in BASIC, but it fouls up the EDTASM+ that I use for M/L programming. The reason is that the PTFX16 routine does not preserve the Y register, which is necessary for EDTASM+. The following is a "FIX" for this problem, as repaired while using EDTASM+.

From power-up, type so that the screen appears like this:

```
*Z (ENTER)
#L PTFX16(ENTER)
#U 3F9E 3FA2 4D(ENTER)
#U 3F96 3F98 8(ENTER)
#B (ENTER)
#3F95/ E 12(ENTER)
#W (ENTER)
#3F96/ 10BE 3420(ENTER)
#3FA0/ 7E82 3520(ENTER)
```

Now to save his on tape, (don't forget to change cassettes):

```
#P PTFX16EA 3F80 3FEE 3F80
```

And to make the printer functional,

```
#168/ 8273 3F8C
```

and print away!

To load your saved PTFX16EA (EA for Editor-Assembler compatible), after power-up, type:

```
*Z (ENTER)
#L PTFX16EA(ENTER)
#W (ENTER)
#168/ 8273 3F8C(ENTER)
```

and you're all set.

Note that PTFX16EA is still compatible with BASIC and is set up according to the PTFX instructions that came with the original cassette.

MAGAZINES

Below are four magazines of special interest to TRS-80 owners that we believe have editorial content of high quality and will be of use to our customers.

80-US (Covers all TRS-80's)*
3838 South Warner Street
Tacoma, WA 98409

Color Computer Magazine
Highland Hill
Camden, ME 04843

Rainbow (Covers the TRS-80 Color Computer.)
5803 Timber Ridge Dr.
Prospect, KY 40059

two/sixteen magazine
P.O. Box 1216
Lancaster, PA 17603

*Write to them to recieve a free sample copy.

Computer Customer Service Address and Phone Numbers

8AM to 5PM Central Time
Computer Customer Services
400 Atrium, One Tandy Center
Fort Worth, Texas 76102

Model I/III Business Group	(817) 390-3939
Model II/16 Business Group	(817) 390-3935
Languages and Compilers	(817) 390-3946
Color and Pocket Computer Group	(817) 390-3944
Hardware and Communications Group	(817) 390-2140
Educational Software	(817) 390-3302
Games, Books, and New Products	(817) 390-2133
Newsletter Subscription Problems	(817) 870-0407

Notes on Previous Newsletters

FEBRUARY 1982

Mailing List Files

Robert K. Abbett
Oakdale Studio, Inc.
7259 East Valley View Road
Scottsdale, AZ 85253

A letter from Neal H. Krape, in your November 1982 issue, deals with avoiding unsightly spaces in the Firstname Lastname problem when alphabetizing people's names for mail lists.

Another solution I have found, uses a defined function to strip the trailing blanks from such data that have been LSET to the field. The function need only be placed once in the program line and can be called again at any time with new variables if needed.

I use:

```
DEF FNS$ (A$) = LEFT$(A$+"  ",INSTR(A$+"  ","  ")-1)
```

(Two spaces between the quotes) and would then use:

```
LPRINT FNS$(NF$)" "NL$
```

NF$ being the field name for first name, etc.

Then I could also call the function to strip the trailing blanks from CY$ (city) so that city and state will be printed up snugly.

```
LPRINT FNS$(CY$)" "ST$" "ZP$
```

My authority is Lewis Rosenfelder's *BASIC Faster and Better*, IJG inc.

Mr. James R. Napolin
2192 Dogwood Lane
Westbury, NY 11590

Mr. Neal H. Krape and Mr. William G.S. Smith recently suggested their solution for alphabetizing a file of people's names by using two fields.

I have a small program using two fields, one for the last name and one for the first name. This program improves upon the suggestions made by Mr. Krape and Mr. Smith in that it eliminates the gaps appearing between the first and last name field. The program allows you to enter a list of names and print them, but there are many possibilities for you to expand it.

I currently have a 48K Model III, Line Printer VI and SCRIPSIT Program, which are completely satisfactory for my many business and programming applications. I would also like to add, your magazine has helped me in innumerable ways. KEEP UP THE GOOD WORK!

```
100 REM  WRITTEN BY: JAMES R. NAPOLIN IN DISK BASIC
110 REM  TRS-80 MODEL III   LINE PRINTER VI

200 REM  THIS PROGRAM WAS WRITTEN TO PRINT FIRST AND LAST
210 REM  NAMES FROM TWO FIELDS WITHOUT THE GAP THAT MIGHT
220 REM  APPEAR BETWEEN THE FIRST NAME AND LAST NAME
230 REM  BECAUSE OF UNUSED SPACE IN THE FIRST NAME FIELD

300 REM  X%  = RECORD NUMBER IN THE RANDOM FILE
         L$  = LAST NAME FIELD
         F$  = FIRST NAME FIELD
         LF$ = LENGTH OF FIRST NAME FIELD

400 CLEAR 500
    : X% = 0                    'HOUSEKEEPING
410 OPEN "R", 1 , "NAMEDATA"          'OPEN FILE $ DEFINE FIELD
420 FIELD1, 15 AS L$, 15 AS F$, 2 AS LF$
500 X% = X% + 1                       'MENU
510 PRINT "ENTER YOUR LAST NAME OR Q TO QUIT OR P TO PRINT LIST"
520   LINE INPUT A$                   'ENTER LAST NAME
530     IF A$ = "Q" THEN CLOSE
    : STOP
540     IF A$ = "P" THEN 1000
550 PRINT "ENTER YOUR FIRST NAME"
560   LINE INPUT B$                   'ENTER FIRST NAME
570     L% = LEN (B$)
580   LSET L$ = A$
    : LSET F$ = B$
    : LSET LF$ = MKI$ (L%)
590   PUT 1, X%                       'WRITE TO FILE
600 GOTO 500

1000 PRINT "NAME LIST"
    : PRINT        'PRINT FIRST AND LAST NAMES
1010 FOR X% = 1 TO LOF (1)
1020     GET 1, X%
1030     L% = CVI (LF$)
1040     PRINT LEFT$ (F$,L%+1) + L$
1050 NEXT X%
1060 GOTO 510                         'RETURN TO MENU

SAMPLE OUTPUT:

NAME LIST

JAMES NAPOLIN
JOHN DOE
JACK SMITH
MICHAEL JOHNSON
MICK JAGGER
```

JULY/AUGUST 1982

Asteroids

Lix Flores
112 Coloma Way
Vallejo, CA 94590

In Richard Zepp's program "Asteroids", I have attained a score of 4812 on page number 161. That score was a little harder to reach since I added some lines to give more of a challenge after 2000 points are reached. And, for those of you who play coin-op video games, I have added a wrap around feature.

So, have fun playing, and Richard Zepp, I salute you.

```
4 PRINT"WRAPAROUND OR REGULAR (W/R)?"
5 B$=INKEY$
     :IF B$="W" THEN F=1 ELSE IF B$=""THEN 5
6 IF B$<> "W" THEN F=0
131 IF S<2000 THEN 135
132 FOR M=1TO20
133 Q=RNO(63)
     :R=RNO(31)
134 SET(Q,R,8)
     :NEXT M
215 IF F=1 THEN 230
225 IF A$=CHR$(9)THEN B=B+1
     :IF B>63 THEN B=63
227 GOTO 235
230 IF A$=CHR$(8)THEN B=B-1
     : IF B<1 THEN B=63
233 IF A$=CHR$(9)THEN B=B+1
     : IF B>63 THEN B=1
1040 CLS
     :GOTO 4
```

Matthew Weyh
Age 7
2641 East Crestline Drive
Bellingham, WA 98226

In the December 1982 issue of *Microcomputer News*, Joseph Prisco reports that he obtained a new high score of 3998 on Richard Zepp's "Asteroids" program for the Color Computer. Well, I would like to report a new record high score of 4718.

Sieve of Eratosthenes

Steven Hess

I was very interested in William Barden's article about the Sieve of Eratosthenes, because I have been using a BASIC

program to find prime numbers. It is a fairly fast program and can be easily converted to produce a hard copy. It was originally written on another computer, and was converted to run on a 4K COLOR COMPUTER.

```
3' PRIME BY DAN JEUCH AND STEVE HESS
5 CLS
1Ø X=9
     : Y=4
11 ' FOR 16 OR 32K, CHANGE LINE 2Ø TO
     : DIM PM(6ØØ)
12 ' AND CHANGE LINE 5Ø TO
     : X=X+1
     : IF X=18ØØ THEN 5ØØ
2Ø DIM PM(2ØØ)
3Ø PM(1)=2
     :PM(2)=3
4Ø PM(3)=5
     :PM(4)=7
5Ø X=X+1
     :IF X=67Ø THEN 5ØØ
6Ø FOR I=1 TO Y
7Ø IF INT(X/PM(I))=X/PM(I)THEN9Ø
8Ø NEXT
     :GOTO1ØØ
9Ø GOTO 5Ø
1ØØ PRINTX;
     :Y=X+1
     :PM(Y)=X
     :GOTO 9Ø
5ØØ PRINT
     :FOR P=1 TO Y
51Ø PRINT PM(Y)
52Ø NEXT
```

SEPTEMBER 1982

General Electric ASCII Sequential Files

Michael P. Guerard
7 South Jefferson Avenue
Wenonah, NJ 80890

Mr. Richard Halloran's tips on using "terminal" files offers some interesting alternatives to data entry, but there is one bug in the process.

The problem is that if the first data value on a line is numerical, it becomes part of the line number, and is lost as a data value! Fortunately, this can be prevented by entering each line as a comment, beginning with a single quote ('). This has the added advantage of allowing the "file" to be RUN without errors (or output!), should one forget that it is not a "real" program.

Greater flexibility in data format can be achieved if LINEINPUT is used instead of INPUT; this allows any characters to be included in the data, even "quotes." Also, I recommend using line numbers from 1000; this allows quite a large file to be entered and keeps the number of characters to be stripped off the front of each line to fixed number. Allowing for the space after the line number, plus the comment quote (6 characters in all), the MID$(A$,7) function works nicely. After the line has been LINEINPUT, it can be broken up and manipulated as needed by the various string functions and VAL( ). Of course, INPUT also works well if the data format is consistent from line to line.

OCTOBER 1982

Hex to Decimal

Justin B. Snyder
403 North Avenue
Lake Bluff, IL 60044

I do not understand all the recent fuss about Hex to Dec.

For $0600, e.g. simply type "?&H0600" and instantly you see 1536.

EDITOR'S NOTE: Not all TRS-80s are capable of automatic Hex to Dec conversion, which is the reason for publishing the program.

Loadcopy and Loaddata

Al Kalar
Box 243
Sumner, WA 98390

Mr. Fraser's article was well presented and documented. Unfortunately, "CSAVEM" is not a feature of non-Extended BASIC (much the pity) on the CoCo.

To use "Loadcopy"'s features with "BASIC," one should "CLOAD" the saved BASIC program and "RUN" it. Then "CLOAD" the program you wish to work on. Since the machine language is in high memory and protected, "CLOAD" or "NEW" will not harm it.

Mailing Labels on the CoCo

D. Banaszak
168 Stratmore
New Carlisle, OH 45344

Special thanks for publication of the program I submitted for mailing labels on the CoCo.

I have received several calls about the listing in which many readers got TM errors in line 1265. This was because the second equal sign in line 1265 should be a plus to read:

```
LN$(1)= LN$(2)+""+LN$(1): etc.
```

Also, the colon in line 1281 should be a semicolon.

My own current plans are to try to incorporate William Barden's machine language sort routine from the June 1982 *TRS-80 Microcomputer News,* in place of the BASIC 'sort by last name option' accomplished in lines 1600 to 4000. I find any of Mr. Barden's writings to be especially helpful.

Thanks for the William Barden articles, the excellent Color Computer, and the other good Radio Shack Computers.

NOVEMBER 1982

Printing Titles

Carl R. Miller
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Warminster, PA 18974

I was amazed to see the complex program "Printing Titles". I say complex, since it is quite involved to do the little it does. Furthermore, I cannot seem to get it to work on the Model I.

First, it gives me an OS Error. When I clear more string space and run, it gives me a syntax error in line 40.

Instead of trying to determine the contents of the program I wrote a simple alternative.

```
1Ø CLEAR 1ØØ
2Ø CLS
     : INPUT "ENTER YOUR TITLE";A$
3Ø N=LEN(A$)
     :CLS
4Ø T=32-N/2
5Ø PRINT TAB(T);A$
6Ø PRINT@T+64, STRING$(N,61)
```

The above will provide the same as Bill Christ's program and can be easily converted to LPRINT.

1. Change PRINTS to LPRINT

For an 80 Col Printer:

2. Change line 40 to:

```
T=4Ø-N/2
```

3. Change line 60 to:

```
LPRINT TAB(T+64); STRING$(N,61)
```

Line 60 could have been the same (instead of LPRINT) for both.

PC-2 Assembly Language–Part 2

Article by Bruce Elliott

This is the second in a series of articles which will describe the MPU (microprocessor unit) used in the Radio Shack PC-2 pocket computer. It is our intention to include specific information about the 8-bit CMOS microprocessor, the machine code used by the microprocessor, as well as information about the PC-2 memory map and certain ROM calls which are available. Please realize that much of what we are talking about refers to the overall capabilities of the MPU, and does not imply that all of these things can be done with a PC-2.

The information provided in these articles is the only information which is available. We will try to clarify any ambiguities which occur in the articles, but can not reply to questions outside the scope of these articles. Further, published copies of *TRS-80 Microcomputer News* are the only source of this information, and we will not be maintaining back issues.

Instruction Set

LOGICAL OPERATIONS

ADC—The contents of the internal register (RL or RH), or the contents of external memory [(R), #(R), (ab), or #(ab)] is added into the accumulator including the carry C. The result is stored in the accumulator. Flags C, H, Z, and V may change after the execution of this instruction.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ADC XL	A + XL + C → A	02	1	6
ADC YL	A + YL + C → A	12	1	6
ADC UL	A + UL + C → A	22	1	6
ADC XH	A + XH + C → A	82	1	6
ADC YH	A + YH + C → A	92	1	6
ADC UH	A + UH + C → A	A2	1	6
ADC (X)	A + (X) + C → A	03	1	7
ADC (Y)	A + (Y) + C → A	13	1	7
ADC (U)	A + (U) + C → A	23	1	7
ADC (ab)	A + (ab) + C → A	A3 a b	3	13
ADC #(X)	A + #(X) + C → A	FD 03	2	11
ADC #(Y)	A + #(Y) + C → A	FD 13	2	11
ADC #(U)	A + #(U) + C → A	FD 23	2	11
ADC #(ab)	A + #(ab) + C → A	FD A3 a b	4	17

ADI—Performs immediate addition to the accumulator or to external memory [(R), #(R), (ab), or #(ab)]. Changes may take place in C, H, Z, or V. The carry flag C will be included in the immediate addition to the accumulator.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ADI A,i	A + i + C → A	B3 i	2	7
ADI (X),i	(X) + i → (X)	4F i	2	13
ADI (Y),i	(Y) + i → (Y)	5F i	2	13
ADI (U),i	(U) + i → (U)	6F i	2	13
ADI (ab),i	(ab) + i → (ab)	EF a b i	4	19
ADI #(X),i	#(X) + i → #(X)	FD 4F i	3	17
ADI #(Y),i	#(Y) + i → #(Y)	FD 5F i	3	17
ADI #(U),i	#(U) + i → #(U)	FD 6F i	3	17
ADI #(ab),i	#(ab) + i → #(ab)	FD EF a b i	5	23

ADR—The content of the accumulator is added into the register R in 16 bits. Change may take place in C, H, Z, or V.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ADR X	XL + A → XL	FD CA	2	11
ADR Y	YL + A → YL	FD DA	2	11
ADR U	UL + A → UL	FD EA	2	11

Comment—RH + 1 → RH if C7 = 1 (no change in CVHZ)

AND—The content of the accumulator is logically ANDed with the content of external memory [(R), #(R), (ab), or #(ab)] and the result is stored in the accumulator. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
AND (X)	A ^ (X) → A	09	1	7
AND (Y)	A ^ (Y) → A	19	1	7
AND (U)	A ^ (U) → A	29	1	7
AND (ab)	A ^ (ab) → A	A9 a b	3	13
AND #(X)	A ^ #(X) → A	FD 09	2	11
AND #(Y)	A ^ #(Y) → A	FD 19	2	11
AND #(U)	A ^ #(U) → A	FD 29	2	11
AND #(ab)	A ^ #(ab) → A	FD A9 a b	4	17

Comment—^ represents the AND operation

ANI—Logical AND of the accumulator and an immediate value, or of external memory [(R), #(R), (ab), or #(ab)] and an immediate value with the results stored in the accumulator or external memory as indicated. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ANI A,i	A ^ i → A	B9 i	2	7
ANI (X),i	(X) ^ i → (X)	49 i	2	13
ANI (Y),i	(Y) ^ i → (Y)	59 i	2	13
ANI (U),i	(U) ^ i → (U)	69 i	2	13
ANI (ab),i	(ab) ^ i → (ab)	E9 a b i	4	19
ANI #(X),i	#(X) ^ i → #(X)	FD 49 i	3	17
ANI #(Y),i	#(Y) ^ i → #(Y)	FD 59 i	3	17
ANI #(U),i	#(U) ^ i → #(U)	FD 69 i	3	17
ANI #(ab),i	#(ab) ^ i → #(ab)	FD E9 a b i	5	23

DCA—The content of external memory [(R) or #(R)] including the carry C is added to the accumulator in the binary-coded-decimal (BCD) system and the result is stored in the accumulator. Change may take place in C, H, Z, or V.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
DCA (X)	A + (X) + C → A	8C	1	15
DCA (Y)	A + (Y) + C → A	9C	1	15
DCA (U)	A + (U) + C → A	AC	1	15
DCA #(X)	A + #(X) + C → A	FD 8C	2	19

DCA #(Y)	A + #(Y) + C → A	FD 9C	2	19
DCA #(U)	A + #(U) + C → A	FD AC	2	19

DCS—The content of the external memory [(R) or #(R)], including the carry C is subtracted from the content of the accumulator in the BCD system, and the result is stored in the accumulator. Change may take place in C, H, Z, or V.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
DCS (X)	A – (X) – $\overline{C}$ → A	0C	1	13
DCS (Y)	A – (Y) – $\overline{C}$ → A	1C	1	13
DCS (U)	A – (U) – $\overline{C}$ → A	2C	1	13
DCS #(X)	A – #(X) – $\overline{C}$ → A	FD 0C	2	17
DCS #(Y)	A – #(Y) – $\overline{C}$ → A	FD 1C	2	17
DCS #(U)	A – #(U) – $\overline{C}$ → A	FD 2C	2	17

DEC—Decrements the accumulator or the register (RL, RH, or R). Change may take place in C, V, H, and Z for the decrement of the accumulator, or the register, RL or RH. But no change takes place in flags when the 16-bit R is decremented.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
DEC A	A – 1 → A	DF	1	5
DEC XL	XL – 1 → XL	42	1	5
DEC YL	YL – 1 → YL	52	1	5
DEC UL	UL – 1 → UL	62	1	5
DEC XH	XH – 1 → XH	FD 42	2	9
DEC YH	YH – 1 → YH	FD 52	2	9
DEC UH	UH – 1 → UH	FD 62	2	9
DEC X	X – 1 → X	46	1	5
DEC Y	Y – 1 → Y	56	1	5
DEC U	U – 1 → U	66	1	5

EAI—The accumulator is EXCLUSIVE ORed with an immediate value and the result is stored in the accumulator. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
EAI i	A ⊕ i → A	BD i	2	7

Comment— ⊕ - represents the XOR operation

EOR—Logical EXCLUSIVE OR (XOR) of the accumulator with external memory [(R), #(R), (ab), or #(ab)] is performed and the result is stored in the accumulator. Change may take place in the Z flag.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
EOR (X)	A ⊕ (X) → A	0D	1	7
EOR (Y)	A ⊕ (Y) → A	1D	1	7
EOR (U)	A ⊕ (U) → A	2D	1	7
EOR (ab)	A ⊕ (ab) → A	AD a b	3	13
EOR #(X)	A ⊕ #(X) → A	FD 0D	2	11
EOR #(Y)	A ⊕ #(Y) → A	FD 1D	2	11
EOR #(U)	A ⊕ #(U) → A	FD 2D	2	11
EOR #(ab)	A ⊕ #(ab)→A	FD AD a b	4	17

INC—Increments the accumulator or the register (RL, RH, or R). Change may take place in C, V, H, and Z for an increment of the accumulator, or the registers, RL or RH. But no change takes place in flags when the 16-bit register R is incremented.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
INC A	A + 1 → A	DD	1	5
INC XL	XL + 1 → XL	40	1	5
INC YL	YL + 1 → YL	50	1	5
INC UL	UL + 1 → UL	60	1	5
INC XH	XH + 1 → XH	FD 40	2	9
INC YH	YH + 1 → YH	FD 50	2	9
INC UH	UH + 1 → UH	FD 60	2	9
INC X	X + 1 → X	44	1	5
INC Y	Y + 1 → Y	54	1	5
INC U	U + 1 → U	64	1	5

ORA—The accumulator is logically ORed with external memory [(R), #(R), or (ab)] and the result is stored in the accumulator. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ORA (X)	A v (X) → A	0B	1	7
ORA (Y)	A v (Y) → A	1B	1	7
ORA (U)	A v (U) → A	2B	1	7
ORA (ab)	A v (ab) → A	AB a b	3	13
ORA #(X)	A v #(X) → A	FD 0B	2	11
ORA #(Y)	A v #(Y) → A	FD 1B	2	11
ORA #(U)	A v #(U) → A	FD 2B	2	11
ORA #(ab)	A v #(ab) → A	FD AB a b	4	17

Comment—v - represents the OR operation

ORI—Logical OR of the accumulator or external memory [(R), #(R), (ab), or #(ab)] with an immediate value. The result is stored in the accumulator or the external memory as indicated. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ORI A,i	A v i → A	BB i	2	7
ORI (X),i	(X) v i → (X)	4B i	2	13
ORI (Y),i	(Y) v i → (Y)	5B i	2	13
ORI (U),i	(U) v i → (U)	6B i	2	13
ORI (ab),i	(ab) v i → (ab)	EB a b i	4	19
ORI #(X),i	#(X) v i → #(X)	FD 4B i	3	17
ORI #(Y),i	#(Y) v i → #(Y)	FD 5B i	3	17
ORI #(U),i	#(U) v i → #(U)	FD 6B i	3	17
ORI #(ab),i	#(ab) v i → #(ab)	FD EB a b i	5	23

SBC—The content of the internal register [RL or RH] or external memory [(R), #(R),(ab), or #(ab)] including the carry C is subtracted from the accumulator and the result is stored in the accumulator. Change may take place in C, H, Z, or V.

This operation can be expressed in the following manner: The complement of the contents in the internal register, RL or RH, or external memory, (R), #(R), (ab), or #(ab) is first obtained. Then the complement is added into the accumulator including the carry C, and the result is stored in the accumulator. Change may take place in C, H, Z, or V.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SBC XL	A – XL – $\overline{C}$ → A	00	1	6
SBC YL	A – YL – $\overline{C}$ → A	10	1	6
SBC UL	A – UL – $\overline{C}$ → A	20	1	6
SBC XH	A – XH – $\overline{C}$ → A	80	1	6
SBC YH	A – YH – $\overline{C}$ → A	90	1	6
SBC UH	A – UH – $\overline{C}$ → A	A0	1	6
SBC (X)	A – (X) – $\overline{C}$ → A	01	1	7
SBC (Y)	A – (Y) – $\overline{C}$ → A	11	1	7
SBC (U)	A – (U) – $\overline{C}$ → A	21	1	7
SBC (ab)	A – (ab) – $\overline{C}$ → A	A1 a b	3	13
SBC #(X)	A – #(X) – $\overline{C}$ →A	FD 01	2	11
SBC #(Y)	A – #(Y) – $\overline{C}$ →A	FD 11	2	11
SBC #(U)	A – #(U) – $\overline{C}$ →A	FD 21	2	11
SBC #(ab)	A – #(ab) – $\overline{C}$ →A	FD A1 a b	4	17

SBI—The immediate value including the carry C is subtracted from the accumulator and the result is stored in the accumulator. Change may take place in C, H, Z, or V.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SBI A,i	A – i – $\overline{C}$ → A	B1 i	2	7

COMPARISONS, BIT TESTS

BII—The accumulator or external memory [(R), #(R), (ab), or #(ab)] is logically ANDed with an immediate value. The result of the test is in the Z flag. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
BII A,i	A ^ i → Z	BF i	2	7
BII (X),i	(X) ^ i → Z	4D i	2	10
BII (Y),i	(Y) ^ i → Z	5D i	2	10
BII (U),i	(U) ^ i → Z	6D i	2	10
BII (ab),i	(ab) ^ i → Z	ED a b i	4	16
BII #(X),i	#(X) ^ i → Z	FD 4D i	3	14
BII #(Y),i	#(Y) ^ i → Z	FD 5D i	3	14
BII #(U),i	#(U) ^ i → Z	FD 6D i	3	14
BII #(ab),i	#(ab) ^ i → Z	FD ED a b i	5	20

Comment—^ - represents the AND operation

BIT—The accumulator is logically ANDed with external memory [(R), #(R), (ab), or #(ab)]. The result is in Z. Change may take place in the Z flag only.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
BIT (X)	A ^ (X) → Z	0F	1	7
BIT (Y)	A ^ (Y) → Z	1F	1	7
BIT (U)	A ^ (U) → Z	2F	1	7
BIT (ab)	A ^ (ab) → Z	AF a b	3	13
BIT #(X)	A ^ #(X) → Z	FD 0F	2	11
BIT #(Y)	A ^ #(Y) → Z	FD 1F	2	11
BIT #(U)	A ^ #(U) → Z	FD 2F	2	11
BIT #(ab)	A ^ #(ab) → Z	FD AF a b	4	17

CPA—Compares the contents of the accumulator with that of the register, RL or RH, or external memory, (R), #(R), (ab), or #(ab). Change may take place in C, V, H, or Z.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
CPA XL	A – XL	06	1	6
CPA YL	A – YL	16	1	6
CPA UL	A – UL	26	1	6
CPA XH	A – XH	86	1	6
CPA YH	A – YH	96	1	6
CPA UH	A – UH	A6	1	6
CPA (X)	A – (X)	07	1	7
CPA (Y)	A – (Y)	17	1	7
CPA (U)	A – (U)	27	1	7
CPA (ab)	A – (ab)	A7 a b	3	13
CPA #(X)	A – #(X)	FD 07	2	11
CPA #(Y)	A – #(Y)	FD 17	2	11
CPA #(U)	A – #(U)	FD 27	2	11
CPA #(ab)	A – #(ab)	FD A7 a b	4	17

Comment—

If	C	Z	V	H
A > op	1	0	*	*
A = op	1	1	*	*
A < op	0	0	*	*

V and H may change depending upon the arithmetic result of the compare.

CPI—The content of the accumulator or the register RL or RH, is compared with the immediate value, i. Change may take place in C, V, H or Z.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
CPI A,i	A – i	B7 i	2	7
CPI XL,i	XL – i	4E i	2	7
CPI YL,i	YL – i	5E i	2	7
CPI UL,i	UL – i	6E i	2	7
CPI XH,i	XH – i	4C i	2	7
CPI YH,i	YH – i	5C i	2	7
CPI UH,i	UH – i	6C i	2	7

Comment—

If	C	Z	V	H
(op) > i	1	0	*	*
(op) = i	1	1	*	*
(op) < i	0	0	*	*

V and H may change depending upon the arithmetic result of the compare.

LOADS, STORES

ATT—The content of the accumulator is transferred to the T register. All flags are subject to change depending on the content of A.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ATT	A → T	FD EC	2	9

Comment—T - Status Register

LDA—The content of the register, RL or RH, or external memory [(R), #(R), (ab), or #(ab)] is loaded into the accumulator. When the content loaded is "00", it sets the flag Z. No change is made with respect to other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
LDA XL	XL → A	04	1	5
LDA YL	YL → A	14	1	5
LDA UL	UL → A	24	1	5
LDA XH	XH → A	84	1	5
LDA YH	YH → A	94	1	5
LDA UH	UH → A	A4	1	5
LDA (X)	(X) → A	05	1	6
LDA (Y)	(Y) → A	15	1	6
LDA (U)	(U) → A	25	1	6
LDA (ab)	(ab) → A	A5 a b	3	12
LDA #(X)	#(X) → A	FD 05	2	10
LDA #(Y)	#(Y) → A	FD 15	2	10
LDA #(U)	#(U) → A	FD 25	2	10
LDA #(ab)	#(ab) → A	FD A5 a b	4	16

LDE—The content of the register R is decremented upon loading the content of the external memory (R) into the accumulator. Change may take place only in the Z flag.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
LDE X	(X) → A, X – 1 → X	47	1	6
LDE Y	(Y) → A, Y – 1 → Y	57	1	6
LDE U	(U) → A, U – 1 → U	67	1	6

LDI—The immediate value is loaded into the accumulator, register (RL or RH), or the stack pointer S. Only the immediate value being placed in S may contain 2 bytes. When using LDI A,i the Z flag may change.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
LDI A,i	i → A	B5 i	2	6
LDI XL,i	i → XL	4A i	2	6
LDI YL,i	i → YL	5A i	2	6
LDI UL,i	i → UL	6A i	2	6
LDI XH,i	i → XH	48 i	2	6
LDI YH,i	i → YH	58 i	2	6
LDI UH,i	i → UH	68 i	2	6
LDI S,i,j	i → SH, j → SL	AA i j	3	12

LDX—The content of the register R, stack pointer S, or program counter P is loaded into the X register. No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
LDX X	X → X	FD 08	2	11
LDX Y	Y → X	FD 18	2	11
LDX U	U → X	FD 28	2	11
LDX S	S → X	FD 48	2	11
LDX P	P → X	FD 58	2	11

LIN—Increments R upon loading the content of the external memory (R) into the accumulator. Change may take place only in the Z flag.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
LIN X	(X) → A, X+1 → X	45	1	6
LIN Y	(Y) → A, Y+1 → Y	55	1	6
LIN U	(U) → A, U+1 → U	65	1	6

POP—The contents placed on the stack by PSH is returned to the accumulator, A or the register, R. POP increments S by one in the case of the accumulator, and increments S by two in the case of a register. The Z flag may change as a result of the POP.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
POP A	(S+1) → A, S+1 → S	FD 8A	2	12
POP X	(S+1) → XH, (S+2) → XL, S+2 → S	FD 0A	2	15
POP Y	(S+1) → YH, (S+2) → YL, S+2 → S	FD 1A	2	15
POP U	(S+1) → UH, (S+2) → UL, S+2 → S	FD 2A	2	15

PSH—The content of the accumulator A or register R is stacked into the memory location specified by S. PSH decrements S by one in the case of the accumulator, and decrements S by two in the case of the register R. No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
PSH A	A → (S), S−1 → S	FD C8	2	11
PSH X	XL → (S), XH → (S−1), S−2 →S	FD 88	2	14
PSH Y	YL → (S), YH → (S−1), S−2 →S	FD 98	2	14
PSH U	UL → (S), UH → (S−1), S−2 →S	FD A8	2	14

SDE—The register R is decremented after the content of the accumulator is stored in external memory (R). No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SDE X	A → (X), X−1 → X	43	1	6
SDE Y	A → (Y), Y−1 → Y	53	1	6
SDE U	A → (U), U−1 → U	63	1	6

SIN—The register R is incremented after content of the accumulator is stored in external memory (R). No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SIN X	A → (X), X+1 → X	41	1	6
SIN Y	A → (Y), Y+1 → Y	51	1	6
SIN U	A → (U), U+1 → U	61	1	6

STA—The content of the accumulator is stored into register, RL or RH, or into external memory [(R), #(R), (ab), #(ab)]. No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
STA XL	A → XL	0A	1	5
STA YL	A → YL	1A	1	5
STA UL	A → UL	2A	1	5
STA XH	A → XH	08	1	5
STA YH	A → YH	18	1	5
STA UH	A → UH	28	1	5
STA (X)	A → (X)	0E	1	6
STA (Y)	A → (Y)	1E	1	6
STA (U)	A → (U)	2E	1	6
STA (ab)	A → (ab)	AE a b	3	12
STA #(X)	A → #(X)	FD 0E	2	10
STA #(Y)	A → #(Y)	FD 1E	2	10
STA #(U)	A → #(U)	FD 2E	2	10
STA #(ab)	A → #(ab)	FD AE a b	4	16

STX—The content of the X register is stored into register R, stack pointer S, or program counter P. No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
STX X	X → X	FD 4A	2	11
STX Y	X → Y	FD 5A	2	11
STX U	X → U	FD 6A	2	11
STX S	X → S	FD 4E	2	11
STX P	X → P	FD 5E	2	11

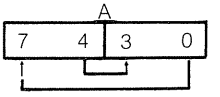
TTA—The content of the T register is transferred to the accumulator. The Z flag may change as a result of this operation.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
TTA	T → A	FD AA	2	9

Comment—T - Status Register

BLOCK TRANSFER, SEARCH

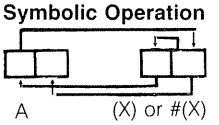
AEX—The high order 4 bit digit in the accumulator is exchanged with the lower order 4 bit digit.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
AEX		F1	1	6

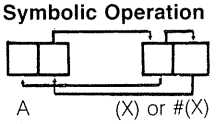
CIN—The content of the accumulator is compared with the content of the external memory (X), the flags C, V, H, and Z are set by the compare, then X register is incremented.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
CIN	A - (X), X+1 → X	F7	1	7

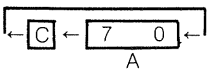
DRL—Performs digit-to-digit forward rotation between the accumulator and external memory, [(X) or #(X)]. No change takes place with respect to flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
DRL (X)		D7	1	12
DRL #(X)		FD D7	2	16

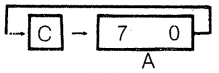
DRR—Performs digit-to-digit backward rotation between the accumulator and external memory [(X) or #(X)]. No change takes place with respect to flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
DRR (X)		D3	1	12
DRR #(X)		FD D3	2	16

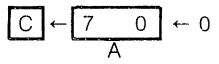
ROL—Forward rotation is made between the accumulator and the flag C. Flags C, V, H, and Z are subject to change.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ROL		DB	1	6

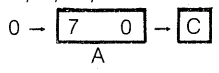
ROR—Backward rotation is made between the accumulator and the flag C. Flags C, V, H, and Z are subject to change.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ROR		D1	1	9

SHL—The content of the accumulator is shifted to the left. Flags C, V, H, and Z are subject to change.

SHL		D9	1	6

SHR—The content of the accumulator is shifted to the right. Flags C, V, H, and Z are subject to change.

SHR		D5	1	9

TIN—The content of the external memory (X) is transferred into the external memory (Y), the X and Y registers are then incremented. No change takes place in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
TIN	(X) → (Y), X+1 → X, Y+1 → Y	F5	1	7

INPUT/OUTPUT

AM0—The contents of the accumulator is transferred timer. Since the timer is composed of a 9-bit polynomial counter, the content of the accumulator is set in the 1st through 8th bits of the counter and "0" is set in the 9th bit. It causes no change in flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
AM0	A → Timer (0-7) 0 → Timer (8)	FD CE	2	9

AM1—Same as AM0, except that "1" is set in the 9th bit. It causes no flag changes.

AM1	A → Timer (0-7) 1 → Timer (8)	FD DE	2	9

ATP—Sends the content of the accumulator to the external data bus. It causes no flag change.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ATP	A → Data Bus	FD CC	2	9

CDV—Clears the internal divider. It causes no flag changes.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
CDV	0 → Divider	FD 8E	2	8

HLT—The MPU is put into a halt state when this instruction is executed, except that the divider is still in operation. MPU operation can be resumed by means of the interrupt. No changes in flags occur.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
HLT		FD B1	2	9

ITA—The contents of the input IN is transferred to the accumulator. Change may take place in the Z flag, but there will be no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
ITA	IN → A	FD BA	2	9

NOP—No operation

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
NOP		38	1	5

OFF—Resets the BF flip-flop. It causes no change in the flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
OFF	0 → BF	FD 4C	2	8

RDP—Resets display flip-flop.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
RDP	0 → Display	FD C0	2	8

REC—Resets the carry flag C off. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
REC	0 → C	F9	1	4

RIE—Resets the Interrupt Enable (IE) flip-flop off. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
RIE	0 → IE	FD BE	2	8

RPU—Resets the general purpose flip-flop PU off. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
RPU	0 → PU	E3	1	4

RPV—Resets the general flip-flop PV off. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
RPV	0 → PV	B8	1	4

SDP—Sets display flip-flop.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SDP	1 → Display	FD C1	2	8

SEC—Sets the carry flag C on. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SEC	1 → C	FB	1	4

SIE—Sets the Interrupt Enable (IE) flip-flop on. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SIE	1 → IE	FD 81	2	8

SPU—Sets the general purpose flip-flop PU on. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SPU	1 → PU	E1	1	4

SPV—Sets the general purpose flip-flop PV on. It causes no change in other flags.

Mnemonic	Symbolic Operation	Hex Op-Code	Byte	Cycle
SPV	1 → PV	A8	1	4

The Expressive, Expeditious, Exhilarating X-Pad

by Paul S. Hoffman

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Shortly after purchasing my Extended BASIC Color Computer, I started exploring ways in which I could expand its already marvelous graphics capabilities. One major question was,"What about other ways of entering information into the computer?" I could write programs to have CoCo ask me for X and Y coordinates; I could have it transfer joystick coordinates to the screen; but what if I wanted to quickly duplicate a piece of flat artwork? I obviously needed some sort of digitizer. (A digitizer is any piece of hardware which converts a hunk of the real world into numeric information.)

I knew of graphics tablets from demonstrations I had seen of some sophisticated graphics software on an Apple. but the least expensive tablet available cost $700.00 and was also in kit form: assemble it yourself! There was also no indication that I would be able to interface it properly with my Color Computer. Why not get Radio Shack's Digitizer (model 26-1195) for $449.99? Well, this was about 10 months before that product was announced, and even so, the price tag still seemed high. The product is also not specifically matched to the unique qualities of the 80C.

Enter the X-Pad! (Wouldn't "X-Y Pad" be a more accurate name!) This is a full-fledged graphics tablet designed specifically for the Color Computer, and comes with an appropriate tag—$350.00, one half the lowest price I could find elsewhere! I ordered mine as soon as I had even an inkling that the product would soon exist!

Briefly, I am more than pleased with my X-Pad: it's fantastic! Biggest disappointment: lack of good software support and some extremely touchy potentiometer adjustments. *(MCN Editor's Note. Additional software for the X-Pad is currently being developed, and potentiometer adjustments by the buyer are not normally required or suggested.)*

So, what exactly did I get for my $350.00? A silvery-grey plastic box, 10 1/2" by 13" by 1/2" thick, with two cords coming out of one side. One cord goes to a controller pack identical in size and shape to TRS-80 Color Disk Controller. The other cord leads to a pen. An 8 1/2" by 11" area in the center of the silver-grey box is recessed slightly to hold a standard piece of typing/writing/drawing paper. The box itself contains a rectangular grid which acts as a receiving antenna for signals sent by a transmitter in the pen. The received signal is decoded into an X-value and a Y-value. The grid network matches precisely the 256 by 192 pixel coordinates of the Color Computer's high resolution screen. In addition to the transmitter in the pen, there is a spring-loaded switch which triggers if the pen point is pressed down on a surface. The writing implement is a ball-point pen, which is refillable (it uses a Fisher Space Pen refill).

The hardware is really quite simple, and designed to be extremely easy to use if you can handle a little bit of programming. Three signals are sent to the computer: X-value, Y-value, and Pen Status. They are stored in three memory locations reserved by the SAM-chip for "future control registers or special I/O," 65376 (X), 65377 (Y), and 65378 (S or Status). The X and Y locations can store a number from 0 to 255. This obviously makes sense for the X-value; Y numbers beyond 191 represent positions outside the "drawing" area of the pad. The first four bits of the Status byte each have a different meaning. Together, they can represent a number from zero to 15.

Bit 0 = Pen Down
Bit 1 = Proximity (pen within receiving range of the pad)
Bit 2 = X-Margin (pen off to the left or right of the drawing area)
Bit 3 = Y-Margin (pen off above the drawing area —top of screen)

In practice, the computer is constantly updating all three values (X, Y, and Status), until you read them. As soon as you "PEEK(65376)," the other two values are held where they are (so you can get an accurate X, Y reading). Status may be read by itself at any time, however, so you can look for a particular pen position before checking X and Y.

Now then, what can you do with all this? Just about anything you can imagine, if you can work out the necessary program! As I indicated earlier, the biggest drawback to the X-Pad is the lack of sophisticated (or even well-structured) software support. Part of the problem seems to be the inherent flexibility of the machine—what kind of program do you provide so that the X-Pad will do all things for all people? Early models of the X-Pad came with programming examples in the instruction book, but no demonstrations on cassette. There is now a free cassette with a demo program on it (#700-2114) which should be supplied to every owner.

By far, the hardest part of programming for the X-Pad is setting-up and reading a menu. Border areas around the active drawing area on your paper can be used as a selection-menu for various commands or values. The actual active area is 7" high by 9" wide. This leaves approximately 3/4" top and bottom and 1" on each side for a menu space. A colorful cardboard menu is provided with the X-Pad, with commands which match the demonstration program on the cassette. I found two drawbacks to this menu: the surface is not plasticized, and quickly gets lots of pen marks on it; and the Pad

had trouble reading the pen signal through the thickness of cardboard. You'd be much better off creating your own menu area on a sheet of drawing paper. I drew up a blank menu sheet and had a ream of paper printed-up at a local quick-print shop, as well as doing a ream of the specialized menu which matches my basic program. See the accompanying sample in Figure 1. *(MCN Editor's Note: Improvements to the menu have been made in more recently manufactured X-Pads. For X-Pad owners without the newer menu, small holes may be punched in the target areas of the menu which will eliminate the problem of the Pad having trouble reading the pen signal through the cardboard.)*

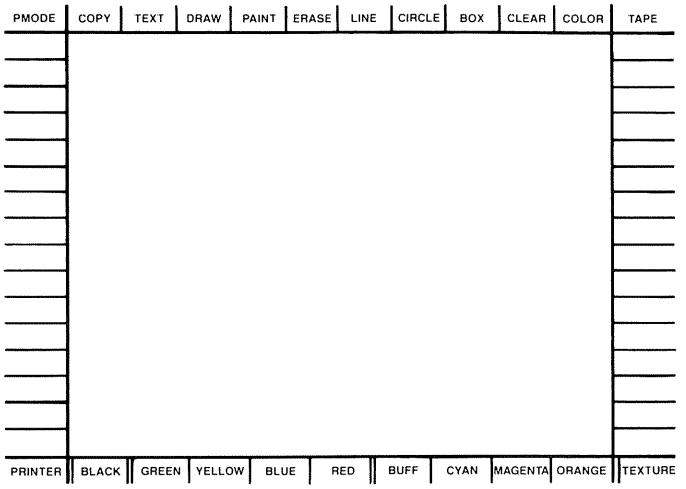

Figure 1.

The accompanying listings, if you work your way through them, should give you a much better handle on how to get the most out of your X-Pad, while building a structured program in the process.

Listing 1 sets up the beginning of a menu program. Initially, it will allow you to DRAW in Orange lines on a Buff screen, or CLEAR the screen to Buff. Notice that the program is completely organized in subroutines. The main loop, which will change very little as we add functions, is lines 20 through 50. Lines 5 and 10 initialize the basic graphics values (PMODE, COLOR, SCREEN). These are referred to through variables so that we can change them later in the program. The first major subroutine used is at line 600. Here, we get the current X-Pad values. This routine can also be entered at line 610 to update only the status byte. In line 30, the S (Status) value is incremented because we intend to use "ON S GOSUB," which would generate an error if S were equal to 0. Line 45 allows us to change the display page through hitting the appropriate key on the keyboard.

The central routine to look at in this listing is from lines 400 through 440—this is where we read the top menu area. The program goes to this routine only if the pen is down in the upper menu area—i.e. you select a function by pressing the pen in one of the upper boxes. The computer then waits until you lift the pen, and then checks the X-coordinate of your location. A variable called "MENU" is set based on which box you're in (MENU = X/width of one box). To let you know that your command has been properly received, a tone is sounded. Then you're sent to the appropriate subroutine.

NOTE: This program is written to work with the accompanying menu, not with the menu card supplied by Radio Shack.

Listing 1.

```
5 M=3
     : P = 1
     : FG = 8
     : BG = 5
     : SC = 1
10 PMODE M,P
     : COLOR FG,BG
     : PCLS
     : SCREEN 1,SC
15 '*******BEGINNING OF MAIN LOOP*******
20 GOSUB 600
30 S = S + 1
40 ON S GOSUB 80, 80, 100, 200, 80, 80, 80, 80, 80
    80, 80, 400, 80, 80, 80, 80
45 A$=INKEY$
     : IF A$ > "0" AND A$ < "5" THEN P = VAL(A$)
     : PLAY A$
     : PMODE M, P
     : SCREEN 1, SC
50 GOTO 20
60 '*******END OF MAIN LOOP*******
70 '***BEGINNING OF SUB-ROUTINES**
80 RETURN
     : ' NO ACTION
90 '**PEN CLOSE TO PAD -- FLASH CURSOR!**
100 GOSUB 600
     : 'READ CO-ORDINATES
110 PS = PPOINT(X,Y)
120 FOR CU = 0 TO 8
     : PSET(X,Y,CU)
     : NEXT
130 PSET(X,Y,PS)
140 RETURN
190 '*******TOUCHING DRAWING SURFACE*******
    ********GOTO PROPER SUBROUTINE********
200 ON MENU GOSUB 80, 80, 1300, 80, 80, 80, 80, 80,
    80, 80
210 RETURN
390 '*******READ TOP MENU AND*******
    ***SET THE APPROPRIATE FLAG****
400 GOSUB 610
     : IF (S AND 1) = 1 THEN 400
     : 'WAIT FOR PEN UP
410 MENU = INT(X/25.6)+1
     : 'MAXIMUM X-VALUE (256) DIVIDED BY THE NUMBER
    OF SPACES IN THE TOP MENU (10)
420 PLAY STR$(MENU)
     : 'LETS YOU KNOW THAT YOU'VE SELECTED A MENU
    ITEM.
430 ON MENU GOSUB 80, 80, 1300, 80, 80, 80, 80, 80,
    1900, 80
440 RETURN
590 '*******READ THE X-PAD*******
600 X = PEEK(65376)
     : Y = PEEK(65377)
610 S = PEEK(65378)
620 RETURN
1290 '*****DRAWING MODE********
1300 GOSUB 100
1310 GOSUB 610
     : IF S <> 3 THEN RETURN
1320 PSET(X,Y,FG)
1330 GOSUB 610
     : IF S <> 3 THEN RETURN
1340 XX = X
     : YY = Y
     : GOSUB 600
1350 LINE(XX,YY) - (X,Y), PSET
1360 GOTO 1330
1890 '*******CLEAR SCREEN*******
     ****TO BACKGROUND COLOR****
1900 PCLS(BG)
1910 RETURN
```

Once you have explored the sketching possibilities, expand the program by adding Listing 2. This involves a change in step 430, and the addition of lines 1990 to 2130.

What you've added is the ability to select foreground and background colors. Press "COLOR" on the top menu and the TWO different color selections in the bottom menu, one for foreground, the second for background. Now if you press "CLEAR" the screen will clear to your new background color.

Listing 2.

```
43Ø ON MENU GOSUB 8Ø, 8Ø, 13ØØ, 8Ø, 8Ø, 8Ø, 8Ø, 8Ø,
    19ØØ, 2ØØØ
199Ø '*******SET FOREGROUND AND*******
     *******BACKGROUND COLORS********
2ØØØ GOSUB 61Ø
     : IF (S AND 1) = 1 THEN 2ØØØ
     : 'WAIT FOR PEN UP
2Ø1Ø GOSUB 21ØØ
     : PLAY STR$(C+1)
2Ø2Ø FG = C
2Ø3Ø GOSUB 21ØØ
     : PLAY STR$(C+1)
2Ø4Ø BG=C
     : IF BG > 4 OR FG > 4 THEN SC = 1 ELSE SC = Ø
2Ø45 SCREEN 1, SC
2Ø5Ø COLOR FG, BG
2Ø6Ø RETURN
2Ø9Ø '*******BOTTOM MENU SELECTION*******
21ØØ GOSUB 6ØØ
     : IF S <> 3 THEN 21ØØ
     : 'WAIT FOR PEN DOWN ON DRAWING SURFACE OR
     BOTTOM MARGIN
211Ø IF Y < 192 OR Y > 2ØØ THEN 21ØØ
212Ø C = INT(X/28.334)
     : '256/9
213Ø RETURN
```

Listing 3 adds "PAINT" and "ERASE" functions. With PAINT you will need to select two colors, as in COLOR. The first color is the painting color, the second is the border color which will limit the painting. Then you position your pen in an area to paint. When you press the pen down, the area will be painted. THIS FUNCTION STAYS ACTIVE UNTIL YOU SELECT ANOTHER MENU FUNCTION. In other words, you can keep painting areas the same color until you decide to change colors or functions. To get new paint colors, you need to re-press PAINT.

Listing 3.

```
2ØØ ON MENU GOSUB 8Ø, 8Ø, 13ØØ, 145Ø, 15ØØ, 8Ø, 8Ø,
    8Ø, 8Ø, 8Ø
43Ø ON MENU GOSUB 8Ø, 8Ø, 13ØØ, 14ØØ, 15ØØ, 8Ø, 8Ø,
    8Ø, 19ØØ, 2ØØØ
139Ø '*******PAINT*******
14ØØ GOSUB 21ØØ
     : PLAY STR$(C+1)
141Ø PC = C
142Ø GOSUB 21ØØ
     : PLAY STR$(C+1)
143Ø BC = C
144Ø RETURN
145Ø IF Y > 191 THEN RETURN
1455 PAINT (X,Y), PC, BC
146Ø RETURN
149Ø '*******ERASE*******
15ØØ GOSUB 1ØØ
     : GOSUB 61Ø
     : IF S <> 3 THEN RETURN
151Ø PSET(X,Y,BG)
152Ø GOSUB 61Ø
     : IF S <> 3 THEN RETURN
153Ø XX = X
     : YY = Y
     : GOSUB 6ØØ
154Ø LINE(XX,YY) - (X,Y), PRESET
155Ø GOTO 152Ø
```

Listing 4 adds LINES, CIRCLES, and BOXES. The core of these routines is the subroutine from lines 1805 to 1835. In this routine the cursor flashes until a point is selected, then the same thing for a second point. For LINE, the line will be drawn between the two selected points, using the current foreground color. For BOX, select the upper-left corner of the box position, then the lower-right corner. In drawing a CIRCLE, you first set the center position, then any point on the perimeter. Again as in the other commands, the function will stay active until a new menu selection is made.

Listing 4.

```
2ØØ ON MENU GOSUB 8Ø, 8Ø, 13ØØ, 145Ø, 15ØØ, 16ØØ,
    17ØØ, 18ØØ, 8Ø, 8Ø
43Ø ON MENU GOSUB 8Ø, 8Ø, 13ØØ, 14ØØ, 15ØØ, 16ØØ,
    17ØØ, 18ØØ, 19ØØ, 2ØØØ
159Ø '*******LINES*******
16ØØ GOSUB 18Ø5
163Ø LINE(XX,YY)-(X,Y),PSET
164Ø RETURN
169Ø '*******DRAW CIRCLES*******
17ØØ GOSUB 18Ø5
175Ø PRESET (XX,YY)
176Ø R = SQR(ABS(X-XX)^2 + ABS(Y-YY)^2)
177Ø CIRCLE(XX,YY),R,FG
178Ø RETURN
179Ø '*******DRAW BOXES*******
18ØØ GOSUB 18Ø5
     : GOTO 184Ø
18Ø5 GOSUB 1ØØ
     : GOSUB 61Ø
     : IF S <> 3 THEN 18Ø5
181Ø PSET(X,Y,FG)
     : XX = X
     : YY = Y
1815 GOSUB 61Ø
     : IF (S AND 1) = 1 THEN 1815
182Ø GOSUB 1ØØ
     : GOSUB 61Ø
     : IF S <> 3 THEN 182Ø
183Ø GOSUB 61Ø
     : IF (S AND 1) = 1 THEN 183Ø
1835 RETURN
184Ø LINE(XX,YY)-(X,Y),PSET,B
185Ø RETURN
```

Now comes the gravy! (Or is it the stuffing?) Listing 5 is for the COPY routine. In very sophisticated computer graphics systems, this is called a "PAINTBRUSH" function. It will allow you to "pick up" a section of the screen and then "draw" with that image. You can, of course, simply plop the image back down somewhere for the purpose of repeating a motif, but the fun comes in the fascinating fat or fuzzy lines you can doodle with! After entering the listing, try this: select foreground and background COLORS, CLEAR the screen, then create a little squiggly doodle in one or two colors (using DRAW). Now select COPY. Position your cursor to the upper left of your squiggle, press down, then do the same at the lower right of the squiggle. You have just picked up the squiggle and can now draw it wherever you press your pen. How'd we do it? The secret is in the use of the "OR" in the PUT command in line 150.

Listing 5.

```
7 DIM CO(15,15)
2ØØ ON MENU GOSUB  112Ø, 8Ø, 13ØØ, 145Ø, 15ØØ, 16ØØ,
    17ØØ, 18ØØ, 8Ø, 8Ø
43Ø ON MENU GOSUB  11ØØ, 8Ø, 13ØØ, 14ØØ, 15ØØ, 16ØØ,
    17ØØ, 18ØØ, 19ØØ, 2ØØØ
1Ø9Ø '***********COPY***********
     ***SETS UP PAINT BRUSHES**
11ØØ FG = Ø
     : FL = Ø
     : RETURN
112Ø IF FG = 1 THEN 115Ø ELSE IF FL = 1 THEN 1135
1125 GOSUB 61Ø
```

```
     : IF (S AND 1) = 1 THEN 1125
1130 AX = X
     : AY = Y
     : FL = 1
     : RETURN
1135 GOSUB 610
     : IF (S AND 1) = 1 THEN 1135
1140 BX = X
     : BY = Y
     : GET(AX,AY)-(BX,BY),CO,G
     : FG = 1
     : RETURN
1150 CX = (X+BX-AX)
     : CY = (Y+BY-AY)
1160 IF CX > 255 THEN RETURN
1165 IF CY > 191 THEN RETURN
1170 IF CX < 0 THEN RETURN
1180 IF CY < 0 THEN RETURN
1185 PUT (X,Y)-(X+BX-AX,Y+BY-AY),CO,OR
     : RETURN
```

If you're still with us after that bit of magic, type in LISTING 6 so you can play around with different PMODES and also save/load your creations to/from TAPE. As in the selection of page numbers in the main loop, you must type the number of the mode you want on the keyboard. I have tried using the left menu for inputting numeric information, but found that any slight mis-adjustment in the Y-circuit caused errors in differentiation between boxes. Both my X-Pad and the demo model in the local computer center are prone to getting out of adjustment in the Y direction—so I felt it wise to avoid the need for precision in reading the side menus.

Listing 6.

```
40 ON S GOSUB 80, 80, 100, 200, 80, 80, 80, 80, 80,
     80, 80, 400, 80, 80, 80, 500
495 '*******UPPER CORNERS*******
500 GOSUB 610
     : IF (S AND 1) = 1 THEN 500
     : 'WAIT FOR PEN UP
510 IF X < 255 THEN 550
     : 'RIGHT
520 PLAY STR$(11)
530 M$ = INKEY$
     : IF M$ = "" THEN 530 ELSE IF M$ < "0" AND M$ >
     "4" THEN 530
535 PLAY M$
     : M = VAL(M$)
540 PMODE M,P
     : SCREEN 1,SC
     : RETURN
545 '*******RIGHT CORNER*******
550 PLAY STR$(12)
     : CLS
     : PRINT
     : PRINT "SAVE OR LOAD (S,L)?"
555 I$ = INKEY$
     : IF I$ = "" THEN 555
560 IF I$ <> "S" AND I$ <> "L" THEN SCREEN 1,SC
     : RETURN
565 PRINT
     : INPUT "FILE NAME"; F$
570 PRINT
     : PRINT "POSITION TAPE - ANY KEY TO CONTINUE -"
571 K$ = INKEY$
     : IF K$ = "" THEN 571
575 IF I$ = "L" THEN 585
580 CSAVEM F$,1536,1535+6144,380
     : SCREEN 1,SC
     : RETURN
585 SCREEN 1,SC
     : CLOADM F$
     : RETURN
```

BUT, we don't want to ignore the existence of these side menus, so LISTING 7 will direct the computer to places in the program where you can insert your own routines. Left menu selection would be in lines 315 through 339, right menu in lines 350 through 444. In both cases, the item selected would be determined by the current Y-value. We need to loop through this area in order to access the lower corners, one of which is reserved for a call to your favorite screen dump routine. I personally use the other corner to call my adaptation to the "TEXTURES" program by George Fraser from the June, 1982 issue of Tandy's *TRS-80 Microcomputer News.*

Listing 7.

```
40 ON S GOSUB 80, 80, 100, 200, 80, 80, 80, 300, 80,
     80, 80, 400, 80, 80, 80, 500
290 '*******LEFT AND RIGHT*******
     *******MENU SELECTION*******
300 GOSUB 600
     : IF S <> 7 THEN 300
     : 'WAIT FOR PEN DOWN ON L OR R MARGIN
305 IF Y > 192 THEN 450
     : 'LOWER CORNERS
310 IF X < 225 THEN 350
     : 'RIGHT MENU
315 RETURN
340 '*******RIGHT MENU*******
350 RETURN
445 '*******LOWER CORNERS********
450 IF X < 25.6 THEN 700
     : 'LOWER RIGHT CORNER
460 'INSERT HERE A CALL TO YOUR FAVORITE SCREEN DUMP
     ROUTINE
470 RETURN
690 '*******LOWER RIGHT CORNER*******
700 RETURN
```

Listing 8 simply fills out the program by accounting for one all-but-forgotten box in the upper menu, the one marked "TEXT." If you have 32K, you will have enough room left in memory to add a subroutine at 1200 to draw letters and numbers on the screen. Try using M.H. Endres' "Graphic Screen Character Set" from *the Rainbow*, May 1982, or Ron VanDyke's "Hi-Res Character Generator" from *TRS-80 Microcomputer News,* April, 1982.

On my 32K machine, I call the final program (with TEXTURE, PRINTER, and TEXT) "Superpad." This little combination of CoCo, X-Pad and the right programming makes a package which rivals almost any graphics system available for any micro out there.

One final note: If you have Tandy's MICROPAINTER cartridge, the pictures on the Micropainter data tape and any pictures saved on tape from Micropainter are loadable and modifiable with this program, and VICE VERSA! My only criticism of Micropainter is that free hand drawing is extremely tedious (pixel by pixel). Try doing a line drawing with the X-Pad, saving it to tape, power down, insert Micropainter, load your saved picture, and PLAY AWAY!

Listing 8.

```
200 ON MENU GOSUB 1120, 1200, 1300, 1450, 1500, 1600,
     1700, 1800, 80, 80
430 ON MENU GOSUB 1100, 1200, 1300, 1400, 1500, 1600,
     1700, 1800, 1900, 2000
1190 '*******DRAWING ALPHANUMERICS*******
1200 RETURN
```

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PEORIA 4125 N. Sheridan Rd., (309) 685-7056
ROCKFORD North Town S/C, 3600 N. Main St., (815) 282-1001
SCHAUMBURG 651 Mall Dr., (312) 884-8600
SPRINGFIELD Sherwood Plaza, 2478 Wabash, (217) 787-3066

INDIANA

EVANSVILLE 431 Diamond Ave., (812) 426-1715
FT. WAYNE 747 Northcrest S/C, (219) 482-9547
GRIFFITH 208 W. Ridge Rd., (219) 838-3000
HOBART Save-More Plaza, Rtes. #6 & 51, (219) 942-0541
INDIANAPOLIS 6242 E. 82nd St., Castleton Plz., (317) 849-6896; Speedway Plaza, 6129 B Crawfordsville, (317) 244-2221, 10013 E. Washington St., (317) 898-4887; Two W. Washington St., (317) 236-9911
SOUTH BEND 1827 South Bend Ave., (219) 277-3789
TERRE HAUTE 3460 U.S. Hwy. 41 S., (812) 234-3212

IOWA

CEDAR RAPIDS 111 First Ave., S.E. (Downtown), (319) 362-7399
DAVENPORT 616 E. Kimberly Rd., (319) 386-3457
DES MOINES 7660 Hickman Rd., Sherwood Forest S/M, (515) 270-0193

KANSAS

OVERLAND PARK 8619 W. 95th, (913) 642-1301
TOPEKA White Lakes Plaza, West Tower, 3715 Plaza Dr., (913) 267-6420
WICHITA 2732 Blvd. Plaza S/C, (316) 681-1212

KENTUCKY

FLORENCE 7727 Mall Rd., (606) 371-2811
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LOUISVILLE 2900 Taylorsville Rd., (502) 459-9901, Louisville Galleria, (502) 589-1013

LOUISIANA

ALEXANDRIA 1213 Texas Ave., (318) 473-0429
BATON ROUGE 7007 Florida Blvd., (504) 928-5260
HOUMA 2348 W. Park Ave. (Hwy. 24), (504) 873-7713
LAFAYETTE University Square at Congress Blvd., (318) 235-6177
METAIRIE 3750 Veterans Hwy., (504) 454-3681
NEW ORLEANS 327 St. Charles Ave., (504) 523-6408
SHREVEPORT 1545 Line Ave., (318) 221-5125

MAINE

BANGOR Maine Square, (207) 945-6491

MARYLAND

BALTIMORE 7942 Belair Rd., Putty Hill Plaza, (301) 882-9583; 115 N. Charles St. at Lexington, (301) 539-7251
BETHESDA 7900 Wisconsin Ave., (301) 656-0892
CATONSVILLE One Mile West S/C, 6600 B Balt. Nat'l. Pike, (301) 788-3277
FREDERICK Shoppers World, Rt. 40W, (301) 695-8440
NEW CARROLLTON-LANHAM 7949 Annapolis Rd., (301) 459-8030
PASADENA 8120 Ritchie Hwy., (301) 544-2352
ROCKVILLE Congressional Plaza, 1673 Rockville Pike, (301) 984-0424
SALISBURY Shoppers World S/C, Rt. 50, (301) 546-9223
TEMPLE HILLS 4520 St. Barnabas Rd., (301) 899-0740
TOWSON-LUTHERVILLE Yorktown S/C York Rd. at Ridgley Rd., (301) 561-2001

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BOSTON 730 Commonwealth Ave., (617) 739-1704, 111 Summer St., (617) 542-0361
BRAINTREE South Shore Plaza, 250 Granite St., (617) 848-9290
BROCKTON 675 Belmont, (617) 583-2270
BURLINGTON Crossroads Plaza, Rt. 3 S., (617) 229-2850
CAMBRIDGE Harvard Square, 28 Boylston St., (617) 354-7694
CHESTNUT HILL 200 Boylston St. (617) 969-2031
NATICK 1400 Worcester Rd., (617) 875-8721
SAUGUS 343 Broadway, (617) 233-4985
SPRINGFIELD 1985 Main St., Northgate Plz., (413) 732-4745
WORCESTER Lincoln Plaza, (617) 852-8844

MICHIGAN

ANN ARBOR 2515 Jackson Rd., (313) 761-6266
BIRMINGHAM 3620 W. Maple Rd., (313) 647-2151
DEARBORN Westborn Shop. Ctr., 23161 Michigan Ave., (313) 274-6161
DETROIT DWNTN 1559 Woodward Ave., (313) 961-6855
FLINT G3298 Miller Rd., Yorkshire Plaza, (313) 732-2530
GRAND RAPIDS 3142 28th St. SE., (616) 957-2040
KALAMAZOO 25 Kalamazoo Center, (616) 343-0780
LANSING 2519 S. Cedar St., (517) 372-1120
PLAINFIELD North Kent Mall, (616) 364-7558
PONTIAC North Oak Plaza-Pontiac Mall, 2436 Elizabeth Lake Rd., (313) 682-6800
LIVONIA 33470 W. 7 Mile Rd., (313) 476-6800
ROSEVILLE 31873 Gratiot Ave., (313) 296-6210
SOUTHFIELD 17651 West 12 Mile Rd., (313) 569-1027
TROY Oakland Plaza, 322 John R. Rd., (313) 585-3900
WARREN 29038 Van Dyke Ave., (313) 573-3870

MINNESOTA

BLOOMINGTON 10566 France Ave. S., (612) 884-1641
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ST. PAUL 6th & Wabasha, (612) 291-7230

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KANSAS CITY 4025 N. Oak Trafficway, (816) 455-3381
ST. ANN 10472 St. Charles Rock Rd., (314) 428-1400
SPRINGFIELD 2684 S. Glenstone, (417) 883-4320

NEBRASKA

OMAHA 3006 Dodge St., (402) 346-4003, 1318 72nd St. at Pacific, (402) 397-1086

NEVADA

LAS VEGAS Commercial Center, 953 E. Sahara #31-B, (702) 731-3956
RENO 3328 Kietzke Lane, (702) 826-6327

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SALEM Salem Plaza, 403 Center, (503) 588-7095

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ERIE 5755 Peach St., (814) 868-5541
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KNOXVILLE Cedar Bluff S/C, 9123 Executive Park Dr., (615) 690-0520
MEMPHIS 4665 American Way, (901) 795-4963; 1997 Union Ave., (901) 278-7935
NASHVILLE 2115 Franklin Pike, (615) 298-5484, Rivergate Plaza, (615) 859-3414

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ROANOKE Franklin Bldg., 3561 Franklin Rd. S.W., (703) 342-6335
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