THE COMPUTING TEACHER

Computing in the Soviet Union

Graphic by Percy Franklin

FEATURES

DEPARTMENTS   COLUMNS

Getting Your Computers to Talk to Each Other

by
Jason Ohler
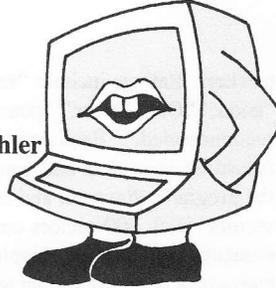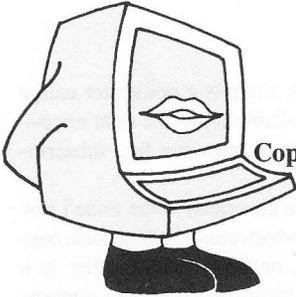
The objective of the project was simple: to get my IBM clone, Macintosh, Apple IIe and Tandy 200 to talk to each other directly without modems, strip readers, or special software, and independent of the telephone system.

I am not a techy, mind you. I am not the guy who stayed home on Friday night and made radios in the basement while everyone else went to the dance; I went to the dance.

But it became obvious to me that the micro world had degenerated into a real tower of Babel due to its adoption of a number of basically incompatible standards for data storage, and that a simple, cheap method was needed for making file transfers among the different computers. The system I used cannot begin to replace a local area network; it is far too crude. But for occasional use, which is all most of us need, it is quite adequate.

In the back of my mind I knew files could be swapped directly among different computers. I just hadn't had the nerve, or the need, to try it. It turned out to be easier than I thought, and the process taught me a tremendous amount about how computers communicate.

The original vision came when I was looking at a diagram of a typical micro-to-micro setup: two micros, both running telecommunication software, exchanging data through modems over the phone system via an on-line service or, rarely, directly. The only reason the modems were included was to compensate for the way our phone system communicates (analog system rather than digital). If the phone system is removed, the modems and on-line service aren't needed. Micro-to-micro communication then simplifies to two microcomputers running telecommunication software with only a cord connecting them.

This file swapping system has three components:

1. Files which are in ASCII format, a format most word processors are capable of supporting (I encourage attempting to send non-ASCII files—I have had unexpected successes);

2. A cable with the correct pin configurations, serving as the physical data path between serial ports on both computers; and

3. Standard telecommunication software on both computers acting as sending and receiving "doors" through which data passes.

ASCII Files

ASCII files are often referred to as "flat" files, as in "no personality." They are files with all of the underlining, boldfacing, italicizing, and anything else that gives them character and can't be printed on most monitors, removed. Thus you are left with just the unadorned characters, something that any computer can understand well enough to print on the screen. How to create ASCII files on each machine using some common software programs appears later under Technical Specifications.

In Search of the Right Cord: Serial Communication and the RS 232 Standard

Every computer has ports, gateways to the world beyond itself, which allow it to communicate with peripherals such as printers, modems, or other computers. Most ports are located on the backs of computers and are linked to a peripheral by means of a cable. There are two popular kinds of ports: serial and parallel. For a number of reasons (which are beyond the scope of this article to explain), serial communication is much better suited for the purpose at hand.

Serial ports exist on most common computers, either as shipped or by virtue of a firmware card installed after purchase. The serial port goes by many names: RS 232 port; asynchronous port; the place you stick your modem cord into; and DB 25 port, signifying the fact that RS 232 supports 25 pins. The IBM PC comes with an RS 232 serial port, as does the Tandy 200. Since one is not generally shipped with the Apple IIe, many users buy Apple's Super Serial Card in order to hook up printers and modems. If you use an ImageWriter, it probably interfaces with your IIe by means of a Super Serial Card. To use the card for telecommunication, you need to turn its jumper block around so it is pointing to MODEM. Consult your local Apple dealer for the details. The Mac does not have an RS 232 port, but its nine-pin serial modem port can be made to speak to an RS 232 port quite easily.

How can the Mac get away with just nine pins while the IBM, Tandy and IIe need 25? The answer is that many of the 25 RS 232 pins are not used for most serial communication in the micro world. So Apple decided to use nine and forget about the rest when it made the Mac. The Mac Plus is down to eight pins.

RS 232 has been the standard in serial communication for years. The 25 pins of the RS 232 port are commonly understood to be used for particular data transmission functions. For example, pins two and three are used for sending and receiving data and they should be reversed when communicating between computers. If, as in the case of the Mac, you do not have the standard, 25-pin RS 232 port, you need to find out which pins need to be crossed to reverse sending and receiving. Other pins which control other aspects of communication need to be aligned in the same way. You then preserve this configuration in a cord that ties the right pins together. If this leaves you confused, don't worry; the details you need are included under Serial Cord Pin Configurations.

Using information about pin configurations gathered from manuals, numerous calls to local computer dealers, and a great deal
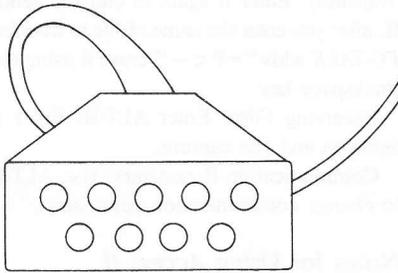
of trial and error, I arrived at the settings described later. I then had cables made to those specifications at the local electronics store for about $30 apiece; I learned the hard way that the cost of a cable can be cut by more than half if you make it yourself. (See "Kits Save Cable Costs" in "What's New?" on page 32.) An indispensable tool for determining pin configurations is a breakout box which allows you to try different pin arrangements relatively easily via jumper wires. There are many grades of breakout boxes which cost from $15 to $400 and up. I bought one for $45 and found no need for the bells and whistles of the more expensive models.

Telecommunication Software

Although I found that a number of different telecommunications software packages worked, I developed favorites. *SmartCom, CrossTalk* and *PC-TALK* all worked on the IBM, but I settled on *PC-TALK*, largely because of the price. *PC-TALK* is shareware, free unless you feel it is worth the $35 the author asks for. It is.

On the Mac, *Smartcom, MacTerminal* and *Red Ryder* worked. I ended up using *Red Ryder* primarily because it was cheap (free for 45 days, $40 if you like it at the end of the trial period) and because it made file transfers very easy.

I began using *ASCII Express* ($100) on the IIe but left it for *Access II* ($75). *ASCII Express* is a monument to the "power vs. ease of use" tradeoff. It offers many features that *Access II* doesn't, but it is as esoteric a piece of software as I have ever used. You actually have to read the manual to get started.

Setting Up the Telecommunication Software

Before computers can communicate with each other, you need to make sure that they are not only speaking the same language

(ASCII), but also observing the same rules of communication.

Sometimes the communication rules are established via DIP switches on cards, on the computer or peripheral. But most of the time, and in all of the situations addressed in this article, they are established from within the telecommunication software. There are, in most cases, five software parameters that need to be set on the software *on both computers*. Remember: *Both machines must have the same settings.* The parameters and their functions are: baud rate (loosely defined as how fast the data travels); the data length (how long a character is); the number of stop bits (how to convey the end of a character transmission); the duplex mode (determines whether or not you see what you are transmitting on your screen); and the parity (used to check for errors in the data that is transmitted). The settings to use appear under Technical Specifications.

A GLIMPSE OF TOMORROW

We don't need to exist in segregated subcultures based upon our brand of computer. Nor do we need to be forced to use a certain computer in the name of compatibility. Thankfully, different computers exist, providing different computing environments to accommodate different personalities. The information in this article can be used to increase compatibility in many data processing environments that use a variety of microcomputers. In education, I envision school districts having a kit in each building consisting of a few cords, a few pieces of software and some simple directions which allow cross-communication among all computers.

This project forced me to look at all four computers on a real nuts-and-bolts level. With this kind of intimate contact, it was hard not to compare them on the basis of how easily each communicated with the others. I am extremely impressed with the Tandy 200. It is quite compatible with other computers; its built-in (meaning no disk swapping) word processor and telecommunications software are made to work together to produce and transfer ASCII files. It is also cheap and easy to use, store and carry. While I was musing on these characteristics, I suddenly saw it as an electronic notebook.

Imagine this: Students in a biology or journalism class take off with Tandy 200s under their arms to conduct field work. Each student is responsible for researching a particular area of the class topic and spends the

morning taking notes on the 200. They return to class and, using the information in this article, download their notes into whatever computer they have in their classroom. Then they all call up their notes in a word processor, arrange them any way they like, and print out a cooperative text, which they all researched and wrote in order to share it with each other. Just imagine.

TECHNICAL SPECIFICATIONS

Note: Due to space limitations, I must assume a little knowledge of the software packages mentioned.

Creating ASCII Files
IBM

Multimate: Use the *Multimate* Utility FILECONV. It has never let me down.

Wordstar: Wordstar files are particularly hard to work with because of their character format (using eight rather than seven bits per character). When you print the document as an ASCII file to the screen using MS DOS's Type command or communications software, half of it looks like it's in Greek. A newer

version of *Wordstar* seems to have corrected this. If you don't have a newer version you can get around the problem by opening a file under non-document mode (with an N rather than a D), but you then need to enter carriage returns at the ends of lines, thus losing paragraph reformatting features. After trying diligently for a week to get past Micropro's (*Wordstar*'s maker) busy signal to find out what they recommended, I gave up. Many utility programs to convert *Wordstar* files to ASCII do exist, and every enclave of hardcore hackers seems to have one. I have tried sending and receiving *Wordstar* files with a data length of seven, hoping to chop off the troubling last bit, and have had some success.

MS Word: Press ESC to get the main menu, T for Transfer and S for Save. After entering the file name, press Tab, which will move you to "Formatted: (Yes)No." Enter N, press Return, and finally press Y to confirm that you want to lose formatting in your document.

LOTUS 1-2-3: Press / for the main menu, P for Print, and F to print it to a file rather than the printer. Enter a filename. Enter the range you want printed, and then G for Go and Q for Quit. The name of your file will have the extension PRN.

DBase III: At the dot prompt enter "set alternate to temp," then enter "set alternate on." This captures whatever comes across your screen (with a few exceptions) in an ASCII file named "temp"; you can give the file any legal MS DOS file name. List your data base at the dot prompt and then enter "set alternate off" to end capture mode. Your file name will have the extension TXT added to it.

Macintosh

*MacWrite* and *MS Word:* Save your file using "Save As." Click on "Text Only" below the dialogue box.

Apple IIe

AppleWorks: Use Open-Apple P and select "To ASCII file on disk." This works for word processor, data base or spreadsheet, but the latter two are printed in columnar format and are not very useful.

Special IIe *AppleWorks*-to-Mac Approach: If you want to send *AppleWorks* files to the Mac, try treating the Mac as a printer using the following approach: Plug a Mac-to-Hayes Smartcom cord into the ImageWriter port on the IIe and telecommunications port on the Mac. Using *Red Ryder* on the

Mac, click on "File," click on "Text File Transfer Preferences," and make sure that "Strip control characters from Received file" is on. Then click on "File," then "Capture Incoming Data to a TEXT file," and name your file. From within *AppleWorks,* print normally. You will have to edit out some characters at the beginning of each line after you have captured the file, but otherwise the file is fine.

AppleWriter, FrEdWriter, Homeword and *Zardax:* My files generated with *Homeword* and *AppleWriter* transferred just fine without any manipulation (except converting my *AppleWriter* files from DOS 3.3 to ProDOS so my telecommunications package could recognize them), though I did not try documents with any embedded print commands. From what I read, *Zardax* produces ASCII files. I have not worked with them to know.
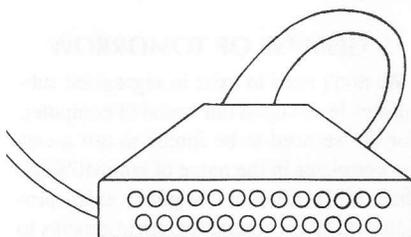
Tandy 200

The word processor produces ASCII files naturally. BASIC files can be converted to ASCII by saving using the A option for ASCII. For example, if you want to save a BASIC program called GAMES in ASCII format, you would enter: "GAMES,A.

Multiplan files can be converted to SYLK file formats and exchanged with other computers. The Tandy 200 Telcom Manual gives very specific directions on how to do this.

TELECOMMUNICATIONS SOFTWARE SETTINGS AND NOTES

Software Settings

The following software settings should be used with all of the telecommunication software featured in this article, except where noted:

Baud Rate: 9600; 1200 when sending to an Apple IIe
Data Length: 8 Number of stop bits: 1
Duplex: Half   Parity: None
If you need to set XON-XOFF protocol, try it ON first.

Notes for Using PC-TALK on IBM

Sending Files: Enter ALT-T (T for Transmit). Enter it again to end file send. If, after you enter the name of file to transfer, *PC-TALK* adds "=P<−," erase it using the Backspace key.

Receiving Files: Enter ALT-R. Enter it again to end file capture.

Communication Parameters: Use ALT-F to change communication parameters.

Notes for Using *Access II* on the IIe

Sending Files: From the main menu choose 4, "Transmit a File." When sending a file, do not use Christensen protocol. You will be asked how many milliseconds to allow between characters and between lines. Start with 0, which will give you the fastest transmission possible. If that doesn't work, go up in increments of 10.

Receiving Files: ***Don't use*** menu option 5, "Receive a File" to capture files. This option works only for files sent or received using Christensen protocol. To capture a file, choose menu option 2, "Terminal Mode." Press Open-Apple R to turn the recording function on and off. It is on when the cursor is blinking. When you are done capturing, press Open-Apple Escape to get to the main menu, choose 3, "Set Up Communications," and then choose 7, "Close the Recording File and Open a New One."

The Recording File: When you boot up, a ProDOS-formatted data disk must be in drive two, which will hold your recording file. You may be asked for the name of a recording file or to enter TEMP as the recording file name and press Return. What you are not told is that you need to specify the entire pathname of the recording file. So, if your disk is named DATA and you wish to name your recording file TEMP, you need to enter: /DATA/TEMP.

Notes for Using *Red Ryder* on the Mac

Sending Files: To send a file, click on "File," on "Send Text File," and on the filename. To cancel the transmission click on "File" and on "Cancel File Send."

Receiving Files: Capture files by clicking on "File" and "Capture Incoming Data to TEXT File," and naming your file. When the file has been transmitted, turn off the capture by clicking on "File" and then on "End File Capture."

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Text File Transfer Preferences: Depending upon the file you are sending or receiving, you may need to force a carriage return at the end of every 80 characters. To do so, click on "File," on "Text File Transfer Preferences," and on "Force line ends in files set at." You are given the option of resetting the number of columns. The default is 80, which should meet most of your needs. Before capturing a file, click on "File," click on "Text File Transfer Preferences," and make sure that "Strip control characters from Received file" is on.

Communication Parameters: Adjust communication parameters in the middle of the top line by clicking on them.

Notes for Using the Tandy 200

Sending Files: Enter telecommunications by pressing the Return key on TELCOM in the directory of files that appears when the machine is turned on. Press F4 (term). Press F3 to upload (send) files.

Notes about Communicating with the Mac and IIe: When uploading to the Mac, *Red Ryder*'s duplex mode must be set to Echo (vs. Full or Half) in order to see the information on the Tandy 200. When sending from the Tandy 200 to the Apple IIe, words appear on top of each other on the IIe screen. Also, nothing appears on the Tandy's screen. However, all of the information is captured by the IIe, as pulling up the caught file as a text file in the *AppleWorks* word processor proves.

Notes on Setting Communications Parameters: Enter telecommunications as described above. Press F3 (stat) and enter "88N1ENI, 0, 10 pps." The first 8 stands for 9600 baud. When communicating with an Apple IIe set the baud rate to 1200 by making it a 5.

Serial Cord Pin Configurations

IIe ↔ Mac	1-1, 2-9, 3-5, 7-3
IBM ↔ Mac	1-1, 2-9, 3-5, 7-3, 20-7
IBM ↔ IIe	1-1, 2-3, 3-2, 7-7, 20-20
T200 ↔ IIe	2-3, 3-2, 6-20, 7-7, 20-6, tie 4 & 5 together on both sides
Mac ↔ T200	1-1, 3-7, 7-20, 5-3, 9-2, tie 4 & 5 together on Tandy side
T200 ↔ IBM	2-3, 3-2, 6-20, 7-7, 20-6, tie 4 & 5 together on both sides

IIe → Mac, from IIe ImageWriter port to modem port on the Mac
1-1, 2-5, 3-9, 5-7, 7-3

More Methods

I've described the methods that have worked for me, but I'm sure there are many more ways to communicate from computer to computer. If you've discovered one, share it with us.

Editor's Note: Commodore users—you're the missing link! Write and tell us how you send files among your Commodores and other machines. 🌐

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Teach the Learning Handicapped
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showing their products to others.

We also find making banners very useful and appealing for all ages. For younger students, or those with serious reading and writing difficulties, we cut out and save the large-print letters and use them over and over again for making words that can later be transferred to the computer. Another activity that we have not tried, but that should be applicable, is to write a rebus, using any of the software's store of drawings for words. **Wizard of Words** (Advanced Ideas, Inc., 2902 San Pablo Avenue, Berkeley, CA 94702).

This program contains very versatile, interactive word games which can be played at different skill levels. A player can create new words or use words from the Wizard's own 38,000-word list. Each of the games is highly motivating and encourages vocabulary development and reading and spelling skills. The directions are easy to follow and the program is enhanced by animated color graphics and a variety of games to choose from.

We find this program very versatile and appropriate for all age groups, from the very young to college level. We use both the existing vocabulary and add our own words, depending on what subject area we are involved with. We've found "unscrambling words" and "hangman" the favorite games of most students. They can choose to compete against the computer or their peers. We find the potential for using this program unlimited. It is highly motivating and very useful for reinforcing necessary skills in reading, spelling and vocabulary.

The Pond (Sunburst Communications, 39 Washington Avenue, Pleasantville, NY 10570-9971).

The user helps a small green frog jump along a maze of lily pads arranged in patterns. Since only a portion of the pond is visible, students must discover the pattern move by move. They must gather information, make and test assumptions, recognize patterns and plan ahead. When the pattern has been identified, the student types it in on the computer and the frog either jumps successfully from pad to pad or splashes into the pond if a choice is incorrect.

Our students find the directions to be clear and concise, though we furnish verbal cues when necessary. This program has been particularly useful for work with students who have sequencing and directionality problems and find it difficult to hypothesize. Because the students find it so motivating, we encourage them to "think out loud," and they often become surprisingly verbal as they work through their problems in their search for the correct patterns. We either work directly with the student or encourage working with a peer.

Conclusion

We cannot emphasize enough that it is not the program itself that overcomes the learning problem. It is the creative and innovative way that the program is used by the individual teacher. We urge that computer learning be set up as an interactive experience between the student and other students and/or the teacher. We hope to generate in all computer users the excitement and challenge that lies ahead for all of us with this new technology. 🌐

We wish to credit all of the authors whose articles in The Computing Teacher, Classroom Computer Learning, Electronic Learning, *and* The Journal of Learning Disabilities *formed the basis from which we could expand. They laid the foundation for our work and allowed us to add to their findings and recommendations the extra dimension of our own direct experience with the handicapped learner.*

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