1 Computers and Braille

In Learner Level Section 7, we showed you *how* to translate print chapters to grade 2 braille using option G - Grade 2 translator. But what's really happening? In this Appendix, we explain how computers represent braille. If you're a braille reader or an experienced transcriber, you can skip over the brief introduction to braille found in Part 1. Part 2: Making Braille with Computers is relevant to everyone making braille with BEX. We explain exactly what we mean by the term *screen braille* in Part 2. Part 3 provides samples of different braille translation modes. Braille readers will find out how to decipher *computer braille* output in Part 4. Finally, Part 5 is addressed to BEX users who do *braille input* with BEX, through a remote keyboard or BEX's braille keyboard mode in the Editor.

1: Traditional Braille

The basic braille unit is the braille *cell,* composed of two vertical columns of three dots each, numbered as follows: Dot 1 is upper left, dot 2 is middle left, dot 3 is lower left, dot 4 is upper right, dot 5 is middle right, and dot 6 is lower right. All text can be represented by specific combinations of dots.

There are sixty-four possible combinations of dots in a single cell. Each lowercase letter of the alphabet has its own representation, and most punctuation marks are also represented by a single cell in braille. Sixty-four combinations are soon exhausted, however, leaving an array of print symbols which must be represented by combining two or more cells.

For example, the uppercase alphabet does not have its own set of symbols in braille. Instead, uppercase letters are represented by adding a prefix to the lowercase symbol for that letter. This prefix, called the *caps sign,* is dot 6. Lowercase *k* is dots 1-3, so uppercase *K* is dot 6, dots 1-3. When an entire word is capitalized, it is preceded by two dot 6s; *DOG* becomes dot 6, dot 6, dots 1-4-5, dots 1-3-5, dots 1-2-4-5.

We're using a common convention for describing the braille cell with dot numbers. *Dots 1-4* means "a cell consisting of dot 1 and dot 4." When we wish to refer to "a cell consisting of dot 1, dot 2, dot 3, and dot 4", it's written *dots 1-2-3-4.* When referring to more than one cell, *dots 1-2, dot 6* means "a cell consisting of dot 1 and dot 2, followed by a cell consisting of dot 6."

There are several *codes* or systems for transcribing print material into braille. The most basic form of braille is called *grade 1* braille. In grade 1 every inkprint letter is represented by one braille cell. It's only used in rare situations where showing an exact letter-for-letter representation of print is absolutely essential (a spelling list, for example).

- ***Grade 2 Braille saves space***

Braille is inherently bulky, because each braille cell must be large enough for a fingertip to feel easily. Less than 1000 characters fit on each braille page, compared with 4000 or so characters on a typeset print page. Because the dots are raised on the page, each page is also thicker than its print equivalent. In addition, many print symbols require more than one braille cell for representation. So, transcribing printed material to braille produces documents several times the size of the print original.

Grade 2 braille was developed as a way of making things shorter and faster for both readers and transcribers. Grade 2 braille uses many *contractions.* Also referred to as "contracted" or "English" braille, grade 2 is the standard braille form used in the United States today. In grade 2, there are many contractions for words and parts of words frequently encountered in the English language. For example, the word *the* is represented by the single cell dots 2-3-4-6. The two-letter combination *st* is dots 3-4. Other contractions involve the use of more than one cell, but still use fewer cells than there are letters in the word. The word *mother* is brailled dot 5, dots 1-3-4.

This system of raised dots is employed to represent many languages other than English, and most of those languages have their own grade 2 braille equivalent. In any language, there are many complex rules governing grammar, syntax, and punctuation. In addition to following the rules of the print language it is representing, braille has a complicated set of rules all its own. *English Braille--American Edition,* explains the grade 2 braille rules--

when you want more detail than is provided here, obtain this book from the American Printing House for the Blind.

BEX was designed to make it easy for typists who are not transcribers to produce readable grade 2 braille quickly. A good typist needs a working knowledge of basic formats to efficiently enter data in print for braille translation. To this end, we provide some brief background information about braille formats in Learner Level Section 9. The TranscriBEX module for BEX is designed for serious braille transcribing. The TranscriBEX Manual is a companion to the braille codebooks; it explains how you use BEX to create the complex braille formats mandated by the codebooks. Any material transcribed for other than personal use should be proofread by a Library of Congress certified transcriber or proofreader.

2: Making Braille with Computers

To understand how BEX handles print and braille, we need to establish some terms. You may have wondered if there aren't easier ways to discuss braille representations than stringing together series of dots and numbers, and fortunately there are. One way is by showing the actual dot patterns in a flat medium, such as the printed page. (You can do this with BEX, if you want. Contact us for details.)

Another way of representing braille requires knowing a little bit about how your Apple deals with print and braille. Actually, the computer doesn't know (or care!) about the differences between braille and print. When you type a character on your keyboard, the Apple assigns its own representation, an *ASCII number,* to that character. The computer uses ASCII numbers for any and all dealings it has with your text. When it sends a particular number to an external device, that device matches the ASCII number to its own list of symbols to decide how to show it. When your Apple sends an ASCII 120 to a print device, the printer prints an *x.* When it sends ASCII 120 to a braille device, the brailler embosses dots 1-3-4-6.

Screen braille

Many times it's useful to look at a braille chapter through a print window. We made up the term *screen braille* to describe how your Apple displays braille text using print characters. When you first see screen braille it may look a little strange.

Screen braille shows each braille cell, stored as one ASCII number, as an inkprint character. For example, a *wh* sign, which is dots 1-5-6 in grade 2 braille, is stored as ASCII 58. In inkprint, ASCII 58 is a colon. When you encounter `:at` while editing a grade 2 chapter, you are seeing the screen braille for the grade 2 word *what.*

- ***Screen braille and BEX***

In BEX, you see screen braille in several contexts. Sighted users see screen braille when they edit grade 2 text with a print screen mode in the Editor. With voice output of braille text, you always hear screen braille. When you use a voice device to review screen braille, it's crucial to set the device for most punctuation. Otherwise, you would miss important braille cells like dot 6 (comma).

On the Main Menu, option H - Heading test shows an instant grade 2 translation in screen braille. The braille previewer display is screen braille. When you configure with brailler code 1, then there's a "cheat sheet" on the righthand side of the screen, reminding you that the exclamation point in screen braille is the *the* sign in grade 2. When you review a grade 2 chapter with a preview brailler, you see or hear the word *Information* as `,9=m,n` or *comma, 9, equal sign, m, comma, n.*

- ***Experimenting with Screen Braille***

The Apple stores all characters as ASCII numbers. BEX provides various doors for input and windows for output. Braille keyboard is a braille door and braille screen modes, SB and SJ, are braille windows. The full Apple keyboard is a print door and the print screen modes, (SH, SN, SL), are print windows. How any ASCII character is input or output depends on your door and window. You can directly experiment with screen braille by mixing braille and print keyboard and screen modes.

Create a new chapter. Suppose you want to see the computer braille representation for colon. Set a braille screen mode with your usual inkprint keyboard mode. Type a colon (ASCII 58). It appears on the screen as dots 1-5-6. Now switch into a print screen mode; the ASCII character 58 is now shown as a colon.

Similarly, suppose you want to see how dots 1-2-6 is shown in screen braille. In the Editor, get into braille keyboard mode and print screen mode. Braille dots 1-2-6 (ASCII 60). It appears on the screen as a *less-than sign.* Arrowing over it, you hear *less than.*

3: Braille Translation Examples

At this point, examples of the types of braille we have discussed so far should be helpful. Let's take a look at all the possibilities for one silly sentence. Here's how it looks in print:

```
She distinguished seeking from finding, but it is
still a job for the experts.
```

When you send this print sentence directly to a braille device, the result is *computer braille.* We explore computer braille in detail in Part 4. For now, the important thing to understand is that computer braille is ambiguous. The braille reader can't tell if the first letter is capitalized or not. The braille cells created by the comma and period characters are not the comma or period characters used in grade 1 or grade 2 braille.

Here's the grade 1 braille equivalent:

```
,she distinguished seeking from finding1 but it is
still a job for the experts4
```

Notice that there are as many characters as there are characters in the sentence, plus one extra to indicate that the *s* is capitalized. The `1` character is dot 2, the comma in grade 1 and grade 2. The `4` character is dots 2-5-6, the period in grade 1 and grade 2.

Now, we've run the sentence through the Grade 2 translator. Here's the screen braille version:

```
,%e 4t+ui%$ seek+ f f9d+1 b x is / a job =!
exp]ts4
```

It's a lot shorter, because of all the contractions used in grade 2. Some letters stand alone to represent words: `f` stands for the word *from*, `b` stands for *but*, and the letter `x` by itself means *it*. The words *still*, *for*, and *the* are each represented by single inkprint punctuation characters. In addition, the commonly used letter combinations *sh, dis, ing, ed, in,* and *er* are each contracted to single print characters. Notice that the *sh* in *She* and *distinguished* are both represented the same way, by a percent sign. Remembering back to our discussion of the caps sign in Part 1, notice that the comma is the screen braille equivalent of dot 6, used before the `%` to show that *She* is capitalized. Also notice that while the first *in* in *finding* is represented by a single character, a different character represents the combination *ing*, found in *seeking*, *finding*, and *distinguished*.

When you are entering text, *you* do not need to make all these distinctions. Just type it in as it appears in print, and the Grade 2 translator does all the work!

Unless you are going to be proofreading screen braille a lot, you don't need to memorize the correspondence between individual braille cells and their print representations. You can learn screen braille naturally if you develop the habit of previewing grade 2 text you create. Since you know what the inkprint text looked like, you will quickly discover what characters are contracted by grade 2 translation. Once sighted users get practice with screen braille, they often find it easier to read than braille dots.

4: Computer Braille

When we say *computer braille* in this manual, we are talking about the braille cells you see when you send inkprint text to a braille device. In the United States, the relationships between inkprint characters and braille cells was first developed at the Massachusetts Institute for Technology. Some people refer

to computer braille as the *MIT Braille Code.* It's easy to confuse the term *computer braille* with the *Code for Computer Braille Notation.* The *Code* is a systematic way to precisely transcribe computer-related material. Just to make things confusing, the name *Code for Computer Braille Notation* is frequently shortened to the *Computer Braille Code.*

As we demonstrated in Part 3, the Apple doesn't care about inkprint or braille: it stores every character by its ASCII number. The *ASCII code* is a standard list of characters and their accompanying numbers. *Computer braille* is the relationship between the inkprint characters, their ASCII numbers, and the braille cells. Computer braille assigns each printable ASCII character to one braille cell.

Consider the inkprint colon **:** character. The Apple thinks of this character as ASCII 58. When the Apple sends ASCII 58 to an inkprint device, it produces a print colon. When the Apple sends ASCII 58 to a braille device, it produces dots 1-5-6. Dots 1-5-6 is a colon in computer braille. Whenever you send inkprint material to a braille device, the result is in the computer braille code, so every colon shows up as dots 1-5-6.

The ASCII digits 1 through 0 appear as Nemeth Code digits in computer braille: dropped *a* through dropped *j.* When reading computer braille, you won't encounter the number sign to signal braille numbers. Computer braille makes no distinction between uppercase and lowercase ASCII characters. Uppercase *A* (ASCII 65) and lowercase *a* (ASCII 97) are both represented by dot 1. Send either ASCII 65 or ASCII 97 to a brailler and it embosses dot 1. Because 52 ASCII letters are mapped on to 26 braille cells, computer braille is ambiguous. Material transcribed in the *Code for Computer Braille Notation* is not ambiguous: the braille reader can distinguish between uppercase and lowercase letters.

The remaining ASCII characters are punctuation marks and symbols. These are given reasonable braille symbols where possible. For example, the period in computer braille is dots 4-6, the decimal point of both literary and Nemeth braille. Some other assignments get arbitrary. The contraction symbols of grade 2 are punctuation in computer braille. For example, a dollar sign in computer braille is dots 1-2-4-6 (the *ed* sign). It is not the two-cell literary form (dropped *d,* dots 3-4-5-6). Here's the list of 21 *unambiguous* symbols, in the order they appear in the ASCII code:

- Symbol Name - Braille Cell
- exclamation point - dots 2-3-4-6
- quote - dot 5
- number sign - dots 3-4-5-6
- dollar sign - dots 1-2-4-6
- percent sign - dots 1-4-6
- ampersand - dots 1-2-3-4-6
- apostrophe - dot 3
- left parenthesis - dots 1-2-3-5-6
- right parenthesis - dots 2-3-4-5-6
- asterisk - dots 1-6
- plus sign - dots 3-4-6
- comma - dot 6
- hyphen (minus sign) - dots 3-6
- period (decimal point) - dots 4-6
- slash - dots 3-4
- colon - dots 1-5-6
- semicolon - dots 5-6
- less-than - dots 1-2-6
- equals sign - dots 1-2-3-4-5-6
- greater-than - dots 3-4-5
- question mark - dots 1-4-5-6
- underbar - dots 4-5-6

Finally, ten inkprint punctuation symbols *double up* on five braille cells. When the inkprint contains these symbols, the computer braille output is ambiguous:

- at sign or grave accent - dot 4
- left bracket or left brace - dots 2-4-6
- backslash or vertical bar - dots 1-2-5-6
- right bracket or right brace - dots 1-2-4-5-6
- caret (up arrow) or tilde - dots 4-5

Again, the *Code for Computer Braille Notation* is not ambiguous: the right bracket and right brace are represented distinctively in this Code.

As if this wasn't confusing enough, you may sometimes hear these five pairs of punctuation characters referred to as *uppercase* and *lowercase.* In the chart, the first character is uppercase and the second is lowercase: the left brace

character is lowercase, while the left bracket is uppercase. This terminology comes from where these characters appear in the ASCII code. It has nothing to do with whether you need to use the shift key to type them.

And now you have the full story on how computer braille represents 95 inkprint characters with only 64 braille cells. Computer braille is important to understand when you're writing a program that interacts with a braille device. When BEX wants to emboss dot 1, it knows it can send out either ASCII 65 *A* or ASCII 97 *a.* As it happens, BEX's translator always creates lowercase letters. For the five pairs of ambiguous punctuation, BEX's translator always creates the uppercase version. The same holds true when you do braille data entry with the braille keyboard mode in the Editor.

However, you can also give BEX braille text in other ways, like sending material from a braille device. Almost every braille device has its own way of entering and displaying uppercase and lowercase--showing the differences between Uppercase *A* (ASCII 65) and lowercase *a,* (ASCII 97) or the at-sign (ASCII 64) and the grave accent (ASCII 96). Any uppercase text is changed to lowercase by option B - Back translate from grade 2.

5: Giving BEX Computer Braille Input

When you communicate with BEX through a braille keyboard, you must give commands in computer braille. When you configure a braille device for all the material going to the screen, BEX presents its dialogue in computer braille. When you press dots 1-4-5 on your braille keyboard, BEX responds with dots 2-4-5-6, 1-2-5, 2-4, 1-4, 1-2-5, space, dots 1-4-5, 1-2-3-5, 2-4, 1-2-3-6, 1-5, 1-4-5-6, space, dots 1-2. When you want to tell BEX to scan drive 2 for all chapters ending in *Q,* you press these keys on the braille keyboard: dots 2-3, dots 3-4, dots 1-2-3-4-5.

When you write text for BEX on a braille keyboard, you must use computer braille for BEX's format commands. This means using dots 1-2-4-6 for the dollar sign and using Nemeth digits (dropped letters). The letters in these commands must be lowercase.

Keep case in mind as you use a VersaBraille, PortaBraille, or any other braille device to create braille text bound for BEX. Make sure your braille device is set for lowercase lock so your format command letters are lowercase. Alternatively, you can ignore case on your braille device and then use Replace characters with the transformation chapter `UCLC` on your BEXtras disk.

Text vs. Commands

As you use BEX you type in both text and commands. BEX doesn't care if your text is grade 2, English, or Albanian. It only cares about how you enter commands, since it must understand them. While you enter your format commands in computer braille, your braille text can be in any braille code you wish. If you intend to process the text through the back translator, then it had better be properly contracted grade 2. When you want to combine computer braille *text* and grade 2 text in a chapter, use the translator controls described in User Level, Section 9, Part 3.

2 BEX and the SlotBuster II

This Appendix provides BEX-specific SlotBuster information, as well as a summary of SCAT commands. The SlotBuster II manual is available on disk--contact RC Systems at the address shown in Appendix 5.

1: The SlotBuster's Many Roles

The SlotBuster II is a multifunction card. You can purchase the card with various functions. As far as BEX is concerned, the SlotBuster can play five roles:

- 1. An integral voice device (in combination with the `SCAT` software)
- 2. A two-way communications interface through its modem port for tape-based VersaBraille transfers or Input through slot
- 3. A one-way serial or parallel printer interface for BEX large print
- 4. A one-way serial or parallel printer interface for any other printer

- 5. A serial voice device

For the SlotBuster to perform correctly in roles 1, 2, and 3, BEX must recognize that the SlotBuster card is installed in your Apple. When BEX doesn't recognize the SlotBuster, use option R - Recognition of cards on the Starting Menu to get the card and BEX acquainted. (Interface Guide Section 15 explains how to use Recognition of cards in detail.) BEX is less picky about roles 4 and 5 on the list above; BEX allows you to configure through an "unknown card" for printers and serial voice devices in general. This Appendix, therefore, focuses on the first three roles. Because the SlotBuster can serve many roles, you must be willing to experiment with it to develop a feel for the possibilities. The more you understand how the SlotBuster manages its tasks, the more success you will have using the SlotBuster with BEX.

2: SlotBuster as Integral Voice Device

When BEX recognizes a SlotBuster card installed in your Apple, then it loads the `SCAT.LC` software into the Apple as you boot. When you have both a SlotBuster and an Echo card in the same Apple, BEX loads the software for the device in the higher numbered slot. When the Echo is in slot 4 and the SlotBuster is in slot 1, BEX loads TEXTALKER. When the Echo is in slot 1 and the SlotBuster is in slot 4, BEX loads SCAT.

You know that BEX has loaded SCAT when the SlotBuster speaks the first `Enter configuration` prompt. If your SlotBuster doesn't speak, then check to make sure it's firmly installed in a higher slot than an Echo. If BEX still doesn't load SCAT, then use option R - Recognition of cards to teach BEX about the SlotBuster.

- ***Establishing a set-up sequence for the SlotBuster***

When you tell BEX you want to use SlotBuster speech, BEX asks you `Establish an automatic set-up sequence for the SlotBuster?` When you answer Y, you have an opportunity to set the

SlotBuster modes as you prefer. For example, you could enter control-E 1 D to make the SlotBuster speak each digit as an individual number, instead of pronouncing digits as words.

Most of the time, you will be using the SlotBuster voice to get access to this configuration question. Since SCAT is active, it would immediately interpret the command instead of passing it to BEX to use as a set-up sequence. BEX gets around this paradox: when you tell BEX you do want to establish a set-up sequence for the SlotBuster, it automatically changes SCAT's command character from control-E to control-Q. When BEX prompts `Type it EXACTLY. Press DELETE key to end sequence:` SCAT's command character has been changed. You can then type `control-E 1 D <Del>` As soon as you press <Del>, BEX changes the command character back to control-E. >

- ***Don't print through SCAT***

The SlotBuster Manual mentions several SCAT functions that are most useful when using SCAT to get voice access to general software. In particular, the SCAT Manual talks about getting printer output while maintaining voice output. You would do this by typing `PR#1` at the BASIC prompt. Because BEX provides many ways to print, we have disabled this feature in the SCAT software on the BEX disk.

- ***Don't add SlotBuster speech to printer interfaced with SlotBuster***

Whenever you print with BEX, you can add voice output to a printer by adding the two characters `+V` to the printer destination number or code letters. However, you cannot add SlotBuster speech to printing when your printer is also interfaced through the SlotBuster. For example, you define printer 2 as BEX large print through your SlotBuster card. You configure with SlotBuster speech. Entering `2+V` at the `Which printer:` prompt causes problems. Each letter of your printout appears twice.

- ***Avoid TEXTALKER emulation***

The SCAT Manual also discusses "Brand X Emulation Mode," where the SlotBuster mimics an Echo using TEXTALKER. *Don't* invoke this mode within BEX. If you did accidentally invoke TEXTALKER emulation by issuing the SCAT command control-E I, you would notice two symptoms. All BEX screen display would be doubled: the Main Menu prompt would be `MMaaiinn MMeennuu::` etc. Also, voice output in the Editor would be at a very low pitch; pitch change for capitalization would become very difficult to decipher. You can't turn off TEXTALKER emulation once you've entered control-E I. BEX reloads SCAT every time you boot, so the way to return to normal SCAT function is to reboot BEX.

- ***Don't change SCAT's command character***

The default command character for SCAT is control-E. You *can* change this by following control-E with another control character. Please don't. BEX uses pitch to show capitalization in the Editor. It accomplishes this by sending pitch change commands to your voice device. If you changed SCAT's command character, BEX wouldn't be able to send pitch change commands to the SlotBuster.

If you do change SCAT's command character by mistake, you will quickly discover that the Editor seems screwy. Suppose you enter control-E control-R, accidentally changing SCAT's command character to control-R. When you press control-R to go back a word and speak it, BEX doesn't respond. Instead, you hear the SlotBuster saying "command." If you press control-T to talk the sentence, you hear strange characters like "12 P" in the middle of your text. You are hearing BEX issuing the SCAT command control-E 12 P to change the pitch. Because control-E is no longer SCAT's command character, the SlotBuster is ignoring BEX.

There are two ways to recover from changing SCAT's command character. The lazy way out is to reboot. If you're feeling energetic, move through the alphabet with control characters in the Editor. When you press a control character and the SlotBuster responds with "command," then you have found the new command character. Press that character followed by control-E to restore things to normal.

- ***SCAT and line review***

The SCAT software provides line review capabilities for the SlotBuster. You can use SCAT line review in all the contexts where we discuss Echo line review: in the Editor during View Mode; when printing to a Review class printer; when printing to SW 80-column or SN 40-column screen; and at BEX Menus. Here's a summary of SCAT commands.

SCAT Command Summary

In this list, the number sign stands for a numerical value of your choosing. The range for this value is shown in parentheses, followed by its initial value when SCAT is loaded.

- `PR#0` - Enable SCAT, 40 columns
- `PR#3` - Enable SCAT, 80 columns
- `Control-E # A` - Articulation (1-8; 6)
- `Control-E # B` - Buffer control (0/1; 1)
- `Control-E # C` - Character punctuation (1-4; 2)
- `Control-E # D` - Digits mode (0/1; 0)
- `Control-E # E` - Echo control (0-3; 3)
- `Control-E # F` - Formant frequency (1-256; 232)
- `Control-E # H` - Hardcopy (printer) destination (0-2; 1)
- `Control-E # L` - Letter delay (1-32; 1)
- `Control-E # P` - Pitch (1-32; 12)
- `Control-E R` - Clear the buffer
- `Control-E # S` - Speed (1-16; 14)
- `Control-E # T` - Text punctuation (1-4; 4)
- `Control-E # V` - Volume (0-15; 8)
- `Control-E # W` - Word delay (1-16; 1)
- `Control-X` - Zap speech
- `Control-E Control-anything` - Change SCAT command character to second control character

- ***SCAT Line Review Commands***

- `Control-R` - Enter Review mode
- `Control-A` - Audio cursor position
- `Control-V` - Video cursor position
- `Control-X` - Zap speech
- `A through X` - Select line 1-24
- `Y` - Select line of video cursor
- `Z` - Exit, leaving video cursor at audio cursor
- `Up/down arrows` - Scroll through lines of text
- `Left/right arrows` - Read word or character on left/right
- `m-n` - Read lines "m" thru "n"
- - Repeat line
- - Toggle between Text and Character modes
- - Normal exit
- `Period` - Start string search
- - Delimit search string
- `Left arrow` - Start searching text previous to audio cursor
- `Right arrow` - Start searching text after audio cursor

3: SlotBuster as Communications Interface

BEX supports two-way communication for tape-based VersaBraille transfers and for Input through slot. As explained in Interface Guide Section 15, BEX considers these applications "fussy": BEX requires particular hardware in the interface card. The SlotBuster modem port is *hardware compatible* with the Super Serial Card, so it functions well as a communications interface. However, the SlotBuster modem port requires different cables than a real Super Serial Card. Check Section 5 in the Interface Guide for the cables needed.

However, the SlotBuster modem port does not have the same *firmware* as a Super Serial Card. This means that neither you nor BEX can use the SSC command sequences to control the SlotBuster modem port. You change communications parameters on any of the SlotBuster's port with the configuration utility supplied on disk with the SlotBuster. These parameters are stored in a battery-backed chip, so they last until you change them. Consult the SlotBuster Manual for how to use these utilities.

4: SlotBuster as Printer Interface

You can purchase the SlotBuster with either or both serial and parallel printer ports, plus the voice output feature. The command control-I # O (uppercase *O*, not zero) controls which mode the SlotBuster uses. When you supply the SlotBuster's slot number as you configure printers, BEX asks you to choose between the three possible modes: serial, parallel, or voice output. Depending on your answer, BEX sends the appropriate control-I # O command to the SlotBuster. When you use option V - View a configuration, you see these commands as part of the automatic set-up sequence for the printer.

When you answer `S` for serial, then BEX sends control-I 2 O to the SlotBuster card whenever you print. When you answer `P` for parallel, BEX sends control-I 1 O to the SlotBuster. Finally, when you answer `V` for voice, BEX sends control-I 0 O (zero, uppercase *0).*

When you want to configure the SlotBuster as a voice printer, you must tell BEX "I want voice" twice. Suppose your SlotBuster card is in slot 4. The relevant excerpt from a configuration dialogue looks like:

```
Printer ONE description
Enter slot: 4
SlotBuster card. Do you want:
S - Serial
P - Parallel
V - Voice
Which mode: V
Enter printer class: V
Establish an automatic set-up sequence for printer
ONE? N
```

When you use option V - View a configuration, you see that BEX has established a set-up sequence of control-I 0 O.

SCAT Modifications

We have made two modifications to the SCAT.LC program provided on the BEX Boot disk. These modifications help minimize problems you could encounter using the SlotBuster. We want to warn you about problems you could encounter if you obtain a later, unmodified version of SCAT and install it on your BEX disk.

As mentioned in Part 2, we disabled printing *through* SCAT with PR#1. If you try this with an unmodified SCAT, BEX screen display goes bananas. The other modification involves how BEX tells if SCAT is using 40-column or 80-column screen display. The hexadeciamal details of this conversation are probably not of interest; the important thing is that if you install an unmodified SCAT, *and* you use both 40-column and 80-column screen in BEX, you may encounter spurious characters.

3 BEX with One Disk Drive

While we've tried to make BEX function with a single disk drive, we cannot promise that it will be fun. If you have a 64K Apple, you will find yourself swapping disks *a lot,* since many BEX options must be loaded from the program disk. The trickiest situation is when you combine 20-column or larger letters on the screen with large print output to a dot matrix printer--we strongly recommend a 2-drive system for this combination. If you *must* try this with a one-drive system, we supply details on coping below. When you have an extended 80-column card, then BEX is workable with a one-drive system. (Not coincidentally, the Apple IIc comes with one drive and a built-in extended 80-column card.)

Once you are at the Master Level, you can configure RAM drives as well as 3.5-inch disk drives. Apple IIgs owners who find themselves limping along with a one 5.25-inch drive system at the Learner and User Levels will be rewarded at the Master Level. See Master Level Section 3 for details.

Configure Correctly

BEX can't internally sense that you only have one drive: you must explicitly tell BEX about your solo state. Three supplied configurations are designed for single drives: S1 for sighted learners, E1 for Echo learners, and L1 for large print learners. When you set up your own Learner and User Level configuration(s), answer `1` when BEX asks you how many drives you have.

"Swap" Prompts

When BEX needs to load some portion of software from your program disk, you're prompted to insert the BEX disk in your drive. You're prompted `Insert program disk in drive, then press any key` at the Learner Level. At the User Level and Master Level, these prompts get more cryptic, of course. BEX loads every menu from disk, so you must have the program disk in your drive to switch menus. When BEX has loaded the needed software, BEX prompts: `Insert data disk`

Copying Chapters and Disks

Option C - Copy disks on the Starting menu prompts you to switch between your *source* disk and your *destination* disk. As we demonstrated in Learner Level Section 2, Part 9, option C - Copy chapters on the Second Menu lets you copy a chapter from one disk to another. For both these options, BEX can't sense if it is writing to the correct disk, so you better follow those prompts literally.

Warning! At the User and Master Levels, option C - Copy chapters appears on the Main Menu as well as the Second Menu. Copy chapters on the Main Menu does not let you copy chapters from one disk to another.

File Not Found Follies

Because BEX is depending on you to insert the appropriate disk at the right time, it's not unlikely that you'll get program crashes before you develop skill in disk swapping. If you get a high error beep, followed by a message like `FILE NOT FOUND, BREAK IN LINE` (some number) it means BEX has just crashed. When the number is 7410, it means BEX encountered trouble when writing to disk. When the number is 7105, then BEX had problems reading from disk.

To recover, insert your BEX program disk, depress your caps lock, type `RUN` and you're back in business. More details on DOS error messages are found in User Level Section 13.

Frequently Check Remaining Disk Space

You must develop the habit of checking to make sure there's room for a chapter. Press # at any menu for the count of free sectors remaining; when less than 100 sectors are free, move on to a new data disk. More details on how much room chapters occupy on disk appear in User Level Section 4, Part 4.

Large Print Printer

After you supply the number corresponding to a BEX large print dot-matrix printer at the `Which printer:` prompt, BEX has to load a file from disk containing the table that draws the large letters. The Main side of the BEX disk has two tables: `FONT-N` is for 14 point, and `FONT-R` is for 18 point. To produce large print output on a one-drive system, you must copy the needed table to each and every data disk you want to print. If you only configure for one size, then you only need to copy the appropriate table. Use option F - FID on the Starting Menu to copy these files. (They're not BEX chapters so you can't use Copy chapters to move them to your data disks.)

4 BEX in a 64K Environment

BEX is designed for an Apple with 128K or more memory. The Apple IIc and IIgs right out of the box have at least 128K memory, so this Appendix is only relevant to owners of Apple IIe and Apple II Plus computers. Part 1 explains the hardware issues that influence what works with a 64K Apple. Part 2 tackles limitations you encounter when BEX is running on a 64K Apple IIe *or* II Plus. Part 3 enumerates the *further* limitations when running BEX on an Apple II Plus.

The Apple's memory is divided into two parts: the *main* memory and the *auxiliary* memory. A *64K* Apple has 64K of main memory. A 128K Apple has 64K of main memory plus 64K of auxiliary memory. Some BEX functions depend on auxiliary memory. When your Apple only has 64K, BEX is slower and less convenient in general, and some functions don't work at all.

1: Sorting through the Hardware Issues

As far as BEX is concerned there are three hardware issues:

- 80-column text display for the IIe and II Plus
- 16K RAM or Language Card memory for the II Plus
- Apple II Plus keyboard layout

80-column card

An 80-column text card provides the Apple with the ability to display information on an 80-column wide screen. Without an 80-column card, you are limited to 40-column display. When you install an 80-column text card in either an Apple IIe or II Plus, you can use BEX functions that require an 80-column card: the Review class printer, the braille previewers, and printing to the 80-column screen. However, 80-column Echo line review is not available with the Apple II Plus--more details in Part 3.

80-column text cards are available for the Apple II Plus and the Apple IIe. In the Apple II Plus, the 80-column text card is installed in slot 3. (By the way, that's why *all* Apples address the 80-column card as if it were in slot 3--to maintain compatibility with software originally written for the II Plus.)

On the Apple IIe, you install an 80-column text card in the auxiliary slot. But because the card is addressed as if it were in slot 3, you can't use slot 3 for another card.

Instead of a *plain* 80-column text card, you can install an *extended 80-column card* in the Apple IIe auxiliary slot. This card provides two functions: 64K additional memory *plus* 80-column text display. BEX takes advantage of both functions; you now have a 128K Apple, and you don't have to bother with this Appendix.

Language card for Apple II Plus

The Apple II Plus starts out with 48K memory; you bring it up to 64K by installing a *language card* in slot zero. The 16K language card provides the memory used by TEXTALKER for Echo speech. Without a language card, BEX won't run at all--and tells you so when you try to boot it. Cards are

available for the Apple II Plus that add more memory than 16K, however, these cards are not compatible with BEX.

- ***Keyboard layout***

Finally, the Apple II Plus keyboard is quite different than any other Apple keyboard. Straight out of the box, the Apple II Plus keyboard can't produce lowercase letters or some punctuation. Some Apple II Plus owners took their computers to the dealer and obtained a *shift-key modification,* or shift-key mod for short. The shift-key mod allows the II Plus's shift key to make lowercase letters. Even without the shift-key mod, BEX lets you do lowercase data entry in the Editor--details in Part 3.

Besides capitalization, the Apple II Plus keyboard lacks the open-Apple and solid-Apple keys found on later models. The "fire" buttons on the game paddles or joystick correspond to the open-Apple and solid-Apple keys. You use the game paddle buttons to control large print screen display--details in Part 2.

2: 64K Limitations

There are six areas where BEX gets clunky when it doesn't have 64K auxiliary memory in which to strut its stuff. These problems occur with both an Apple II Plus and a 64K Apple IIe. In the order in which you encounter them, from Learner to User Levels, they are:

- 1. No large print scrolling
- 2. All Main Menu options require disk access
- 3. The Clipboard in the Editor is limited to 768 characters, and must be used within one Editor session
- 4. You can't press control-V in the Editor to view how material will be printed
- 5. An automatic procedure chapter invoked from disk can contain no more than 255 characters
- 6. BEX won't let you configure at the Master Level

Let's explore the complete ramifications of each of these.

- ***Large print screen flip***

BEX requires auxiliary memory to do true scrolling for large print. Therefore, when you have a 64K Apple, BEX uses *screen flip* instead. Screen flip lacks a true cursor. Screen flip requires action on your part whenever the screen fills with data. You use the open-Apple and solid-Apple keys to control screen flip. On an Apple II Plus, you must use the "fire" buttons on a joystick instead of the open-Apple and solid-Apple keys.

The open-Apple key controls *when* the next screen appears. The solid-Apple key controls whether the next screen appears manually or automatically. Every time you boot BEX, it starts out using manual screen flip. Each time the screen fills, BEX pauses, and the Apple speaker makes a low boop. Press the open-Apple key or fire button to see the next screen.

To change screen flip to automatic, you must hold down the solid-Apple key until you hear the boop, then release the solid- Apple key. Depress the solid-Apple key, then press at any Menu. As soon as you hear the boop, release the solid-Apple key. Now each screen of data stays for 1.5 seconds, and then automatically flips to the next.

To *temporarily* freeze the screen, depress the open-Apple key. When you release the open-Apple key, the automatic screen flip continues. You use the solid-Apple key again to toggle back to manual screen flip. Hold down the solid-Apple when the characters are being drawn, then let go.

Hint!

> Screen flip does not provide a cursor for large print screen display. When BEX is ready for your input, you see a colon or a question mark on the screen. That colon must be there before you can type characters. Sometimes this means you must flip to the next screen to get the colon.

- ***Disk access at the Main Menu***

With a 128K Apple, BEX copies the software for the Editor, Print, and Replace characters into auxiliary memory. When you press E, P, or R, you get the `Drive number or chapter name:` prompt almost instantaneously. With a 64K Apple, BEX must load these options from disk every time.

- ***The More Vulnerable 768-Character Clipboard***

User Level Section 5, Part 4 explains the clipboard, a floating page that's outside of any BEX chapter. In a 128K Apple, the clipboard is stored in auxiliary memory: it can contain up to 4096 characters. With a 64K Apple, the clipboard can only contain 768 characters. Since many BEX pages contain more than 768 characters, BEX won't let you press control-B X to exchange the contents of the clipboard and the current page.

In User Level Section 5, we state that the contents of the clipboard, while not saved on disk, are unaffected by any BEX action, including a warm reboot. This is not true with a 64K Apple. The memory used for the smaller 768-character clipboard is also used for printing, depending on the types of printers or braillers you have configured. You can edit several chapters in a row without affecting the clipboard, but as soon as you print chapters, the clipboard is gone. This same memory is also wiped clean when you reboot BEX without turning off the power.

- ***No View Mode in the Editor***

User Level Section 5, Part 5 explains the View Mode. You press control-V and your current BEX page is printed to the 80-column screen. View mode depends on auxiliary memory, so pressing control-V in a 64K Apple does nothing.

Master Level Issues

BEX won't let you configure at the Master Level when you only have 64K memory in your Apple. However, some Master Level features are actually *available* at the User Level; they're just not *documented* until the Master Level.

So there's a certain amount of "back-door" Master Level activities you can accomplish on a 64K Apple.

- ***All printing features work on 64K***

We made a special point of supporting all printing features in the 64K Apple. The best use of an Apple II Plus is to dedicate it to printing; use another, 128K Apple for all other BEX activities. Section 5 of the Master Level discusses printing features: the discretionary linebreak and hyphen, the sticky space and touching token, and the$$eX commands for class S - Specific printers. All these features work at Learner and User Levels as well as the Master Level. Read Section 5 to find out what to do, and then you can use any of the features described there with a 64K Apple.

- ***Contextual Replace***

Master Level Section 6 explains contextual Replace in detail, providing many samples of typing contextual changes directly following BEX's prompts. This feature is only available at the Master Level, so you won't be able to type contextual changes directly. However, Part 6 explains creating contextual transformation chapters in the Editor. Doing this requires diligent study, but it doesn't require 128K. You can specify a contextual transformation chapter by name at any Level. If you are able to create contextual transformation chapters in the Editor, then you can use this feature on a 64K Apple.

- ***Automatic procedure chapters limited to 255 or less characters***

Master Level Section 7 details creating automatic procedure chapters. With a 64K Apple, you cannot ask BEX to remember your keystrokes at the menus. However, Part 4 explains editing automatic procedure chapters. As with contextual Replace, if you can create your auto chapter in the Editor, you can take advantage of this Master Level feature when your Apple only has 64K. There is one limitation on auto chapters with a 64K Apple: they cannot exceed 255 characters in length.

3: BEX Limitations on the Apple II Plus

Although there are memory cards available that increase the Apple II Plus memory beyond 64K, they are not compatible with BEX. As far as BEX is concerned, an Apple II Plus is always a 64K Apple; all of the limitations enumerated in Part 2 apply to Apple II Plus owners. There are two further limitations on the Apple II Plus: its nonstandard keyboard and the TEXTALKER it requires for Echo speech.

- ***Apple II Plus Keyboard Issues***

Game paddles required for screen flip

The Apple II Plus keyboard does not have open- or solid-Apple keys. Pressing the buttons on joysticks or game paddles provides the same signal as pressing the open Apple and closed Apple keys. To control large print screen display on an Apple II Plus, you must use the buttons on joysticks or game paddles: you'll have to experiment to see which button is which.

- ***Arrowing***

Up and down arrows are only found on later keyboards. To move your cursor up and down lines in the Editor, use the control-character equivalents: up arrow is control-K and down arrow is control-J.

- ***Capitalization when configuring and at menus***

When you are configuring BEX, BEX is not yet in control of input. This means that the only characters you can type on the Apple II Plus keyboard are those supplied by the keyboard and/or shift key mod. Since the configuration dialogue requires all uppercase input, this is only problematic in relationship to automatic set-up sequences. If you don't have a shift-key mod, you can't

type lowercase letters in an automatic set-up sequence. The Apple II Plus keyboard does not have a delete key. To signal the end of an automatic set-up sequence, press caret.

At BEX menus, every key you press is interpreted as uppercase anyway, so the Apple II Plus keyboard does not present any problems.

- ***Apple II Plus keyboard in Editor***

If your Apple II Plus does *not* have the shift key modification, every letter you type in the Editor is interpreted as lowercase. You can change this by pressing the Escape key, abbreviated . For a single uppercase letter, press and then the appropriate letter. For an uppercase lock--equivalent to the Caps Lock on the IIe and IIc--press twice. To leave uppercase lock, press once more. Some punctuation characters are not provided on the Apple II Plus keyboard. To access them, enter control-X and a number from 1 to 9, as follows:

- control-X 0 - grave accent `
- control-X 1 - left bracket [
- control-X 2 - backslash \
- control-X 3 - delete character <Del>
- control-X 4 - caret ^
- control-X 5 - underbar _
- control-X 6 - left brace {
- control-X 7 - vertical bar |
- control-X 8 - right brace }
- control-X 9 - tilde ~
- control-X semicolon **;** - Type the control character in your text

When your Apple II Plus *does* have the shift-key mod, the shift key acts like a normal typewriter shift key to make uppercase characters. You don't have to use to get uppercase characters. Some punctuation (including at-sign and caret) are disabled to avoid conflict with uppercase letters. See the documentation accompanying your shift-key mod for further details.

The software that lets you create lowercase letters in the Editor occupies the memory used by the keyboard buffer in 128K Apples. Therefore, you don't

have a keyboard buffer in the Editor on an Apple II Plus. Whenever BEX is redrawing the screen in the Editor, any characters you type are lost.

Apple II Plus and TEXTALKER 1.3

As mentioned in Learner Level Section 10, speech output from the Echo synthesizer depends on the TEXTALKER software. Due to differences deep in the internal architecture of the Apple II Plus, more recent versions of TEXTALKER cause some problems. The TEXTALKER supplied on your BEX Boot side is the most recent version, 3.1.2 or later. The Echo commands we describe in Learner Level Section 10 and on the Quick Reference Card are relevant to version 3.1.2. Unfortunately, an earlier version, TEXTALKER 1.3, works better with the Apple II Plus. It's unfortunate because the earlier version lacks some nifty features.

- ***Copying the correct TEXTALKER to your BEX Disk***

When you boot BEX on an Apple II Plus, it checks the TEXTALKER version. When BEX finds TEXTALKER 3.1.2 or later, then BEX advises you to use FID to copy the earlier TEXTALKER from the BEXtras disk to your program disk. (More details on FID appear in User Level Section 13.) Here's how you do it:

- 1. Get to the Starting Menu. (Either establish a new configuration or enter the name of an existing configuration.)
- 2. Press F to use FID, a file-handling utility. As with BEX, you can press at FID's main prompt to get the list of choices.
- 3. Place your *working backup* BEX boot side in drive 1 and the *back* side of the BEXtras disk in drive 2.
- 4. At FID's `ENTER OPTION:` prompt, type `3` to check the free space on your BEX disk.
- 5. FID prompts for source slot and drive numbers. Unless you know that your disk controller card is somewhere else, your source slot is 6 and source drive is 1 for the BEX boot side. When there are at least 50 sectors free, jump ahead to step 7.
- 6. When there are less than 50 sectors free, you must delete files to make room. If you are sure you never want to use the SlotBuster, you can delete its software: the two files are named SCAT.TABLE and SCAT.LC and together they use 22 sectors. Most files on the boot side are *locked* to

prevent you from accidentally altering them; FID won't let you delete a locked file. Use FID's option 4 to unlock the files you've chosen to delete, then use option 6 to delete them. Once you have 50 sectors free, proceed to step 7.

- 7. At FID's main prompt, type `1` to copy files. The source slot and drive is 6, 2 for the BEXtras disk. The target slot and drive is 6, 1 for your BEX boot disk.
- 8. When FID prompts `FILENAME?` type `TEXT=`
- 9. When FID prompts `DO YOU WANT PROMPTING?` type `N`
- 10. FID copies two files from the BEXtras disk: TEXTALKER.PLUS and TEXTALKER.RAM.OBJ. The next time you boot BEX, you won't hear the lengthy suggestion to use FID.

Command syntax for TEXTALKER 1.3

Once you have copied TEXTALKER 1.3 to your BEX boot disk, you must issue commands correctly. As with later versions, all TEXTALKER 1.3 commands start with control-E. But all letters in the commands *must be* uppercase, and each command must finish with . (Later versions don't care about case, and you don't use at the end.)

BEX interprets every letter you type at the menus as uppercase, so capitalization is not a particular problem. However, you can't issue Echo commands whenever the Apple is waiting for input--you can only issue them at the top of the menu. You must complete each Echo command with .

- ***Commands in the Editor***

TEXTALKER 1.3 is less vigilant about grabbing your keystrokes. In the Editor, you must precede the Echo command with control-S. The control-S alerts BEX to send the Echo command that follows to TEXTALKER. When you don't have a shift-key mod, you must use in the Editor to make your command letters uppercase. For example, when you want the Echo in most punctuation mode, this is what you type in the Editor:

```
control-S control-E m
```

When you do have a shift-key mod, use the shift key to make your Echo command letters uppercase.

TEXTALKER 1.3 is Very Chatty

In Section 10, Part 6 we describe the *instant silence* feature for the Echo: when you press a key while the Echo is talking, the Echo shuts up and passes on the keystroke to BEX. This instant silence feature is not available with TEXTALKER 1.3, which means you either have to listen to the Echo talk a lot, or use control-X constantly to shut it up.

Here's what's going on: When the Echo is talking, TEXTALKER 1.3 takes over all keyboard input. When you press any key while the Echo is speaking, TEXTALKER holds on to that keystroke and does not pass it to the Apple. This means that, while the Echo is talking, you can't type any commands to BEX; TEXTALKER won't pass them over to BEX.

To temporarily disconnect TEXTALKER's control over input, press control-X. After you press control-X, there's a short pause while the Echo speaks silently. This "silent" speech continues until the next time the Apple is waiting for input. At this point, BEX gets whatever you type.

Line Review for TEXTALKER 1.3

Line review is significantly different with the earlier TEXTALKER. No 80-column line review is available, and you cannot use columnar review at all. After you press the letter of the line to read, you must press to actually hear it. Since the Apple II Plus doesn't have up and down arrow keys, you use semicolon to move up and slash to move down. When you use semicolon and slash to move between lines, you must press to actually hear the line.

And since TEXTALKER 1.3 doesn't have the instant silence feature, moving between lines in line review takes more time. You must press control-X to silence the current line, wait a few seconds, then press semicolon or slash to move to another line, then press to start reading it.

Finally, you cannot change the Echo's punctuation or speed inside line review. To change from letter to word mode and back, you must press T.

5 Resources

Peripherals Mentioned in BEX

Most hardware mentioned in the BEX Manuals is readily available through computer dealers. These adresses are those you might need while working out tricky interfaces.

- RAM Cards; Applied Engineering, Inc.; P.O. Box 798; Carrollton TX 75006; 214-241-6060.
- The Sider (hard disk) Series; First Class Peripherals; 3579 Highway 50 East; Carson City NV 89701; 1-800-538-1307.
- Grappler cards; Orange Micro, Inc.; 1400 N. Lakeview Avenue; Anaheim CA 92807; 1-800-223-8029.
- SlotBuster II; RC Systems, Inc.; 121 West Winesap Road; Bothell WA 98012; 206-672-6909.
- AmDOS 3.5 Operating System; RMS Software, Inc.; #210; 131 Water Street; Vancouver, BC V6B 4M3; CANADA; 604-681-3371

Audio Tape, Large Print, and Braille Publishers

The best starting place when hunting down a particular book is your local librarian, who can use NLS resources for book searches. Special education departments at schools and universities may have access to APH's CARL search system.

- American Printing House for the Blind; 1829 Frankfort Avenue, PO Box 6085; Louisville KY 40206; 502-895-2405; Publications: General Topics including Computers; Medium: Audio Tape, Braille, Large Print.
- Education Tape Recording for the Blind; 10234 South Kedzie Ave.; Evergreen Park IL 60642; 312-499-3666; Publications: Computer Books; Medium: Audio Tapes.
- Massachusetts Association for the Blind; 200 Ivy Street; Brookline MA 02146; 617-738-5110; Publications: General Topics including Computers; Medium: Audio Tape, Braille.
- National Braille Press, Inc.; 88 St. Stephen Street; Boston MA 02115; 617-266-6160; Publications: Beginner's Guides to Computers; Medium: Braille, Audio Tape, Print
- National Library Service for the Blind & Physically Handicapped; Library of Congress; Washington DC 20542; Call your local library for information; Publications: General Topics including Computers; Medium: Audio tape, Large Print, Braille.

- Recording for the Blind; 20 Roszel Road; Princeton NJ 08540; 1-800-221-4792; Publications: General Topics including Computers; Medium: Audio Tape

Periodicals for and by Visually Impaired Computer Users

- APPLE TALK; 3015 S. Tyler Street; Little Rock AR 72204; 501-666-6552 (6-9 PM, CST); Medium: Disk.
- BAUD; Microtalk; P.O. Box 6959; Louisville KY 40206; 502-955-8255; Medium: Audio Tape, Print, Disk.
- Raised Dot Computing Newsletter; Raised Dot Computing, Inc.; 408 South Baldwin Street; Madison WI 53703; 608-257-9595; Medium: Audio Tape, Large Print, Disk
- SENSUS; Sensory Aids Foundation; 399 Sherman Avenue, Suite 12; Palo Alto CA 94306; 415-329-0430; Medium: Audio Tape, Print.
- Smith-Kettlewell Technical File; Smith-Kettlewell Rehabilitation Engineering Center; 2232 Webster Street; San Francisco CA 94115; 415-561-1619; Medium: Braille, Large Print, Audio Tape.
- TACTIC; Clovernook Printing House for the Blind; 7000 Hamilton Avenue; Cincinnati OH 45231; 513-522-3860; Medium: Braille.
- Technical Innovations Bulletin; Innovative Rehabilitative Technologies, Inc.; 26699 Snell Lane; Los Altos Hills CA 94022; 415-948-8588; Medium: Audio Tape.
- Technology Update; Sensory Aids Foundation; 399 Sherman Avenue, Suite 12; Palo Alto CA 94306; 415-329-0430; Medium: Audio Tape, Print
- VersaNews; c/o David Goldstein; 87 Sanford Lane; Stamford CT 06905; 203-366-3300; Medium: VB Tape, VB II Disk, Print

National Organizations of Interest

This list is by no means inclusive. We provide these names so you can begin the process of hunting down information you need.

- ACB: American Council of the Blind; 1010 Vermont Avenue, N.W., Suite 1100; Washington DC 20005; 202-393-3666.
- AER: Alliance for Education & Rehabilitation of the Blind & Visually Impaired; 206 N. Washington St., Suite 320; Alexandria VA 22314; 703-548-1884.

- Access Unlimited--SPEECH Enterprises; P.O. Box 7986; Houston TX 77270; 713-461-0006.
- American Foundation for the Blind; National Technology Center; 15 West 16 Street; New York NY 10011; 212-620-2080.
- Apple Computer; Office of Special Education; National Special Education Alliance (NSEA); 20525 Mariani Avenue; Cupertino CA 95014; 408-996-1010
- Closing the Gap; P.O. Box 68; Henderson MN 56044; 612-248-3294.
- Council for Exceptional Children; 1920 Association Drive; Reston VA 22091; 703-620-3660.
- LINC Resources, Inc.; 3857 North High Street; Columbus OH 43214; 614-263-5462.
- NAPVI: National Association for Parents of the Visually Impaired; P.O. Box 180806; Austin TX 78718; 512-323-5710.
- NFB: National Federation of the Blind; 1800 Johnson Street; Baltimore MD 21230; 301-659-9314.
- NARIC: National Rehabilitation Information Center; 4407 Eighth St., N.E.; Washington DC 20017; 1-800-34-NARIC.
- TRACE Center; S-151 Waisman Center; 1500 Highland Avenue; Madison WI 53705; 608-262-6966
