Braille Technology Evaluation

David Andrews, Editor

International Braille and Technology
Center for the Blind

Braille Literacy: Training, Mentoring, and
Technical Services Program for Adults

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BRAILLE TECHNOLOGY EVALUATION
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International Braille

and Technology Center

for the Blind

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Note: In this document, commands, file names, etc., that would be entered on the computer keyboard, are segregated from surrounding text by angle brackets.

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ACKNOWLEDGEMENTS

Preface

The following evaluations of Braille-related technology were made by members of the Technology Evaluation Panel of the National Federation of the Blind, under the auspices of a cooperative effort with the American Printing House for the Blind (APH). This effort is supported by a Braille Literacy Training Grant to APH from the U. S. Department of Education, National Institute on Disability and Rehabilitation Research, with technical assistance from the International Braille and Technology Center for the Blind at the National Center for the Blind in Baltimore, Maryland. Each evaluation includes factual and descriptive information about the piece of hardware or software in question, as well as a discussion of its strengths and weaknesses. Further, there is also discussion of the product's applicability to Braille literacy training for adults.

All of the equipment and software reviewed is housed in the International Braille and Technology Center for the Blind. It is available for demonstration and evaluation. To make an appointment one may call (410) 659-9314.

Prices for the reviewed products are listed, but prospective purchasers should be aware that these prices will likely change. Also, products are discontinued and new products introduced to the market on a regular basis. This document has been prepared in loose-leaf form so that out-of-date reviews can be replaced by updated reviews as they become available.

Members of the Technology Evaluation Panel were as follows: Curtis Chong, Tim Cranmer, Mike Freeman, Steve Jacobson, Dr. Abraham Nemeth, Lloyd Rasmussen, and Jim Willows. They were assisted by David Andrews, Director of the International Braille and Technology Center for the Blind.

BRAILLE EMBOSSERS

The objective of this section is to provide information on all of the printers that are currently housed in the International Braille and Technology Center for the Blind. The Center has attempted to obtain representative models of as many known products as possible. Included is factual information as well as the overall evaluation of the Technology Panel for each unit. While prices are subject to change and could vary from those listed here, all of the printers listed are at the time of this writing available in the United States and may be inspected at the International Braille and Technology Center for the Blind. Unless otherwise stated, a paper size of 11 by 11.5 inches is assumed when stating figures for cells per line and lines per page.

Because of their cost, size, and speed, some of the printers (with respect to Braille the terms *printer* and *embosser* are used interchangeably) reviewed below are likely not to be used in literacy training situations. They are intended for medium- or high-volume Braille production facilities. However, there are many embossers which are appropriate for low-volume production by individuals. All embossers appear in order by their price (from highest to lowest).

Braillo 400S

Type: Interpoint printer
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue, City of
    Commerce, California 90040; (213) 723-9021
Price: $77,995
Lines per page: 26
Cells per line: 42
Speed: 400 characters per second
Size: 41 inches wide by 26.5 inches deep by 44 inches high
Weight: 528 pounds

Description: The Braillo 400S is a large floor-standing embosser. It looks somewhat like a squared-off refrigerator. The paper feeds in from the back to the front. There are metal shelves which attach to the back and front of the printer to handle the paper supply and collection.

There are L-shaped doors in the front and back of the printer which can be raised to expose the paper feed and printing mechanisms or lowered to reduce the sound level. There is a panel with 16 buttons on the front of the printer, plus the on/off switch. The buttons are used to set and control different functions of the machine. The printer keeps track of how many pages it has printed. This information and other messages are displayed on a small visual display, information from which is not available to blind persons. The machine runs on 220-volt current. A transformer which steps up 110-volt current is available.

Comments: This is a very large and heavy-duty printer. It prints interpoint Braille at approximately 1200 pages per hour. Users report it has been quite reliable. It seems a little noisy, but that is not a serious problem when one considers how much work it is doing. The Braille quality is very high.

Thiel BAX-10

Type: Interpoint printer
Manufacturer: Thiel GMBH of Germany
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road, Forest Hill,
    Maryland 21050; (410) 893-9333
Price: $55,000 approximately
Lines per page: 27
Cells per line: 42
Speed: 300 characters per second
Size: 29.5 inches wide by 27.5 inches deep by 52.5 inches high
Weight: 322 pounds

Description: The Thiel BAX-10 is a large high-speed interpoint embosser. The printing mechanism itself is not actually that big, but the unit comes in a large enclosure. There is a bottom cabinet which houses the electronics unit and a stack of fan-fold Braille paper, located behind two hinged doors. The top two-thirds of the BAX-10 is a second cabinet which houses the printing part of the unit. The front and top of this unit is a large plexiglass door which is hinged at the top rear and which swings up to provide access to the unit somewhat like opening the trunk of a car. The paper feeds up through slots in both cabinets, up the front of the embosser unit, and across the top and out the back of the sound enclosure. There are four buttons on the front of the embosser used to control different functions.

Comments: This printer has been available since the fall of 1991. It is large because it comes in a big sound enclosure. Even without this enclosure it is very quiet, and with the enclosure it is extraordinarily quiet. It produces good Braille and should be reliable. The printer comes with a MS-DOS-based setup program on disk. The program is not easy to use with speech access technology, and like the other Thiel printers, it can be a little confusing to set up initially. There are also attachments available which will burst and bind paper automatically. If noise is a problem, this is the quietest printer on the

market at any price.

Elekul-03

Type: Single-side printer
Manufacturer: Elbicon of Belgium
Address: N. V. Interpoint, Celestijnenlaan 48, B-3001
     Leuven-Heverlee, Belgium; Phone (32) 16 20 12 30
Price: $42,200
Lines per page: NA
Cells per line: 40
Speed: 300 characters per second

Description: In approach and looks this is the most unusual embosser in the International Braille and Technology Center for the Blind. It prints on a continuous roll of paper, cutting it off into individual pages as it goes. The roll of paper is housed at one end, below the body of the printer.

The whole unit is on wheels and is high, rectangular, and boxy. In the front of the machine is a hinged door that folds back and lies on the top of the unit. Underneath is a basket for catching pages as they come out. Control buttons and switches are housed on the right front side of the unit, and the paper is all the way in the back underneath. Below the paper-catching basket are the electronic components for the unit.

The whole printer is made of metal, and while some may regard its appearance as a little home-made, it is very solid. The designer has installed a number of interlocks and safety measures. For example, one cannot print while the lid of the printer is off. There are also chains around the back, held up by posts similar to those used for guide ropes in movie theaters. These are designed to keep the operator away from the large paper roll, perhaps excessive caution based upon the designer's having been warned about the possibilities of lawsuits in the United States.

Comments: This printer was designed and manufactured by a university professor from Belgium. Because it uses a continuous roll of paper, the lines per page figure is irrelevant. It can be adjusted anywhere from one line per page to a very large number. The printer can handle paper up to 11.5 inches wide; however, 40 cells is the most it can print on one line. The printer seems to be very heavily constructed and is intended as a high-volume production printer, running five to eight hours a day. It is not widely distributed in the U.S.; the International Braille and Technology Center for the Blind has the first. This is probably its major drawback. Blazie Engineering is considering representing the manufacturer but has not made a final decision. The designer reports that he is working on an interpoint model which will print up to 3,000 pages of Braille per hour.

Braillo 200

Type: Interpoint printer
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue, City of
        Commerce, California 90040; (213) 723-9021
Price: $37,995
Lines per page: 26
Cells per line: 42
Speed: 200 characters per second
Size: 34.5 inches wide by 26 inches deep by 23 inches high
Weight: 386 pounds

Description: The Braillo 200 is half the price and half the speed of its big brother, the Braillo 400S. Unlike the 400S it is a table-top unit, but the table had better be a strong one. Other than being smaller, it is similar in design and layout.

Comments: The Braillo 200 seems to be a good printer and a more reasonable alternative than the Braillo 400S if one needs a heavy-duty interpoint embosser for high-production situations. It is in use at a number of sites around the United States.

TED 600

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
    Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $37,500
Lines per page: 27
Cells per line: 42
Speed: Approximately 350 characters per second
Size: 25 inches wide by 28 inches deep by 43 inches high
Weight: 200 pounds approximately

Description: The TED 600 has been around for a number of years. It is housed in a large wooden cabinet. The paper sits on a shelf at the bottom. Above it is a door which is hinged on the left side. When opened, it reveals the mechanical and electronic innards of the embosser. The paper proceeds from underneath, up through the printer, and out the top of the cabinet through a narrow slot. It then folds over and goes across the top of the printer and down the back, where it is caught in a wire basket. There are six buttons and a small display on the front left of the unit, near the top.

Comments: This printer is based on somewhat older technology. Users have reported various problems with the printer. It has generally required frequent adjustments to its printing mechanism to keep it working. The company has improved it a good deal. However, the panel is cautious about recommending it to just anyone since for most people, the printer seems to require fairly regular adjustment by a knowledgeable technician. The Braille quality on the International Braille and Technology Center's unit is good.

Braille Express

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
     Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $18,750
Lines per page: 27
Cells per line: 44
Speed: 160 characters per second
Size: 19.75 inches wide by 15.5 inches deep by 7 inches high
Weight: 52 pounds

Description: The Braille Express, like most Enabling
Technologies printers, is designed with a cover and handle so it can be
easily moved. However, at 52 pounds, it probably isn't something a
user would want to do often.

The paper is loaded from the front of the machine. It goes
across the top, under the embossing mechanism and out the back.
The printer is equipped with both push and pull tractors. There is a
panel of 16 buttons at the right rear of the top of the machine. Most
of these keys are laid out like a calculator pad with a few extra keys
such as on-line/off-line, linefeed and form feed. The key layout and
most of the functions are identical to most ET printers, including the
Braille Express, Marathon, Book Maker, Romeo, and Juliet. Settings
are changed by entering sequences of numbers with the keys. If the
user works with them often they are fairly easy to remember;
otherwise, one has to look them up in the manual. This method of
control isn't as simple as some, but after initial setup most people will
not have to change things often.

Comments: This is a relatively new printer and is basically a fast
Braille BookMaker. The panel is aware of no major problems with it,
but reports are few. The quality of the Braille is good. It is
somewhat noisy, but quieter than the BookMaker.

Type: Single-side printer
Manufacturer: Resus of Holland
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue, City of
     Commerce, California 90040; (213) 723-9021
Price: $15,995
Lines per page: 27
Cells per line: 40
Speed: 140 characters per second
Size: 20.5 inches wide by 17.25 inches deep by 36 inches high
Weight: 93 pounds

Description: The Resus is a floor-standing model. The metal legs are built onto the printer. The paper sits on the floor underneath the machine and feeds in through the bottom. It comes out the front and goes across the top of the unit and down the back. The printer has three buttons on the front right side. These buttons take it on line and off line, and so on.

Comments: There are mixed reports on this printer, which isn't very widely used in the U.S. The panel is aware of no serious problems with the International Braille and Technology Center's unit during the last two and a half years or so, but there were some initial problems when it was placed into use. Other users have reported that it requires a good deal of initial adjustment. Overall, it produces good quality Braille, and operators seem to have no complaints. It is not especially noisy, but it does sound unusual, rather like a piece of farm machinery coming up to speed and working. The company indicates that it is most reliable when used continuously for longer runs of printing as opposed to many short documents where it starts and stops repeatedly.

Thiel Beta/X3

Type: Single-side printer
Manufacturer: Thiel GMBH
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road, Forest Hill,
      Maryland 21050; (410) 893-9333
Price: $12,000 approximately
Lines per page: 26
Cells per line: 42
Speed: 130 characters per second
Size: 16.25 inches wide by 22.25 inches deep by 5.75 inches high
Weight: 84 pounds

Description: Like a number of others, this embosser comes with a metal lid and has a handle. It can be moved, but it is heavy. The paper feeds in from the front and goes across the top of the printer. It is equipped with pull-type tractors. There are six buttons and a switch on the right front of the top of the unit. These are used to control the printer. There is a cut-out on the right side which contains the input cable connector, power cord and on/off switch which is actually a key the operator turns. The connection to a computer is made via serial port; there is no parallel connection.

Comments: This printer, which has been available since the mid-1980's, is generally considered to be very reliable. The International Braille and Technology Center for the Blind owns a number of them and considers them real workhorses. While they tend to be expensive to repair, they generally go and go and go. They are also relatively quiet units. The Braille quality is good. This unit, like all Thiel printers, can be a little confusing to set up. There is a dialogue of yes/no questions which is answered by pressing different buttons on the printer. The dialogue takes place in Braille. Some of the questions can be a little confusing until one gets the hang of the process.

Marathon

Type: Single-side printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
     Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $12,995
Lines per page: 27
Cells per line: 42
Speed: 200 characters per second
Size: 18 inches wide by 15.5 inches deep by 6 inches high
Weight: 65 pounds

Description: The Marathon looks similar to other Enabling Technologies embossers. It is a desk top unit equipped with a metal case and lid and a carrying handle. The paper feeds across the top from the front to the back. There are pull-type tractors. The keypad is in the top right corner along with a small visual display. There is also a knob for controlling the height of the Braille dots. This is Enabling Technologies' only printer with such a control. On most of their other machines one controls dot height with codes entered at the keypad. The power cord and the serial and parallel ports are located on the back of the unit.

Comments: There are a number of these printers at the National Center for the Blind in Baltimore, and success with them has been mixed. There are a couple that have been very good performers and at least one that has exhibited some problems. In fairness, it should be added that it was a very early production unit, and staff of Enabling Technologies feel that they have resolved its problems. Panel members also note some problems adjusting some units to the thinner Braille paper currently being used by many consumers. While the panel cannot recommend this printer without reservations, overall it is a good unit. It is a little noisy, but fast and a good bargain, relatively speaking. Finally, Enabling has been very willing to work toward resolving problems with this printer.

The Braille BookMaker

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
      Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $10,500
Lines per page: 27
Cells per line: 44
Speed interpoint: 80 characters per second
Speed single-sided: 50 characters per second
Size: 20 inches wide by 15.5 inches deep by 6.5 inches high
Weight: 52 pounds

Description: This unit has the fairly standard Enabling
Technologies design and layout. The top of the printer, which covers
the embossing mechanism, etc., is made out of a plastic-like material.
It is metal on some of the other units. Its layout and controls are
much the same as with other units. The impression control setting is
made by turning a small screw on the back. It is a little difficult to
get it right since the range of motion for the screw is fairly limited.
This is also true for the Braille Express.

Comments: This seems to be a reliable and well-made printer.
It is a little on the noisy side. It very occasionally rips the paper;
however, there is an adjustment that can take care of this problem.
The machine has both "push" and "pull" tractor feeds. It is most
reliable to use the pull tractors, but doing so wastes a sheet of paper at
the top of each printout. If one uses the push tractors, once the first
sheet has gone through, then both sets are engaged. There is some
risk of jamming when the first sheet is going through the emboss heads
and engaging the pull tractor, but once that is past, the user has the
advantages of the pull tractor without wasting a sheet of paper.

Everest

Type: Interpoint printer
Manufacturer: Index of Sweden
Importer: TeleSensory, Inc.
Address: TeleSensory Incorporated, 455 North Bernardo Avenue,
    Post Office Box 7455, Mountain View, California 94039-7455;
    (415) 960-0920
Price: $5,995
Lines per page: 26
Cells per line: 42
Speed: 100 characters per second
Size: 20 inches wide by 6.75 inches deep by 25 inches high
Weight: 25 pounds

Description: The Everest is not typical in its design. It is wide
and tall, and not very deep. The printer uses single sheets of paper
which are held in a paper feeder on the top of the unit. The paper
goes down through the printer and comes out the bottom where it
lands in a catch basket.

Along the front panel of the printer are a number of buttons
used to control and change settings on the printer. The power cord
and parallel cable connect to the back of the unit in plugs on one of
the legs or supports. The power switch is also located there.

Comments: This embosser prints on single sheets of paper held
in a sheet feeder at the top of the unit. The feeder holds from 100 to
150 sheets depending on the thickness of the paper. There have been
occasional jams from this sheet feeder. The embosser comes with a
stripped-down version of the Duxbury Braille translator in ROM.
There is also a printer driver for WordPerfect so that it is possible to
print directly from that program. While the quality of the translation
is very good, the formatting abilities of the software are rather limited.
It is suitable for quick Braille for personal use but would not be
satisfactory for production work. The importer rates the embosser at

100 characters per second. It would appear that this rating was measured while printing a single sheet of paper and does not include the time needed to change sheets. The unit also has a built-in speech synthesizer that vocalizes the buttons as they are pushed. The buttons also have Braille markings on them, although some of the Braille is oddly spaced. The speech is somewhat difficult to understand and is not as well-integrated as is the speech on the Braille Blazer. It also cannot be used as a separate speech synthesizer as can the Blazer. While this embosser seems to offer good value for the money, a number of questions still remain. This is a very new machine, and Index has had problems producing a workable interpoint printer in the past. As users have continued to work with the machine, paper jamming problems persist, on approximately one out of every three sheets or so. This has been verified by a TeleSensory representative who offers assurance that such experience is not typical. Typical or not, it does exist, and one would offer this caveat in recommending the printer at this time.

Ohtsuki BT-5000

Type: Single-side embosser (can produce Braille and print, Braille only, or print only

Manufacturer: Ohtsuki Printer Company of Japan

Importer: American Thermoform Corp.

Address: American Thermoform Corp., 2311 Travers Avenue, City of Commerce, California 90040; (213) 723-9021

Price: $4,695

Lines per page: (Braille and print) 20

Cells per line: (Braille and print) 42

Lines per page: (Braille only) 25

Cells per page: (Braille only) 42

Lines per page: (print only) 58

Characters per line: (print only) 105

Speed: (Braille and print) 8 characters per second

Speed: (Braille only) 13 characters per second

Speed: (print only) 40 characters per second

Size: 20.5 inches wide by 11.5 inches deep by 5 inches high

Weight: 45 pounds

Description: The Ohtsuki looks somewhat more like a conventional ink-print printer than most of the other embossers. There are three buttons on the front panel used for control. There is a plastic and metal flap on the top front of the unit which when opened reveals the printing mechanism. The power cord, on/off switch, and serial and parallel ports are on the back. The paper also feeds in through the back of the unit and circles around the roller and printing mechanism. It then comes out the back again, just above where it goes in. The printer uses a special continuous form paper which is slightly thinner than normal Braille paper. The paper is sold by American Thermoform and is a little on the expensive side.

Comments: This printer is very slow when producing Braille and print. It is suggested that one use special paper which is slightly lighter than normal Braille paper. The printer also uses a friction feed

feed system which occasionally slips and/or jams. Since the paper
exits near where it enters the machine, it can go back inside the
printer causing a loop and jamming the paper. This was observed at
least once during evaluation, and the repairs cost some $350. The
print is produced by "back translating" the Braille code. The back
translator is somewhat inaccurate, and there is little evidence that this
shortcoming has been addressed. This printer should only be
considered where it is necessary to produce print and Braille on the
same page. It is not a good candidate for Braille production only.

Juliet

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
    Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $3,995
Speed: 40 to 56 characters per second
Size: 24.75 inches wide by 11.5 inches deep by 9 inches high
Weight: 50 pounds

Description: This embosser has a different design from that of
previous Enabling Technologies units. It is a desktop unit, not
designed as a portable or movable printer. Enabling Technologies says
that the design is to make the unit quieter than previous models. The
embosser has a rectangular base with a hinged lid above it. The lid
covers about two-thirds of the top surface. It is filled with acoustic
foam and when raised reveals the printing mechanism cover and the
standard Enabling Technologies control pad.

The Juliet is equipped with push-type tractors. While this avoids
wasting a sheet at the top of each printout, it is not as reliable in
getting the first sheet through the printer. Further, push tractors are
not considered to be as reliable by the printer industry, but many
people bemoan the blank sheet at the top of each printout. Many
users simply save them for use in Braille writers and prefer the
reliability of the pull-type tractors. It is the panel's understanding
that Enabling Technologies has added a single-sheet option to the
Juliet. Only one member of the panel has seen this arrangement yet,
but the manufacturer indicates there will be a new unit soon.

Comments: This is the newest machine from Enabling
Technologies. It is reportedly based on Romeo technology, so it should
be reliable. The Juliet is quieter than the Romeo and other Enabling
Technologies printers. The Braille quality is good. The embosser
prints one line per second, regardless of the number of characters on

the line, so the actual characters per second rating will depend on the lengths of lines. The Juliet will handle paper up to 15 inches wide. All in all this appears to be a very good machine, and it is expected to dominate its end of the market. It is the least expensive interpoint printer at this time.

Braillo Comet

Type: Single-side embosser
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue, City of
    Commerce, California 90040; (213) 723-9021 Price: $3,795
Lines per page: 26
Cells per line: 40
Speed: 75 to 50 characters per second
Size: 22.5 inches wide by 14 inches deep by 4.5 inches high
Weight: 45 pounds

Description: The Braillo Comet looks something like a number of printers. The paper feeds from the front, across the top, and off the back of the machine. The unit has pull-type tractor feeds. There are seven switches in the upper right corner which control different functions. The back panel contains serial and parallel connections, an on/off switch, and power cord.

The Comet will print at either 50 or 75 characters per second. It is presumed that the slower speed offers higher quality printing and less noise, although there is not a great difference in the quality.

Comments: The Comet replaces the Braillo 90. It has two speed settings, a graphics mode and the ability to print sideways, among other things. The Braille quality on the initial units was somewhat better then the previous model, the Braillo 90, but still not the best Braille around. The dots were a little dim and not consistent in their height. The printer strikes into a rubber matrix rather than a metal matrix like that most other printers use. Thus the dots are not as pronounced or as well-formed. However, an updated model was on display at a recent technology conference, and the Braille was much improved. The dots were better formed, not dim, and of consistent quality. American Thermoform Corporation (ATC) is supposed to update the machine evaluated, which is a little noisy, in the near future.

Romeo RB-40

Type: Single-side embosser
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
      Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $3,795
Lines per page: 27
Cells per line: 42
Speed: 40 characters per second
Size: 20.5 inches wide by 13 inches deep by 5 inches high
Weight: 30 pounds

Description: The Romeo is fairly standard in its configuration. The early models were housed in a metal case, with a metal lid and handle for transportation. The current model has a plastic housing. The paper feeds in from the front, across the top, under the embossing bar, and off the back. The control pad, on/off switch, power cord, and serial and parallel ports are all located on the top face of the printer, on the right side. There is a roller on the left side, making manual paper adjustment easy. The Romeo has pull-type tractors.

Comments: This seems to be a well-made and reliable printer. The company has worked hard at improving its image and service reputation, with some apparent success. The controls are not quite as simple to use as the VersaPoint, its main competitor; however, most of them are seldom used anyway. This printer has developed a reputation for being a real workhorse in its class. The Braille quality is good. The unit comes with a lid, and has a handle, so it can be relatively easily moved.

The embossing bar is held in place by two knurled nuts. If users wish to print graphics, they must remove the two nuts and flip over the bar. Further adjusting the printer for a different thickness of paper requires removing the bar and adding or removing little shims or spacers underneath. While not difficult, both these operations are

somewhat inconvenient. Newer printers make these adjustments much easier. Most printers, including the Juliet from Enabling Technologies, can go into a graphics mode with a software command.

VersaPoint

Type: Single-side embosser
Manufacturer: Telesensory Systems, Inc.
Address: TeleSensory Systems Incorporated, 455 North Bernardo
     Avenue, Post Office Box 7455, Mountain View, California
     94039-7455; (415) 960-0920
Price: $3,795
Lines per page: 26
Cells per line: 42
Speed: 40 characters per second
Size: 19.5 inches wide by 16 inches deep by 7.5 inches high
Weight: 39 pounds

Description: The VersaPoint is a desktop printer. The paper
feeds in through the front, under a cover which is about two and a
half inches high. It goes across the top of the printer and off the
back. Serial and parallel connections are on the right side of the unit,
and the power cord and on/off switch are on the back. There are four
buttons, three switches, and a dial in the upper right-hand corner.
The knob is for impression control. The buttons and switches are used
for form feed, line feed, on-line/off-line, etc. These controls are well
marked in Braille and very easy to use. One nice touch is that it is
possible to switch between serial and parallel input with the flip of a
switch.

Comments: This printer has improved with each new model.
The latest model, Model D, is quieter and has improved controls which
are quite easy to use. This printer comes with a "push tractor feed
mechanism" which means that it does not waste a sheet of paper at the
top of each printout. However, in general, the printer industry does
not consider this type of arrangement to be as reliable as pull-type
tractor feeds for unattended operation. A push-type tractor feed is
more prone to paper jams, and there are reports of this with the
VersaPoint. It is also necessary to remove the embossing head cover to
check paper position. It is not hinged (it just sits on top), so once it is

taken off, a place must be found to put it down somewhere. This arrangement can be annoying. All in all, setting top of form on this printer is also on the annoying side. The quality of the Braille is good.

Index Basic

Type: Single-side embosser
Manufacturer: Index of Sweden
Dealer: Young Opportunities
Address: Young Opportunities, Inc., 464 Sylvania Avenue, Glenside,
    PA 19038; (215) 572-5882
Price: $2,995
Lines per page: 26
Cells per line: 40
Speed: 50 characters per second
Size: 20 inches wide by 11.75 inches deep by 7.5 inches high
Weight: 14 pounds

Description: The Index Basic is somewhat lighter and smaller than competing printers. As with most, the paper is fed from the front to the back, across the top of the unit. There are four switches and an impression control knob on the top plate of the printer in the rear left corner. There are a serial and parallel port, on/off switch, and power cord on the back.

Comments: This printer is quieter than most. While it is a good bargain, service remains the unknown. It has a new distributor, and the previous distributor has said that there were some reliability problems with it. The panel has been unable to determine the nature of the problems. The Index has changed importers once again, and in fact it is uncertain who is the official importer at this time since there is litigation involved. It is still available in the U.S., but details are unclear. There appear to be a number of people selling the printer, and they are getting it wherever they can. Overall the Braille quality is rather good. While not the absolute best, it is quite readable; and the printer represents a good bargain for the money.

Romeo RB-20

Type: Single-side embosser
Manufacturer: Enabling Technologies
Address: Enabling Technologies Company, 3102 Southeast Jay Street,
     Stuart, Florida 34997; (703) 683-5818 or (407) 283-4817
Price: $2,995
Lines per page: 27
Cells per line: 42
Size: 20.5 inches wide by 13 inches deep by 5 inches high
Speed: 20 characters per second
Weight: 27 pounds

Description: This embosser is virtually identical to the Romeo RB-40. See above for information.

Comments: The performance of this embosser is virtually identical to that of the Romeo RB-40 except that it prints at half the speed.

Mountbatten Brailler

Type: Single-side printer, electronic Braille writer, and notetaker
Manufacturer: Quantum Technologies
Importer: HumanWare, Inc.
Address: HumanWare, Inc., 6245 King Road, Loomis, California
    95650; (916) 652-7253 or (800) 722-3393
Price: $2,595 to $3,250
Lines per page: 26
Cells per line: 40
Speed: 8 characters per second
Size: 17.5 inches wide by 9 inches deep and 3.5 inches high
Weight: 10.75 pounds

Description: The Mountbatten is fundamentally an electronic Braille writer which can also work as an electronic note-taker similar to a Braille 'n Speak or a BrailleMate. The unit also has the capacity to back- and forward-translate Braille and transfer files to and from a PC. Finally, it can also be used with a regular computer keyboard to produce Grade 2 Braille.

The Mountbatten Brailler is approximately seventeen and a half inches wide by nine inches deep by three and a half inches high. It weighs ten and three quarters pounds and can run on its built-in batteries. According to its manufacturer, it can print approximately thirty pages of Braille while battery-operated. When used as an electronic note-taker, without printing, it will operate for approximately sixteen hours. It has a carrying handle that slides out of the front of the machine and a plastic snap-on cover which protects the embossing area. However, it does not have a full carrying case.

The feel of the keyboard is more similar to a computer's than to a Perkins Braille writer's. The keys are quiet and don't require much pressure. This would offer advantages to a young child or a person with physical weakness in the hands or arms. The keys differ from those of a Perkins Braille writer in their placement and layout. The

regular Brailling keys (Dots one, two, three, four, five, and six) are not lined up straight across the machine but are arranged in a shallow V shape. It does take some getting used to. The producer maintains that this layout keeps the user from twisting and therefore possibly injuring the hands and wrists. This may be true, but the position does not seem inherently more comfortable. Perhaps being very familiar with the keyboard of the Perkins makes this one take a good deal of getting used to.

There is a small round key located between the two sets of three Brailling keys, but this is not the space bar. It is the Command Key, used in conjunction with other keys to issue commands. The space bar and the line space keys are located in the middle, below the Brailling keys. For those used to the Perkins keyboard, this also takes a good deal of adjustment. Most people likely would prefer the space bar in the more traditional, higher location. However, the apparent rationale is that with the lower placement the user can hit the space bar or line space keys easily with the thumbs while Brailling. The machine can produce either six- or eight-dot Braille. There are two extra keys with which to produce dots seven and eight. The machine also has the capacity to switch to a wide variety of foreign language Braille codes and keyboard layouts.

The Mountbatten Brailler can be set so that it automatically goes to the beginning of a new line when the user Brailles to the end of the current line. The embossing mechanism prints at about eight characters per second. A good Braillist can write faster than that, but the machine is able to buffer the characters and doesn't seem to drop any. When Brailling, the Mountbatten is a little on the noisy side; it makes a sharp clacking sound. This could be a disadvantage in a classroom. The machine is grey, black, yellow, and blue in color. The body is grey, and the keys are black or blue. The area under the keys and some other parts are yellow.

The Mountbatten Brailler uses single sheets of Braille paper. It can handle a variety of thicknesses and sizes, and it adjusts to new

paper automatically. Loading paper is a little tricky. The sheet must be all the way to the left, or the machine will not operate at all. It does not automatically position the paper for Brailling on the first line. The user must position the paper by hand so that the first line appears where he or she wishes. This is a little awkward because, if one is not careful, the paper will become crooked. The paper insertion is tricky enough to constitute a problem for small children, one of the target audiences for this device.

Most people will use the Mountbatten Brailler as an electronic Braille writer. It does aid in correcting mistakes. The user can rub out an incorrect character and replace it with the right letter. There are actually two ways to correct a mistake: have the machine rub out the bad cell by pressing the space and backspace keys simultaneously or replace the wrong letter with the proper one by pressing the new letter while pressing the backspace key. Though convenient, this method does not erase the dots as completely as the first.

Commands for the Mountbatten Brailler are issued from the keyboard. In general the user first presses the Command Key, then types in the command and terminates input by pressing the Margin Release key, located on the right side of the machine. While there are a large number of commands, most of them are logical words or mnemonic abbreviations for words or phrases. As an electronic Braille Writer, note-taker, printer, and translator the Mountbatten has a full complement of easy-to-use features. It is also possible to move text to and from a computer and do basic page formatting.

A good manual in Braille is provided with the machine. Interestingly enough, the International Braille and Technology Center for the Blind has received a number of very expensive Braille devices without Braille manuals or with totally inadequate manuals. The Mountbatten manual is divided into several volumes. Each is self-contained, and users can tackle a new one as they need the features it offers. There are, for example, a basic manual, an advanced manual, and manuals for forward- and back-translation. The manuals are well

written and easy to understand. There are also instructions for using the Mountbatten with other devices such as the Braille 'n Speak and the Eureka A4.

The Mountbatten Brailler comes in two models. The Mountbatten Brailler Standard has 32K of memory, which will hold approximately thirty-five to forty pages of text. It costs $2,595. The Mountbatten Brailler Educational Package, which costs $3,295, has additional memory (160K) and comes with forward and reverse Braille translation software and an interface box. This version has serial and parallel ports and a connector for a standard computer keyboard. The interface faculties greatly amplify the power of the Mountbatten, facilitating its connection to other computers, Braille or ink-print printers, or regular keyboards. With a keyboard and the Braille translation software, a sighted person who knows little or nothing about Braille can enter text into the machine and produce relatively well-formatted Grade II Braille. This would be particularly useful in public schools. The Basic model does come with one serial port and an external keyboard connector. However, the Educational model is needed to get a second serial port and a parallel port. In fact, it has two parallel ports.

Comments: Everyone has heard the definition of a camel as a horse designed by a committee. Though it may be stretching a point, in some ways the Mountbatten Brailler strikes the panel as a Braille writer designed by a technology committee, every member of which had individual notions of what was essential. All in all, however, the Mountbatten Brailler does accomplish what it sets out to do. It can perform a variety of functions and is a compact and portable unit. However, if a user is just looking for a Braille printer, the Braille Blazer is faster and cheaper. If one seeks merely an electronic note-taker, both the Braille 'n Speak and the BrailleMate are more powerful, smaller, and cheaper. If a person wants an electronic Braille writer, then the Mountbatten is worth considering, although it is on the expensive side. It appears that this device is best suited for an individual or school that could use a number of its functions. It would

then be much easier to justify the steep cost. Nevertheless, for what it costs to purchase the Mountbatten Educational Package, one could purchase a Braille Blazer, a Blazie disk drive, and a standard Braille 'n Speak. While not a compact, one-piece unit, each of the Blazie components is better or more powerful then the comparable features in the Mountbatten, and the disk drive gives one the ability to store unlimited numbers of files.

When asked how the multi-colored machine looked, one sighted person consulted responded succinctly, "It looks like something from Fisher-Price." [a prominent toy manufacturer] This high-contrast color scheme is intended to aid the visually impaired. The feature holds no great appeal for most who have seen it, but it may be of assistance to some. One fails to understand, however, what advantage is gained by watching the Brailling keys. The real objection is that such a color design is not typical of machines used in business and would draw more attention to the equipment than one would wish it to receive.

Porta-Thiel

Type: Single-side embosser
Manufacturer: Thiel GMBH
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road, Forest Hill,
    Maryland 21050; (410) 893-9333
Price: $1,895
Lines per page: 27
Cells per line: 32
Speed: 10 characters per second
Size: 15.25 inches wide by 14 inches deep by 3.5 inches high
Weight: 11 pounds 2 ounces

Description: The Porta-Thiel is a low, flat printer. The paper goes in the front and comes out the back. Extending from the back of the printer is a flat platform called the "reading table." This provides a flat surface to read on as paper emerges from the printer. The controls and connections for the printer are located on the sides. The printer rests in part on a bar which extends from the back of the printer on two supports. This bar can also be used as a handle.

On the left end is one button, a DIN connector for a keyboard, and a parallel connector. On the right end are two buttons, a serial connector, and the power cord. Commands are issued by pressing one or more of the three buttons.

Comments: This is the newest entry from Thiel. It is a small, lightweight unit. It uses a friction feed system and can accept single sheets or continuous form paper. If the continuous paper is used, the tractor feed strips should be left on because the device uses them in the paper sensing process. The Braille quality is good but not exceptional. The unit is also on the slow side and like its big brothers can be a little tricky to set up.

The setup dialogue is conducted in Braille. There is a series of

yes/no questions, which aren't always clear. If one answers wrong, the dialogue ends and must be started over again. It takes many people a number of tries to get it right. The printer has a little rubber pointer that sticks out from the embossing mechanism, which is covered up by the top case of the printer. When the user makes choices in the setup dialogue, they are printed, and the pointer is then placed on the first one. One of the control buttons is used to move the pointer to the choice desired. It is a rather ingenious system.

The machine does offer the ability to print jumbo Braille, which may be of interest to some. This could be of use in adult literacy teaching situations. The Porta-Thiel also has built-in speech, but it is not used very effectively. It signals when the unit is ready or a few error conditions exist but little else. The machine seems to be well-built, and Thiel has a reputation for reliability. However, for less money the Braille Blazer offers more features, better Braille, and a faster speed. Thiel is reportedly going to modify the unit so it will print up to a 40-cell line and is also supposed to be working on an interpoint model. With these considerations the embosser warrants watching.

Braille Blazer

Type: Single-side embosser
Manufacturer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road, Forest Hill,
    Maryland 21050; (410) 893-9333
Price: $1,695
Lines per page: 27
Cells per line: 34
Speed: 15 characters per second
Size: 14.75 inches wide by 9.5 inches deep by 5 inches high
Weight: 14 pounds 5 ounces

Description: The Blazer is a small, portable unit. It is housed in
a plastic case. The paper feeds from the front, across the top, and off
the back. There is a dust cover that hinges at the back and covers the
tractor feeds, which are pull-type, and the embossing bar. The cover
also reduces the noise and holds the paper flat as it enters the printer.
There are three buttons on the right side of the unit and a rocker
switch on the left. The buttons control the functions of the printer as
well as walk the user through a set of menus, used for setting
parameters. The rocker switch moves both ways, forward and
backward, and advances the paper in the direction it is pushed. The
Braille Blazer's back panel contains serial and parallel ports, power
switch, electrical cord, and a handle.

The Braille Blazer has a built-in speech synthesizer. In fact, the
unit can be used as a fully functional synthesizer in conjunction with a
screen review program. It emulates a Braille 'n Speak in this mode.
The synthesizer also voices all button pushes and menus. It is totally
possible to set up the printer using speech. In fact, if one knows a
little about printers and what the three buttons do, it may not be
necessary to read the manual at all.

Comments: This is only one of two printers that will not use 11
by 11.5-inch paper. The maximum size it will handle is 8.5 by 11

inches. It is relatively quiet and produces very high quality and consistent Braille. This is a very good personal use printer, but it isn't intended for production situations. It would also be satisfactory for low-volume institutional or business use. This is also probably the best printer for a beginner or new Braille user because of its relatively low cost and ease of use.

BRAILLE TRANSLATORS

Following are reviews of all the major Braille translation programs currently available in the United States. With one exception, the reviewed programs all run on IBM or compatible computers. One program, the Duxbury Braille Translator, also has a version for the MacIntosh, and one other, the Ransley Braille Interface, is hardware-based and will work with a variety of computers. The panel has stuck to the IBM and compatible varieties for two reasons. First, this is where the majority of the development is going on and secondly these computers are the ones used by most blind adults.

One point of comparison that was used in examining translators is that of speed of translation. Unless every translator is installed on the same computer and the same document used with each, an absolute comparison is difficult. The broad-based experience of the staff and volunteers associated with the International Braille and Technology Center for the Blind was used to give some meaning to this comparison without setting up an elaborate testing procedure.

The applicability of each translation system to adult literacy training is not specifically discussed. However, each review gives enough information about the features, strengths and weaknesses of each system that anyone reading them should be able to pick out the best product that meets his/her needs, budget etc. Any of these products could be used in training situations and could be made a part of a Braille or computer training sequence.

Auto Braille

Type of system (hardware or software): Software
Name of vendor or manufacturer: KANSYS, Inc.
Address: 1016 Ohio Street, Lawrence, KS 66044; (800) 279-4880 or
(913) 843-0351
Price: $295 (currently bundled with Turbo Braille)
Computer for which software is written: IBM and compatible
computers
Operating system under which software can run (e.g., DOS, Windows,
etc.): PC/MS-DOS

Description: Auto Braille is a memory-resident translator and
the only product of its type which is available as a stand-alone. The
program is run before any other application, and it intercepts,
translates, and formats output as it is sent to a printer. This allows
printing in Braille as one would in print.

Speed of translation process: This is dependent on the computer
but is somewhat slower than with some translators. Translation is
going on in the background and is somewhat dependent on the speed
at which the application being used processes and sends data to the
printer.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
Auto Braille does not normally use source files, although one could
send an ASCII file to it. It is a memory-resident Braille translator.
That is, the software is loaded before running another application such
as WordPerfect. Then when output of that application is directed to a
printer, Auto Braille intercepts it, does translation of the data stream,
formats it, and sends it on to the printer. It is not necessary to exit
the application to print in Braille. Auto Braille has a variety of input
options. It can receive data from a serial or parallel port or take it
from a text window on the screen. This output can then be directed to

a variety of output options.

Method for fixing Braille translation errors: The user is unable
to fix translation errors.

Strengths: Auto Braille enables a user to print Braille from
within another application. To print one turns it on with a hot key,
normally Alt-3, and prints data as with an ink-print printer. Auto
Braille can be loaded into expanded memory, so it takes up little
conventional memory. Options are easily changed when the program
is loaded or at any time using a utility program called Auto Braille
Commander "ABC." ABC is entered on the command line with the
options it is desired to change. The program offers a variety of input
and output options.

Once installed and configured, Auto Braille is easy to use. This
should make it easy for beginners to get Grade 2 Braille out of their
application programs without a lot of fuss.

Weaknesses: The major weakness of Auto Braille at this time is
poor formatting. It does minimal formatting, and the user isn't able
to exercise that much control. The author reports that he is in the
process of making major changes to the program, which should
improve formatting capabilities. In theory the program should format
Braille as well as the Turbo Braille program, which is written and
marketed by the same company. While not perfect, Turbo Braille in
general formats well. However, at this time Auto Braille could only be
used for personal use Braille. If and when it is upgraded, however, it
will be as much translator as most people will need for personal use.

Output options supported (e.g., can output be directed to a file,
screen, paper in ink-print, specific embossers supported, etc.): The
output of Auto Braille can be directed to a parallel port, serial port, or
a "Braille Window" on the computer screen. With the output directed
to the screen, this means that a Braille display could receive real-time
Grade 2 Braille translation for display.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Auto Braille does not use Word processor codes directly. It intercepts ASCII output intended for printing and uses this information to perform formatting tasks. In its present version this ability is weak. Centering, page numbering and running headers are not supported. Further, line breaks and paragraphs are not always correct. It is hoped that this will be corrected in a future version. The user could format the source text in such a way that the desired output would be achieved; however, this would be a trial-and-error proposition. Auto Braille is best suited for quick Braille for personal use.

Mechanism/command structure for controlling format of Braille output: There are not any specific embedded commands to control formatting. The Auto Braille Commander has commands to set page length, page offset (a margin for binding), and a few other characteristics of the Braille page.

Memory requirements: Auto Braille takes 48K of conventional memory. However if expanded memory is available, it will use that. When using expanded memory Auto Braille occupies 2K of conventional memory and 48K of expanded memory.

Ability to support output to a Braille display as opposed to hard copy: Auto Braille has a variety of input and output options. As mentioned earlier, output can be sent to a parallel port, a serial port, or a pre-defined window on the screen. There are also memory-resident programs available that will intercept output sent to a serial or parallel port and save it as a file. Using one of these options, Auto Braille will support virtually any output device.

Braille Talk

Type of system (hardware or software): Software
Name of vendor or manufacturer: GW Micro
Address: GW Micro, 310 Racquet Drive, Fort Wayne, Indiana 46825;
 (219) 483-3625
Price: $195
Computer for which software is written: Apple II, IBM PC's and
 Compatibles
Operating system under which software can run (e.g., DOS, Windows,
 etc.): PC/MS-DOS

Description: BrailleTalk is a simple, menu-driven Braille
translator. It is easy to use but somewhat limited in its features and
potential.

Speed of translation process: The MS-DOS version was tested.
Like all others, speed is dependent on the computer. The translation
speed of Braille Talk seems to be slightly above average.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
ASCII only

Method for fixing braille translation errors: The user can create
an exceptions file. This file contains three items: the incorrect word,
how it should be written, and the number of the rule to apply. There
is a set of rules which govern when the exception should be applied,
for example, always if it occurs in a certain part of the word, etc. In
the second entry, the corrected word, the user must know the ASCII
character that the printer expects to produce the desired Braille
symbol, for example 1 for ea.

Strengths: Braille Talk is an easy-to-use menu-driven program.
The user can practically use it without the manual, and even reading

the manual only takes another half hour. The program will also support a variety of speech synthesizers even without a screen review program.

Weaknesses: Although the program is simple and inexpensive, it has little else going for it. In informal tests the panel found it to be the least accurate of all the available translators currently on the market. Further, it has very limited formatting possibilities and capabilities. It prematurely ends lines with fair regularity and occasionally skips too many blank lines. It also will center lines if they are preceded by at least ten spaces. This action could cause false centering in some cases and uncentered lines in others. Braille Talk has not been upgraded in some time and has not kept up with the times. The PC program is essentially a port of the Apple II program and doesn't utilize the additional power of the PC.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be directed to either a file or Braille embosser. There are no other options.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Braille Talk only accepts ASCII files as input. It does not use codes from WordPerfect or other programs. It gets its formatting information from the ASCII file, which is somewhat inaccurate at best.

Mechanism/command structure for controlling format of Braille output: Braille Talk has a few embedded commands, but not many. They include commands to set tabs, control the level or grade of translation, center lines, advance to a new page, and indent subsequent pages. These are the only formatting commands offered.

Memory requirements: 128K

Ability to support output to a Braille display as opposed to hard

copy: Not supported

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Duxbury Braille Translator

Type of system (hardware or software): Software

Name of vendor or manufacturer: Duxbury Systems, Inc.

Address: Duxbury Systems, Inc., 435 King Street, Post Office Box
1504, Littleton, Massachusetts 01460; (508) 486-9766

Price: $495

Computer for which software is written: The software reviewed runs
on IBM compatibles. Other versions exist for the Apple
MacIntosh, VersaBraille II, Navigator, CP/M, and some
minicomputers.

Operating system under which software can run (e.g., DOS, Windows,
etc.): This set of programs runs under DOS and has a text
interface.

Description: The Duxbury Braille Translator is widely used and
has become the standard against which others are measured. It is as
accurate as any translator, full-featured and complex if one delves into
all its possibilities.

Speed of translation process: Speeds are approximately those
logged for DUXWP, when running from a WordPerfect file to
formatted Braille. Translation takes about 50% of the time, with WP
to TXT taking 25% and unformatted to formatted Braille taking
another 25%. In all cases, this program runs a file through one
process, then runs that file through another process, and so on. Thus,
when one goes from WordPerfect to formatted Braille, two
intermediate files have been created, processed, then deleted when no
longer needed. This is why it is so slow when it is run while logged
onto a floppy drive.

Capacity for back translation: By running the appropriate batch
files, Braille files can be back-translated. If they contain formatting
commands that begin with vertical bar symbols, formatted print can
be created. A range of controls and tricks can be used to correct
mistakes and ambiguities in the back translation process. On the IBM

version, it would be difficult to produce print enhancements such as boldfacing, underlining, and changes of print size without loading the file into a word processor for final touch-up. Until one gets accustomed to the back translation process, documents should be proofread carefully.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): The Duxbury Braille Translator accepts source files in ASCII or in WordPerfect 5.0, 5.1, and 6.0 formats. For best results, the user should try to get a properly coded WordPerfect file for input.

Method for fixing Braille translation errors: Although translation errors can often be corrected in a WordPerfect or page-image file, the greatest control can be achieved when working on a TXT file. This is an ASCII, untranslated file containing formatting and translation control codes.

(Note: The braille character having dots 1-2-4-6, the dollar sign in the Computer Braille Code, is the initial character in the Duxbury format control codes that follow.)

It looks like an ordinary text file, but is sprinkled with codes such as <$p> for new paragraph, <$l> for new line, <$hds ... $hde> around a centered heading, <$cbi> to go into Computer Braille Code with the CBC indicator sign, or <$d> to produce the next word in direct Braille. The length of lines is not important, but any line ending with a hyphen in the original text should have two in the TXT version. Dollar signs that are not to be acted upon by the program should be doubled.

Some people using the program with a Braille display prefer to work with the BRU file, a translated version containing Grade 2 Braille, interspersed with <|p>, <|l>, and other formatting commands.

Strengths: This translator has been on the market and used by

major Braille producers for the past sixteen years. Its output has been scrutinized by more proofreaders than that of any other translation program. With all this input from a wide range of Braille producers, these programs have evolved into a very flexible tool for producing a wide range of Braille codes and formats. The author has taken great pains to conform to BANA rules for Braille, as far as a computer can automatically interpret them.

It is possible, if one knows the consequences of breaking contractions, to enter <$-> commands in a TXT file, which will cause words to be hyphenated at those points if necessary. If a file contains a large number of instances of a long word like "rehabilitation", a few lines can be saved by telling Duxbury where it can be hyphenated. This feature must be used with caution.

The program can be configured to produce simulated Braille on a laser or dot-matrix printer, and the Braille lines can have the corresponding print shown between them. The Computer Braille Code (CBC) is fully implemented. The translator must be told which parts of the text are to be transcribed in CBC. The WordPerfect and page-image bridge programs can assist in determining which portions need such treatment.

If batch files are customized for the user's needs, translating a file can be a very simple operation. The program can be run from batch files, a "response file", or by answering some or all of its questions when it is run. A short help message can be displayed by typing control-E at any of the questions. But with the number of options that are possible, it is better to create batch files for various tasks than to answer all the questions each time the program is run. A large number of batch files are provided to get started, but one should be prepared to make copies of some of these and include personal modifications.

Some rather complicated formats can be produced, including tables with left, center, decimal or right tabulations, line-numbered

text, tables of contents, and dictionaries with guide words at the foot of each page, or odd-numbered pages. Some of these formats can be produced by the WordPerfect Bridge, but others are provided as commands, which the user must add to a TXT file.

The Duxbury translator is really not a single program, but a collection of tools (small specialized programs) connected together by batch files. These tools include prompted word search/replacement, automatic character replacement with state variables to define context, a file browser, a text-find utility, and more. Some of these programs can be driven by batch files supplied by Duxbury, and others are best suited to an experienced programmer.

Weaknesses: Because the Duxbury translator started at large installations, running on minicomputers, a certain amount of computer experience has always been assumed by the authors. As the program has migrated to PC's and MacIntoshes, the number of customers and technical support calls has mushroomed. As a result, the quality of the documentation and the simplicity of operation have improved significantly and are continuing to evolve. Because of the number of programs involved and their long history and need for backward compatibility, the number of commands and options can be overwhelming to a new user.

Some of the documentation files are not provided in print or Braille but can be printed from disk or translated into Braille by the user. The disk documentation is broken up into a large number of files, and without referring to the <CTL-LIST> or some other master file, it can take some time to find the information one needs at a particular moment.

Much of the documentation still has a mainframe flavor, reflecting its origins. It does not provide a lot of basic information or hand-holding. This program may not be the best choice for the beginner or casual and/or occasional user.

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As discussed in the DUXWP review below, it is easy to produce terribly formatted Braille with this program or any other if the user does not examine the source file and correct its problems.

HINT: Questions about how something in a TXT file being edited will look in translated form may be answered through use of the following procedure: A copy of the whole file should be saved. A few lines of it should be marked and saved to another TXT file (both must be saved as ASCII). The user then temporarily exits ("shells out") to DOS and runs the small block through the translator and formatter. The BRF file can then be viewed with a favorite editing program or the Duxbury browser. One then exits from DOS and returns to work on the large file. Because the program can run automatically from batch files, someone needs to study enough of the documentation so that these files can be customized to meet local needs. Many good batch files are supplied by Duxbury, but a user is likely to produce some more. If a menu-driven user interface is wanted, the user should consider getting DUXWP instead of, or in addition to, this program. No Braille translator can relieve users of the necessity of having persons knowledgeable about Braille in their organizations. Quality assurance procedures are needed for the files produced and for the hard copies a printer embosses.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Translated or formatted files can be sent to a wide range of devices. A sophisticated printer driver is included for sending data to serial or parallel devices. Output can only go to one destination at a time.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Duxbury can do automatic formatting from WordPerfect files by means of its WordPerfect Bridge WPBRI, or from ASCII print image files using PIMBRI, the page image bridge. Both of these programs produce TXT files with formatting and translation codes. Of the two bridges, the WordPerfect bridge is more complete. If there is a choice between

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ASCII or WP files for translation, it is almost always better to start from the WP 5.0 or 5.1 version. Before using either of these bridges, one must know whether the file has sudden changes of margins, changes from tables to text, a section printed in two columns, and other features that can confuse these bridges. In a WP file, every hard return in print will cause a hard return in Braille, which is often not desirable. The better a user knows WordPerfect and the Duxbury program, the better Braille from WP files can be.

Mechanism/command structure for controlling format of Braille output: Formatting can be controlled either by adjusting the format of a page image file or WP file or by adjusting the formatting commands which Duxbury bridges put into the TXT file. It takes some time to learn the differences between a <$tab>, <$tas> or <$taa> tab command, or between <$inm> and <$ind>. But once these things are learned, the user has absolute control over the format of the Braille output.

Memory requirements: The Duxbury programs can run in 256K of free RAM, but 512K is recommended by the manufacturer. A hard disk is recommended for processing larger files.

Ability to support output to a Braille display as opposed to hard copy: Braille files can be sent to Braille display devices. Batch files and tables for the SCRUB program exist, so that many of the linear Braille format symbols can be produced.

DUXWP

Type of system (hardware or software): Software
Name of vendor or manufacturer: Duxbury Systems, Inc.
Address: Duxbury Systems, Inc., 435 King Street, Post Office Box
    1504, Littleton, Massachusetts 01460; (508) 486-9766
Price: $295
Computer for which software is written: IBM PC and compatibles
    with at least 512K RAM.
Operating system under which software can run (e.g., DOS, Windows,
    etc.): MS-DOS. The program uses a text-based Windows-like
    user interface.

Description: DUXWP is a menu-driven translator by the publishers of the Duxbury Braille translator. It only accepts as input WordPerfect files. It automatically formats these files for output to Braille devices.

Speed of translation process: After all selections have been made, translation from a WordPerfect file to a Braille file takes 33 seconds on a hard disk with the SMARTDRV disk cache implemented, and 42 seconds if it is not implemented. Translation will take well over one minute if a floppy drive is the source and destination for the file, and four minutes if translation is also initiated from the floppy drive, because of the number of intermediate files that must be written and read. (See Turbo Braille review below for comments on system used and size of file processed.)

Capacity for back translation: There is no back translator for DUXWP.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): Source files should be WordPerfect 5.0, 5.1, or 6.0.

Method for fixing Braille translation errors: Some types of translation errors can be fixed in the WordPerfect file. The translator

will switch to Grade 1 if a non-English language is selected. If the user configuration file is set properly, the program will go into Computer Braille Code wherever the font has been set to Courier. If a Braille font has been installed in WordPerfect, switching to that font puts the translator into direct Braille mode until a normal font is reinstated. If the ampersand codes (such as < & + > for a forced letter sign) are imbedded in a WordPerfect file, they will be correctly interpreted when the file is translated. The dollar commands that are customarily used by the Duxbury programs for formatting or translation control will not go through DUXWP properly. Duxbury is working on this deficiency. If the user owns the full Duxbury Braille Translator, DUXWP can generate TXT files which can be completely manipulated by the user and which contain representations of all the supported WordPerfect codes.

Strengths: Because the program is fully menu-driven and mouse-aware, producing hard-copy Braille, a Braille file, or simulated Braille could not be much easier. Since the Duxbury translator is in use at all of the U.S. Braille book and magazine production facilities, its output has been scrutinized by more proofreaders than any of the other translaters now in use. Although translation is never perfect, the Duxbury translator usually makes fewer translation errors than other translators do. However, no matter how accurate a translator is, it has no reliable way of knowing whether the letter V is a Roman numeral and should not have a letter sign, is the letter V by itself and should have a letter sign, is followed by a period or parenthesis in an outline and should not have a letter sign, or is the last word of a sentence and should have a letter sign. DUXWP supports a large number of WordPerfect formatting and emphasis commands, so the Braille copy can reflect the print format quite accurately. Format codes supported include left, center, right, and decimal tabs; left or left/right indents; margin changes; centering; block protect; footnotes; and more. The manuals for the DUXWP program and the Tips document describing proper input file formats are quite well written and should not pose problems for experienced WordPerfect and DOS users.

Weaknesses: This program and others make Braille so easy to produce that there is a noticeable increase in the amount of Braille that has not been proofread. Since the translation and printing processes are so easy, one is tempted to run Braille copies off without checking the input file first. It is especially easy to produce strange-looking Braille because a file has hard returns at some places where they don't belong, tabs after soft returns, spaces instead of tabs, indent and centering codes, frequent left margin changes, wide tables within the text, block protect codes that make sense for the print copy but make no sense in Braille, etc. Generally, if a person formats a file so that its appearance is not affected by changes in print size, the Braille format will be the most consistent. The better one uses WordPerfect, the better the Braille copy will look.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be to a file, Braille embosser, Braille display device, or simulated Braille on paper. Output can only go to one device at a time.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Formatting is as automatic as the state of the art permits. Nearly all codes that can be logically transferred to Braille are supported.

Mechanism/command structure for controlling format of Braille output: One controls the format by proper coding of the WordPerfect file. In addition, handling of paragraphs, multiple skipped lines, and soft and hard page breaks, plus the scale factor relating print tabs to Braille tabs, can be adjusted and saved in the user's configuration file.

Memory requirements: 500K

Ability to support output to a Braille display as opposed to hard copy: Braille could be sent to a paperless Braille device, but the "linear Braille" format indicators are not produced.

Hot Dots

Type of system (hardware or software): Software
Name of vendor or manufacturer: Raised Dot Computing
Address: Raised Dot Computing, Inc., 408 South Baldwin Street,
    Madison, Wisconsin 53703; (608) 257-9595
Price: $350
Computer for which software is written: IBM and compatible
    computers
Operating system under which software can run (e.g., DOS, Windows,
    etc.): PC/MS-DOS

Description: Hot Dots is a full-featured and accurate translator.
It offers many possibilities for input, output and display. There are a
number of batch files provided to automate and/or facilitate the Braille
production process.

Speed of translation process: Partly due to the wide variety of
computer systems in use today, it is difficult to judge the speed at
which Hot Dots is able to perform all of its functions: importation,
translation, formatting, and ultimately embossing. If, instead of
sending output to an embosser, one sends it to a disk file to achieve the
maximum throughput, it takes a 20MHZ computer at least ten seconds
to run through a rather small document which ultimately results in
eight Braille pages. Because the entire process has been broken down
into four discrete steps, there is a certain amount of time that must be
allowed for the machine cycles necessary to move between tasks. The
longest step in the entire process seems to be the importation phase.
Once this has been completed, everything else seems to fly.

Capacity for back translation: Yes

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
Hot Dots is capable of processing ASCII files, print image files, and
files generated by more than thirty word processing systems. This is
accomplished using the Hot Dots importing feature, which converts a

document into a format that Hot Dots, in its native mode, will recognize. Generally speaking, only basic word processing formatting commands are recognized and properly converted by the importation process. These include commands to center a line of text, generate a new paragraph, and italicize or underline a section of text. Word processor file types supported include WordPerfect, MicroSoft Word, WordStar, and many, many more. Using the import feature, the user needs to know what word processor created the file the program to process. Incorrect specification of the file type will generate an error message.

In most cases, users of Hot Dots need to maintain only one version of their document: the one intended to be used with the word processor of their choice. However, if there are unique Braille translation and/or formatting requirements, users may find it desirable to maintain two versions of their document: one for printing with their preferred word processor and the other for brailling with Hot Dots.

Method for fixing Braille translation errors: With Hot Dots a variety of strategies can be employed to correct Braille translation errors. One can place an < @i > sequence (the at sign followed by the letter i) between letters of a document that are not to be contracted. An < @f > sequence can be placed in the document to force the next character to be sent as is. The global search and replace utility can be used to correct translation errors that appear in the final translated file prior to having it formatted. These are only a few of the methods that can be used. There is no Grade II translation table that can be modified by the user. Raised Dot Computing (RDC) is always on the lookout for new translation errors, and the company encourages users to report any consistent errors in translation that may be discovered.

Strengths: The biggest strength of the Hot Dots system is its ability to interpret native word processing files and convert them into a standard format that can be edited with relative ease. It was not possible for the panel to determine how well the package worked with

all of the thirty-plus word processors supported, but WordPerfect did seem to work well as long as no extraordinary formatting was used (i.e., tables of contents, page centering, running headers/footers, etc.). The customer support provided by Raised Dot Computing is always exemplary and geared for the non-technical user. This, irrespective of the merits of Hot Dots, should definitely be kept in mind when translation software purchasing decisions are to be made.

Another strength of Hot Dots is the abundance of convenient batch files provided with the product. Using batch files, the user can completely process a document, from importation to embossing, or partially process a document using different batch files. There is even a batch file supplied to emboss multiple copies and another to ascertain the number of pages to be embossed before committing anything to paper.

Anyone familiar with RDC's BEX product for the Apple II line will be familiar with many of the Hot Dots formatting commands. Hot Dots can be controlled either from the DOS command line, when the program is first invoked, or one can use the menu system that comes with the product. The batch files make Hot Dots a lot easier to use. For example, with a simple command, followed by three or four parameters, one can instruct Hot Dots to import, translate, format, then emboss a file. It is as simple as entering a line of commands as follows:

DOTS1234 SAMPLE.WP5 WPF5 LPT1

If the Hot Dots menu is used, each process must be invoked manually.

Weaknesses: The panel finds that a major weakness in Hot Dots is the lack of status messages during its operation. When the user is processing a document from start to finish, messages are displayed telling the user that a document is being imported, translated, formatted, or embossed. However, during the formatting phase, for example, one cannot learn what page is being formatted or how much

further the program has to go before the process is finished. This more than anything else proved to be the most frustrating deficiency in Hot Dots.

There are a great many formatting commands and commands to control the translation activity. Depending upon a user's sophistication, this can be either a blessing or a curse. The ideal situation would be for the user never to have to learn any of these commands.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): With the aid of the many batch files provided, Hot Dots enables Braille output to be routed to a variety of communication ports or simply to a disk file. Configuration of the serial port requires some understanding of the DOS MODE command unless the embosser used is already configured to receive data at 9600 baud, eight data bits, no parity, and with one stop bit. If the embosser is so configured, the MODE command is not necessary.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): As mentioned above, Hot Dots can read the native formats of some 30 word processor types. It can convert these files into intermediate files, which can be edited, or send the output directly to a file, a Braille device, or the screen.

Mechanism/command structure for controlling format of Braille output: When Hot Dots imports a file, it converts many of the internal word processing formatting commands into what it calls "dollar sign commands." These are commands that are stored in an intermediate file. They are not translated into Grade II Braille but control how the final Braille output will be formatted. Some of the dollar sign commands are as follows:

    < $p >   New paragraph

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<$l>	New line (not a paragraph)
<$$c>	Center text in current output line plus all subsequent output lines until next new line command
<$$l#>	Set line spacing to #, e.g., <$$l2> for double spacing
<$$np>	Place page numbers on all pages
<$$p#>	Place text at absolute character position # on the output line

Hot Dots also provides a set of commands to control how the translator will behave. All of these commands begin with an <@> (at sign). Throughout the document, one can change translation modes from Grade II, Grade I, British Braille (without capitalization), or no translation (often referred to as computer Braille). Using the <@> codes, accent marks can be forced into Braille output or letter signs inserted or removed.

Memory requirements: 256K

Ability to support output to a Braille display as opposed to hard copy: Hot Dots includes support for a variety of Braille-producing devices, including refreshable Braille devices such as TeleSensory's VersaBraille. Support is also included for such esoteric devices as Dipner Dots, the Ohtsuki, and the Cranmer Brailler. The manual also includes instructions for configuring these devices for proper attachment to the computer.

MegaDots

Type of system (hardware or software): Software
Name of vendor or manufacturer: Raised Dot Computing
Address: Raised Dot Computing, Inc., 408 South Baldwin Street,
    Madison, Wisconsin 53703; (608) 257-9595
Price: $500
Computer for which software is written: IBM PC and compatible
    computers
Operating system under which software can run (e.g., DOS, Windows,
    etc.): PC/MS-DOS

Description: MegaDots is more than just a forward and
backward Grade II Braille translation software package. It can also
double as a WYSIWYG (What you see is what you get) word
processor capable of editing text in either print or Braille format. The
user can instantly switch between print and Braille translations, and a
variety of display options are available.

Unlike other translation systems which rely upon specialized
codes to control the format of Braille output, MegaDots uses a "style
system." A style is simply a set of format descriptions which can be
associated with individual paragraphs within a document. For
example, most paragraphs would be normally formatted text or "body
text" as they are called in MegaDots. Other paragraphs might be
headings of different levels. One style of heading might cause the text
to be centered while another might cause the text to be underlined and
aligned with the left margin.

MegaDots is clearly a tool for the no-nonsense Braille
transcriber. With a single keystroke, one can flip between print and
Braille representations of a document and can determine right on the
screen how a particular section of text will appear when it is printed
or Brailled. Skilled Braillists can enter Braille text directly using six
keys on the computer keyboard, and MegaDots even permits the
display of Braille output as dots on the screen.

Speed of translation process: Braille translation with MegaDots is extremely fast on a 386/486 processor. It has to be since the nature of the program is such that users are encouraged to switch back and forth between Braille and print modes with the touch of a single key. On a 20MHZ machine, the process of translating a 60-page document takes approximately ten seconds.

Capacity for back translation: Yes

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): MegaDots has a basic set of file converters which enable documents created by other word processors to be converted into a form that can be processed by the MegaDots program. ASCII files and documents created by WordPerfect are among the basic conversions supported. For an additional fee, supplemental conversion packages can be supplied. Whenever MegaDots is told to open a file, it automatically recognizes the type of file that is being opened and performs all of the conversions necessary to create a reasonably well formatted MegaDots file (a file with the .MEG extension). It is the MegaDots file that is actually modified when editing takes place. The original file that was imported is untouched.

Method for fixing Braille translation errors: MegaDots does not require the user to update a Braille translation table in order to fix translation errors. Instead, since it is a relatively quick process to switch between print and Braille display modes, one can find in print the Braille word that was produced in error, switch to Braille mode with a single keystroke, correct the resultant Braille word displayed on the screen, and revert to the print mode. The correction is preserved by MegaDots. Another method that can be used is to employ the program's global search and replace feature when the document is being displayed in the Braille mode. Both options require that the user have some knowledge of Braille and the various ways of displaying Braille output on the computer screen. MegaDots provides a rules file that can be used repeatedly to make certain changes in different documents. However, rules file processing is not invoked

automatically but must be initiated by the user when the document is displayed on the screen.

Strengths: MegaDots is a unique departure from traditional Grade II translation software systems, being in its own right a word processor, a print and Braille utility, and a translator. The extensive on-line help supplied with the program is extremely useful, even though much of the information is not reproduced in the manual.

It is extremely simple to correct formatting problems: simply change the style used for a particular paragraph. For sighted or blind users who are not skilled readers of Braille, the architecture of the program makes it simple to determine the format of Braille output before committing it to paper. This is, in the view of the panel, one of the program's greatest strengths.

MegaDots has a variety of display modes to suit both blind and sighted users. For people who like windows, tiling, pull down menus, and the like, MegaDots can make extensive use of highlight bars and pull-down menus, and it also can be controlled using a mouse. For blind users with speech or Braille screen access technology, MegaDots can display menus and the like on a blank screen, and it can be instructed to make minimal use of color.

MegaDots comes with extensive on-line and context-sensitive help screens. At any point, the user can press the F1 key to bring up a help screen dealing with the feature of the program in use.

MegaDots makes extensive use of menus which are fairly easy to navigate through. Keystrokes used to navigate through the menus are consistent and easy to remember, and with the latest version, the DOS cursor follows the highlight bar. In earlier versions, the failure of the cursor to follow highlight bars or to be moved at all was a considerable problem for persons who wanted to use the program with screen access technology for the blind.

MegaDots has had a number of upgrades and removals of system bugs since it was initially released in the summer of 1992. The company is also promising a number of interesting features in upcoming versions. This is a powerful and sophisticated program that is breaking new ground in the Braille translation/formatting arena. Raised Dot Computing has a long-term commitment to Braille and some of the best customer support in the business. The program warrants watching.

Weaknesses: MegaDots currently consumes a huge amount of memory: 500K in some cases. The vendor is in the process of producing a new version which uses some of the high memory available on 386/486 processors. Because MegaDots is an extremely powerful and sophisticated program, it is rather difficult to learn at first. However, once a user "dives in", many of its operations become self-evident. There does not seem to be a reliable way to fix permanently Braille translation errors that may crop up. No translator is 100% perfect, and MegaDots provides only short-term methods for fixing errors. One cannot update a permanent table of Braille rules to fix translation errors.

MegaDots seems to be keeping pace with modern software development—that is, getting more power by using more memory and consuming large amounts of disk space. The vendor indicates that MegaDots cannot run on a computer that does not have a hard disk. The program and supporting files take up about 2 megabytes on a hard disk. Given today's rapidly growing computer capacity and rapidly plummeting prices, this may not be as big a problem as it once was.

MegaDots makes use of some fairly esoteric key sequences (e.g., Control-Insert, Control-Down Arrow, etc.). Although Raised Dot Computing is to be commended for now attempting to resolve conflicts with screen access technology for the blind, one cannot help wondering why such problems were not considered during the initial design.

Raised Dot Computing is to be commended for working on a new manual. The original manual supplied with MegaDots does not contain enough information to help the user achieve a thorough understanding of the program before throwing it onto the computer.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): MegaDots can route Braille output to any one of the parallel ports or to any one of the serial ports, depending upon where the embosser is attached to the computer. In addition, MegaDots can be instructed to direct Braille output into a file. When users instruct MegaDots to begin Brailling, they can indicate how many copies to generate, which Braille pages to emboss, the number of lines to emboss on a Braille page, and the number of Braille cells to produce on a line.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): MegaDots can import files created by a wide variety of word processors. Whenever MegaDots is told to open a file, it automatically recognizes the type of file that is being opened and performs all of the conversions necessary to create a reasonably well-formatted MegaDots file (a file with the .MEG extension). It is the MegaDots file that is actually modified when editing takes place. The original file that was imported is untouched.

Mechanism/command structure for controlling format of Braille output: MegaDots uses the "style system" to control the format of Braille output. Documents are divided up into paragraphs, each of which has its own unique "style." For example, to have a single line of text centered, one simply gives it the style of a heading. To have a block of text treated as a normal paragraph, it is simply given the style of "normal body text." When a file is imported, MegaDots makes its "best guess" about the style that should be assigned to each paragraph. The panel found that the importing of WordPerfect files was not 100% perfect. More often than not, it was necessary to change the style associated with certain paragraphs to achieve the desired Braille

output format. However, this was relatively easy to do and consumed relatively little time.

Memory requirements: 512K MegaDots is a memory-hungry program. It is advisable to have at least 640K of memory to allow room for MegaDots, DOS, and any access software one might be running. Raised Dot Computing is testing a version of the program for 386 and higher computers which uses a special protected memory mode. A minimum of 2 megabytes of extended memory is recommended for this mode.

Ability to support output to a Braille display as opposed to hard copy: MegaDots can generate linear Braille format output for paperless Braille devices. MegaDots can also generate computer Braille output for computer programs and the like. For print users, MegaDots has a mode whereby Braille dots can be printed along with the back-translated print information to show what is actually being Brailled.

NFBTRANS

Type of system (hardware or software): Software
Name of vendor or manufacturer: Roudley Associates
Address: Roudley Associates, Post Office Box 608, Owings Mills,
    Maryland 21117; (410) 363-0834 or (800) 333-7049
Price: $395
Computer for which software is written: IBM and compatible
    computers
Operating system under which software can run (e.g., DOS, Windows,
    etc.): PC/MS-DOS

Description: NFBTRANS is an easy-to-use menu-driven Braille
translation program. It provides the user with a simple set of
commands which must be inserted into a source file to control
formatting.

Speed of translation process: It is difficult to judge the speed of
a Braille translation program because of the variety of factors that
need to be considered. These factors include the speed of the
embosser (if translation and embossing occur simultaneously), the
speed of the computer processor, and disk access time. Assuming that
one is translating directly into a file for later embossing, NFBTRANS
produces Braille pages at a rate that can vary anywhere from one
Braille page every ten seconds (on an old 8086 processor) to three
Braille pages per second (on the new 80486 processors).

Capacity for back translation: NFBTRANS is a forward
translator only. It does not "back translate" from Grade II Braille to
print.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
NFBTRANS was originally written to process pure ASCII text or print
image files and later evolved to handle files created by some versions
of WordStar. Today, this is still the case. In other words, one can
prepare an NFBTRANS document with any word processor, but that

word processor must be able to convert the document into an ASCII file containing only normal text, carriage return/line feed sequences, and special codes recognized by NFBTRANS to control the format of Braille output. NFBTRANS does not recognize internal word processing commands (e.g., centering, running headings, italics, etc.) that are native to specific word processors.

Method for fixing Braille translation errors: No Grade II Braille translation software is 100% perfect. There are going to be words that are not Brailled correctly by even the best translator. NFBTRANS provides a Braille translation table which can be updated and compiled by the computer user, provided that appropriate caution is exercised. The steps to follow for making simple table modifications are spelled out in the documentation, and users are strongly encouraged to contact the program's developer, Charles Cook, through Roudley Associates if more sophisticated changes are required. Most often, however, it is only necessary to insert the incorrect word into the table with the proper translation codes specified. This does require a certain amount of knowledge about how ASCII symbols displayed on the computer screen are embossed in Braille.

The vertical bar symbol can also be used in the text to suppress Braille translation. (Actually, the vertical bar tells NFBTRANS to send the immediately following character as is to the embosser without any attempt at translation.)

Strengths: NFBTRANS is a Grade II Braille translation program written to run on IBM PCs and compatible machines. It was developed by the National Federation of the Blind (1800 Johnson Street, Baltimore, Maryland 21230, Phone: (410) 659-9314). The NFB originally developed NFBTRANS on a DEC minicomputer for internal use. It was later moved to PCs and marketed to others at a reasonable cost when some other programs cost thousands of dollars.

NFBTRANS comes with a simple print spooling program (NFBSPOOL) which is handy for re-routing printed output to a disk

file. In addition, NFBTRANS comes with a resident help program (NFBHELP) which can be "popped up" while running a text editor. NFBTRANS contains a feature called External Format Language which can be used to aid in the production of standard columnar computer reports. The External Formatting Language codes are stored in a file that can be edited using any word processor. (Actually, the file must ultimately be converted into ASCII text.) External Format Language essentially tells NFBTRANS how to process specific lines or ranges of lines in the input file. NFBTRANS can be instructed to ignore or process the lines and even to process certain lines only if specific character strings are encountered.

Unlike other translators, NFBTRANS both translates and formats Braille output in a single pass. There is no separate format step required before a document can be embossed. In its default mode, NFBTRANS presents the user with a series of menu prompts. All of these prompts can be bypassed, however, through the use of parameters that can be passed to the program on the command line when it is first invoked. With a single command, for example, users can instruct NFBTRANS to translate and emboss a file, then exit the program. As text is being translated and formatted, NFBTRANS provides a running commentary on the screen, telling the user which Braille page and which Braille copy is being embossed. If translation and formatting are being done into a file, this provides an excellent means to determine ahead of time how many Braille sheets will be required for the final embossing operation. NFBTRANS seems to be best suited for people who know little or nothing about Braille translation and/or Braille formatting. There is a set of simple commands which must be inserted in a file. These commands control translation and formatting. The manual explains their use in a simple straightforward way. By following the manual, persons who know little about Braille can be relatively sure that they are producing accurate, well-formatted Braille.

In conclusion, NFBTRANS is relatively easy to learn and easy to use. It takes up relatively little memory (approximately 64K). Its

menu prompts are consistent and easy to understand. Finally, since there are no hidden codes, it is easy to predict how the program will format Braille output given knowledge of how an ASCII file is formatted.

Weaknesses: Unless one is using NFBTRANS in its short form mode, it will always present the same menu prompts each time the program is entered. However, it is not possible to return to an earlier menu once the user has responded to a particular prompt. If users make mistakes, they have to force their way out of the program and start all over again. And there is no "clean" way to exit the program. It gives every appearance of being designed to be run without ever being exited.

NFBTRANS has not matched the progress made by other Braille translation software in terms of its ability to handle files created by various word processors in their native mode. This forces the maintenance of two files: one for printing and the other to be used for producing Braille hard copy. Further, it will not automatically insert formatting codes into a file, so this step must always be done by the user.

Braille translation errors are not easy to fix. The process of updating then compiling the translation table requires more care and technical understanding than the average non-technical computer user possesses.

Re-routing Braille output to the serial port requires too much in the way of technical knowledge and sophistication. The average user is hardly likely to understand the use of the DOS MODE command.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): NFBTRANS has the ability directly to translate and format Braille into a file or to translate and emboss directly to an embosser attached to the computer's LPT1 parallel port. The program cannot directly

address other parallel ports such as LPT2 or LPT3. To send Braille output from NFBTRANS to an embosser connected to a serial port (e.g., COM1 or COM2), the user is required to redirect printed output away from LPT1 to the correct COM port using the DOS MODE command before entering NFBTRANS.

Using NFBSPOOL, one can "outfake" the NFBTRANS program. In other words, NFBTRANS can "think" that it is sending characters to the LPT1 port, but NFBSPOOL can take the output and stick it into a file. Later, through the use of the DOS COPY or PRINT commands, the file produced by NFBTRANS can be embossed directly.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): NFBTRANS cannot automatically format files unless the formatting codes it uses have been inserted into the text.

Mechanism/command structure for controlling format of Braille output: NFBTRANS provides a full set of commands that control the format of Braille output produced. These commands are denoted using either the tilde $< \sim >$ character or the caret $< \hat{\ } >$. Using NFBTRANS formatting commands, one can center lines of Braille output, generate running headers or footers, produce page numbers in Roman or Arabic numerals, italicize specific Braille text, add Braille letter signs, generate blank lines, and much more.

Here is a partial list of the commands that NFBTRANS recognizes:

    ~A Put next word only in Grade 1.
    ~C Center immediately following text.
    ~D Double space Braille output.
    ~E Switch to poetry format.
    ~T Switch to normal text format.
    ~H Running header.

~I   Generate Braille italics indicator.
~S   Insert a Braille blank line.
~0   Disable all translation.
~1   Translate to Grade 1 Braille.
~2   Translate to Grade 2 Braille.

These commands must be inserted into any document that a user intends to have translated into Grade II Braille. If a file processed by NFBTRANS contains no such commands, the program will eliminate all blank lines from the output and will only generate a Braille paragraph if it comes across two carriage return/line feed sequences in a row or an indented line. A Braille page number will be generated on all Braille pages except the first. This is not the way Braille is typically produced. Users will probably want to do some centering of text, at a bare minimum.

Memory requirements: 64K

Ability to support output to a Braille display as opposed to hard copy: NFBTRANS output can be redirected to a file or to another DOS device. While some knowledge of DOS will be necessary it would be possible to translate a file and send it elsewhere. There is however no specific support for non-hard-copy or non-file devices.

(Note: As a gift to the computer community the National Federation of the Blind has released the source code for NFBTRANS. Further, anyone who purchases the program will also get a copy of the source code. Individuals are encouraged to modify the source code, which is in the computer language Pascal, and to freely pass the improved program around. The only restriction on the release of the source code is that people not use it to create a commercial product from which they intend to make money.

The source code can be downloaded from NFB NET, the computer bulletin board system run by the NFB itself. NFB NET may be reached by calling (410) 752-5011. The BBS supports connections

at baud rates from 300 to 9600 baud, no parity, 8 data bits and 1 stop bit. A user has also converted the source code into the computer language C, and made modifications. The new source code is also available via NFB NET and users are urged to upload their work to NFB NET so that it can be shared with others.)

PC-Braille

Type of system (hardware or software): Software Manufacturer: Arts Computer Products Inc.
Address: Arts Computer Products, 121 Beach Street, Suite 400, Boston, MA 02111-2501; (800) 343-0095 or (617) 547-7520
Price: PC-Braille: $495; WP-Sift: $180; PC-Sift: $180; PC-Braille Pro (Includes all three): $795
Computer for which software is written: IBM PC and compatibles
Operating system under which software can be run: MS-DOS or PC-DOS 2.1 or higher

Description: PC-Braille is a command-driven full-featured translation program. It offers additional programs which can be used to provide automatic formatting of text or WordPerfect files.

Speed of Translation: Below average

Capacity for back translation: No

Types of source files supported: WordPerfect and ASCII text files when used with optional PC-SIFT and WP-SIFT programs

Method of Correcting Translation Errors: Tables controlling contraction rules and exceptions can be modified by the user. Commands are provided to suspend translation temporarily when necessary.

Strengths: PC-Braille provides many formatting commands, including conditional end-of-page, headers, footers, and temporary indentation. A macro language including symbolic substitution permits the experienced user to build specialized formatting and translating commands. The ability to define sequences of numbers allows paragraph numbering to be done automatically. This feature permits PC-Braille to handle usefully some of WordPerfect's automatic numbering features when used with WP-SIFT. PC-Braille formatting

commands can be placed within WordPerfect documents as "comments" with an identifying prefix. So treated, they do not appear in printed output but are still recognized by WP-SIFT and PC-Braille. Finally, it is perhaps the only Braille translator that can generate a table of contents with Braille page numbers. However, this ability also depends upon WordPerfect and the WP-Sift formatting program.

Weaknesses: Although PC-Braille is a very powerful translator with many formatting commands, no automatic formatting is available without purchasing either PC-Sift or WP-sift. The inclusion of one or both of these programs makes PC-Braille the most expensive software-based translator for personal computers currently on the market. Although PC-Braille has great flexibility from the command line, there are no menus to assist the casual user. There is no on-line help available. Little indication of progress is provided when translating large documents, with long periods of silence.

Output types supported: Translated Braille can be stored in a file, sent to the screen in ASCII Braille, printed in ink-print using periods, or printed on modified daisy-wheel printers in readable Braille using periods; and a number of Braille printers are supported. The user can create new printer definitions.

Automatic Formatting Capabilities: Formatting can be extracted from WordPerfect and ASCII text files using WP-SIFT and PC-SIFT respectively. These programs are available at extra cost.

Mechanism/command structure for controlling format of Braille output: Many formatting commands are available. Generally, each command begins with a period and appears on a line by itself. In addition to the expected commands such as temporary and permanent indentation, centering, running headers and footers, and conditional end-of-page, PC-Braille provides numerous options that control such things as use of capitalization, termination signs, and the transition characters in numbers (characters that can appear in numbers without causing an additional number sign to be printed).

Memory Requirements: 512K

      Ability to support output to a Braille display as opposed to hard copy: Yes, but device may need to be defined.

Ransley Braille Interface

Type of system (hardware or software): Hardware
Name of vendor or manufacturer: Manufactured by Pulse Data
    International, Limited of Christ Church, New Zealand and
    imported by HumanWare, Inc.
Address: HumanWare, Inc., 6245 King Road, Loomis, California
    95650; (916) 652-7253 or (800) 722-3393
Price: $995
Computer for which software is written: (not applicable)
Operating system under which software can run (e.g., DOS, Windows,
    etc.): Since the Ransley is hardware-based, it will operate under
    any operating system.

Description: The Ransley Braille Interface (RBI) is a hardware-based device. It is a box that attaches to the serial or parallel output of any computer, intercepts data from the computer, performs translation and formatting tasks, and sends Braille output to either a serial or parallel port. Consequently, it will work with any computer that has a serial or parallel output port.

Speed of translation process: Even though it is hardware-based, the Ransley Braille Interface is no faster than software-based translators. In fact, it is slower than some, doing a page approximately every two seconds.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): This device accepts a data stream from a computer. It is only necessary to print to the device as with any other printer.

Method for fixing Braille translation errors: The translation tables are not accessible to the user.

Strengths: This device is relatively simple to use. If one must

perform Braille translation on a variety of computers, the Ransley is a portable solution. It would work for multiple computers, which could be the same or different. It could also be installed on a print server on a network, and output directed to it from a variety of sources. The Ransley is a good choice where a variety of computers, operating systems, and/or software packages are used.

Weaknesses: The RBI is on the expensive side. It is also a little slow. It will do some basic pre-processing and formatting on its own; however, these capabilities are somewhat limited. The results might be acceptable for personal use, but would not be appropriate for Braille that is given to others. There is a good set of basic commands to control formatting and translation. They are relatively straightforward and easy to use, but not as sophisticated as with some translation systems. It would be more difficult to do elaborate formatting with the Ransley. The translation accuracy seems to be acceptable, but not outstanding.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output is either sent to a serial or parallel port. Thus, one could theoretically direct output to any device with a serial or parallel port that would accept a data stream. Primarily, this means a printer but could also include things such as a VersaBraille, Braille 'n Speak, etc. Anything that would accept a file as input should work.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): The Ransley Braille Interface pre-processes a file before translation. It will strip out extra spaces, such as in margins. It can be directed to take out blank lines also. It does not act upon word processor codes, however, since it expects an ASCII stream of data. It will act upon its own embedded codes if it finds them.

Mechanism/command structure for controlling format of Braille output: Most Ransley commands begin with two exclamation points

<!! > and are followed by a letter and possibly a number. For
example, <!!C> centers text and <!!c> stops centering. The
program differentiates between the uppercase and lowercase c. As
mentioned above the list of commands is adequate but not extensive.

Memory requirements: Not applicable

Ability to support output to a Braille display as opposed to hard
copy: The output could be directed to a Braille display as long as the
display could accept serial or parallel output directly, without the
intervention of another computer. Devices such as a VersaBraille,
Braille 'n Speak, BrailleMate, Notex, and the Personal Touch would
meet these requirements.

Turbo Braille

Type of system (hardware or software): Software
Vendor or Manufacturer: KanSys, Inc.
Address: KANSYS, Inc., 1016 Ohio Street, Lawrence, KS 66044;
    (800) 279-4880 or (913) 843-0351
Price: $295
Computer for which software is written: IBM and compatibles
Operating system under which software can run (e.g., DOS, Windows,
    etc.): MS-DOS (interface is text-based)

Description: Turbo Braille is a fast, command-driven Braille translator. While not as full-featured as some, it does have more than adequate features and good translation accuracy; and it is available at an affordable price.

Speed of translation process: File-to-file translation speeds as follows: Hard disk with SMARTDRV enabled: 17 seconds. Hard disk without SMARTDRV: 18 seconds. Data files on floppy, program files on hard disk: 70 seconds.

Tests were run on a 40 Mhz clone 80386 computer with Vocal-Eyes screen review program running and speech silenced with the control key. When SMARTDRV is enabled, it is 2.1 megabytes. These numbers are for a 97K WordPerfect 5.1 file, producing a 79-page (72.5K) Braille file and no intermediate files. The CHECKIT program rates this PC as 32 times as fast as an IBM XT. Since Braille translation depends partly on disk speed as well as processing speed, I would guess that this computer is more like 20 times as fast as an XT for this task. In general, the panel finds Turbo Braille to be one of the faster translators around. This is in part because it is just one program; multiple processes do not have to be called.

Capacity for back translation: No back translator is available. The program attempts to do Grade 3 and does not produce the Computer Braille Code.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): Directly supports ASCII, WordStar, and WordPerfect 4.2 through 5.1 source files.

Method for fixing Braille translation errors: Braille translation and formatting errors can be fixed if a BIF (Braille intermediate file) is created. Most formatting commands are on individual lines and begin with a period. Examples of these commands are: < .pp > for new paragraph, < .sp > for skip line, < .ce > for centering, < .br > to break to a new line, etc. Translation can be controlled using two-character commands imbedded in the text, such as \1 for Grade 1, \2 for Grade 2, etc. When the BIF file has been properly tweaked, it can be run through the translator, just like an ASCII, WordStar or WordPerfect file.

Strengths: Turbo Braille is fairly easy to learn, as Braille translation programs go. Its on-line help facility is not context-sensitive, but it contains practically all of the information in the manual. The manual is not extremely long. This means that some functions of the program are not explained in great detail. But it also means that one need not search through a large amount of material to find information on a command or function.

Turbo Braille uses small configuration files to guide its operation. They can be placed in the directory where the program was installed. These "global" configuration instructions can be overridden by a "local" configuration file in the current directory, or by command line parameters or interactive commands. Control commands can be stored in a text file that is read in by a command in the file being translated. All of this provides the user with a great deal of flexibility, but this flexibility does not make the program unnecessarily complicated.

Turbo Braille is especially good with ASCII files, provided they do not contain any control characters that fool the program into thinking that the file is in WordStar format. The program is fast, and

usually produces good Braille which does not waste space. The <\:>, <\.>, & <\-> commands are especially useful in creating two- to four-column tables, with judicious tweaking of the intermediate file.

This program is breaking new ground in Braille production by producing Grade 3, directly supporting WordPerfect graphics, and generating embossed block letters. The author has also provided commands which offer above-average support for interpoint embossers. Although it does not support the full Computer Braille Code and does not conform to BANA's requirements that mathematical symbols such as plus, equals, greater-than, braces, and others must be Brailled as words, anyone familiar with the Nemeth Code and a little of the Computer Code will find that Turbo Braille does a sensible job of translating a wide variety of documents.

Weaknesses: When translating WordPerfect files, Turbo Braille supports some WP codes, but ignores many others. Format codes in the WP file are translated into a small set of Braille format control commands. For example, different levels of indention and tabs in the print file will not produce different levels of indention in the Braille document. This means that less space is wasted, but outlines are not represented accurately unless the intermediate file is adjusted. Footnotes are completely skipped.

When editing an intermediate file, dot commands must remain on their own lines and must always start at the left margin. It might be advantageous to use an ASCII file editor, such as the DOS 5 editor, QEDIT, PC-Write, or the WordPerfect program editor, in order to keep the hard returns from moving around while editing an intermediate file.

The translator is reasonably good, but rules continue to be added as users find errors. One persistent problem is that when lines end with "for" or "of", and the next line begins with a word which can be joined to those words in Braille, they will not be joined. These words are properly joined together under most other conditions.

Although Grade 3 Braille can be produced, it is not very readable. Further work needs to be done to improve the Grade 3 translation, outlining and word-spacing rules. An obstacle to accomplishing this is that few blind people use Grade 3 at present, it was never adopted as an American standard Braille code, and manuals which describe the code contain some contradictory advice and are out of print.

As stated above, the author has tried to produce Braille that is practical for people to use and does not put a high priority on producing Braille that conforms to the literary Braille code. Some symbols, such as letter signs, the transcriber's note symbol, computer Braille code indicators, and reference indicators would need to be put into the file by switching to direct Braille, then back to Grade 2.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be sent to a file, a Braille printer, or both simultaneously. Most of the commonly available embossers are supported.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Automatic formatting is supported for several kinds of files and is discussed in previous sections.

Mechanism/command structure for controlling format of Braille output: As mentioned earlier, the user can completely control the format and translation by manipulating a Braille Intermediate File. This is not really a Braille file, but is an ASCII file containing all the instructions needed to translate and format the information into Braille.

Memory Requirements: Turbo Braille runs in a minimum of 256K of memory.

Ability to support output to a Braille display as opposed to hard

copy: Braille can be sent to any serial or parallel device, including a Braille display. Line length can be adjusted. The "linear Braille" symbols such as <$p> for paragraph cannot be directly generated by the program.

REFRESHABLE BRAILLE DISPLAY

The following reviews are for devices which are generally called "refreshable" or "paperless" Braille displays. These displays have small pins that pop up and down, forming Braille letters. The displays generally have either 20, 40, or 80 cells, which means that they can show a quarter, half or full line. All of the refreshable Braille displays which are reviewed here work with IBM or compatible computers.

It should be mentioned that these displays, while expensive, provide the user with detailed information about what is on the screen as well as the format of the data. These products are sometimes preferred by computer programmers, customer service personnel working on the telephone, and by persons doing detailed editing. There are also, of course, people who are Braille-oriented rather than speech-oriented. (Use of such equipment traditionally has been more common in Europe since some countries there are more willing to purchase the expensive equipment.)

It should also be noted that the refreshable Braille displays provide their information in so-called Computer Braille. This is the same code that Braille printers use. It is basically Grade 1 Braille with different symbols for punctuation. The code allows for a one-to-one correspondence between the character on the screen and the character shown on the Braille display; that is, there are no two-cell symbols used to display anything. While there have been some attempts at providing real-time Grade 2 translation, they have for the most part suffered from limitations. All current displays have all of their Braille cells on one horizontal line. Without the use of a multi-line layout, scanning and very fast reading are difficult. The current technology does not permit such a multi-line layout.

While expensive, refreshable Braille displays offer a variety of opportunities in the teaching of Braille. Despite this potential advantage, we are not aware of any computerized Braille instruction programs employing this technology.

Alva Braille Terminal

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650; (916) 652-7253
   or (800) 722-3393
Manufacturer: ALVA the Netherlands
Price: $14,495 for 83-cell model, $8,995 for 43-cell model
Size: 23.5 inches wide by 11 inches deep by 1 inch high
Weight: 11 pounds 6 ounces

Description: The Alva Braille Terminal (ABT) is a flat, low, rectangular unit in a plastic housing. Across the front edge are seven buttons, three round ones on the left, and two long and two shorter bars to the right with the long keys being in the middle and the shorter ones on the outside. From left to right these keys are Program, Home, Cursor, Line Up, Line Down, Line Down and Line Up. On the top front edge is the Braille display. The unit reviewed has an 80-cell display with three additional status cells on the left. The ABT is also available as a 40-cell unit. The first two cells show the position of the Braille display, that is if it is on line 01, line 17, line 25, etc. The third cell shows attribute information.

Above the Braille cells is a line of 80 dots. Each of the dots is located above a Braille cell and is the cursor routing dot for that cell. If one presses the dot above a given cell, the ABT will move or "route" the applications cursor to that cell, provided that the cursor can be moved to that point. The cursor cannot be moved at the DOS prompt, for example, but it can be moved in the editing screen of WordPerfect. This is a convenient way to find and correct errors. The back edge of the ABT contains the power cord, on/off switch, and the input and output connectors.

Strengths and weaknesses: The Alva Braille Terminal is straightforward and easy to use. It accepts data via the parallel port of a computer. It has a parallel port of its own to replace the one it occupies on the computer. Unlike the KeyBraille, its parallel port

seems to operate normally, without any degradation in performance. The memory-resident control software also operates without any adverse effects on your computer. It is easy to install, doesn't adversely affect performance and seems to be very tolerant of other memory-resident programs and stand-alone applications.

It is possible on the ABT to display both characters and attribute information, a feature some find very useful. It is possible to move the system's cursor with the up and down bars, which will be useful in some programs, particularly word processors. The Braille on the ABT is a little mushy but not bad. It is still acceptably readable. Since most of the Braille displays use cells from the same two or three companies, the differences are minor.

Applicability to literacy: The Alva Braille Terminal is an all-around good choice for most users. It is simple and effective. Combined with the right software it can be useful in Braille instruction and/or reinforcement.

Baum DMFM-80

Importer: Baum USA
Address: Baum USA: Accessibility Technologies, 17525 Ventura
    Blvd., Suite 303, Encino, CA 91316; (818) 981-2253 or (800)
    225-3150
Manufacturer: Baum Elektronik GmbH
Price: $25,000
Size: 25.5 inches wide by 14.75 inches deep by 2.25 inches high
Weight: 16 pounds 14 ounces

Description: The DMFM-80 is as much a Braille work station as
a refreshable Braille display. It contains an 80-cell Braille display,
four status cells, Optical Sensor Cursor Routing, 8-dot Braille
keyboard, two 12-cell satellite Braille displays, and a numeric keypad.

Starting at the front of the machine, in the center, there is an 8-
dot Braille keyboard. There is, of course, a space bar. On either side
of this keyboard is a bank of 12 Braille cells. These are independent
banks of cells which can be set to monitor any part of the screen
independently from each other and from the main display. They can
also be attached to the cursor position in some manner allowing one to
scan more than one line at a time. At the bottom right of the bottom
portion of the work station is a 16-key numeric style keypad. It can
be used as a standard computer numeric keypad or switched to one of
15 levels. Each key can then be programmed for a specific function,
command or macro, in that level. This yields hundreds of possible
commands. This portion of the work station is known as the FM-80.

Above the FM-80 is the DM-80/OSCR, which is the main portion
of the work station. There are four status cells on the left side. To
their right are two buttons, an up and a down button. Then there is
the main 80-cell Braille display. Above each cell is a dot, for reference
and above that is the photocell sensor for the OSCR system. OSCR
stands for Optical Sensor Cursor Routing. To the right of the display
are five buttons. There are two vertical rows of two with a single

button in between. This button is a Return key, and the buttons on the left duplicate the two buttons all the way to the left of the Braille display. The other two buttons, to the right of the Return key, control additional functions of the DMFM-80. In addition, combinations of the five right-hand buttons, as well as the left-hand and right-hand buttons, control additional functions.

Behind the Braille display is a corrugated or wavy platform where a standard computer keyboard can be set, either for regular QWERTY input or Braille input through 8 of its keys.

To the left and right of the keyboard platform are vertical OSCR strips for vertical cursor positioning. To the right of the right-hand OSCR strip are six switches, in a vertical row. They are used to control different functions of the machine such as 6- or 8-dot Braille, display of screen attributes, etc.

On the rear edge of the machine is a cable which goes to the PC through attachment to an expansion board which must go into a slot in the PC. The DMFM-80 gets its power from the PC; there is no separate power connection. Finally, there is memory-resident software which must be run to activate and control the DMFM-80.

Strengths and weaknesses: Like the David, which is also from Baum, the DMFM-80 is a complex and sophisticated device. It is probably the ultimate refreshable Braille display. Its two additional 12-cell displays, built-in Braille keyboard, optical sensors, and keypad which can be programmed for hundreds of commands and macros give it vast amounts of power and flexibility. There are a number of U.S., European, and Russian Braille tables available, and users can customize their own. While there is some built-in speech capability, this function has not been taken as far as with the David. Further, the DMFM-80 does not have the Grade 2 Braille display capabilities that the David has. The manual lists a command for Grade 2 Braille translation display, but it does nothing.

There are a number of ways users can issue most commands. They can be issued from or assigned to different levels of the numeric keypad, issued by pressing different combinations of the keys to the left and right of the Braille display, or entered as chorded commands using the Braille or QWERTY keyboard. This allows for great flexibility and diversity. It also yields hundreds and hundreds of possible key combinations, all of which can be reassigned or changed. The quality of the Braille on the displays is good.

The International Braille and Technology Center for the Blind did not receive a Braille manual with the DMFM-80, a fact which necessitated printing one from a disk. This is an inexcusable failure for a $25,000 Braille product. Baum USA says that the manual is in progress and that the device and its commands are changing, so that they didn't want to release the manual yet. Recently, they have reported that some of the commands are being changed to make the DMFM-80 more like the David. It could be argued that, considering all of this, the product was released prematurely. With both the Baum products available in the United States, the software seems to lag behind the hardware. This is, however, a chronic problem in the computer industry as a whole.

One problem with this display, and the other 80-cell displays, for that matter, is the size. An 80-cell line is quite wide, and a reader's arms can get tired after a lot of reading. Further, it is difficult to find a comfortable place for the keyboard, where it and the display can both be easily reached and used. With the DMFM-80, it is a long stretch to the QWERTY keyboard. With it and many of the other displays, there is no easy place to rest one's hands during typing. The DMFM-80's corrugated keyboard platform does hold it in place. On some displays, namely the Braillex IB80 and Alva Braille Terminal, if a user puts the keyboard behind the Braille display, it slides and moves around. The prototype of the DMFM-80 viewed in December of 1991 was housed in a custom piece of computer furniture. This special desk did help some with the ergonomics. A full-time refreshable Braille display user might want to investigate finding a

good platform or having something made.

Applicability to literacy: Because of its expense and complexity, this is a power user's product. It is unlikely that it would be used by a beginner. A fair amount of computer knowledge and Braille competency is required to utilize effectively the DMFM-80.

Importer: ATR Computer
Address: ATR Computers, 4420 Norledge, Kansas City, Missouri
      64123; (800) 421-9775
Manufacturer: Papenmeier GmbH Co.
Price: $15,000 for IB80 and $10,000 for 4040
Size: 29 inches wide by 11.5 inches deep by 1.25 inches high
Weight: 20 pounds 2 ounces

Description: The Braillex comes in 40- and 80-cell models, the
4040 and IB80 respectively. In addition to the regular Braille cells
there are also four status cells on the left side of each model. The
panel evaluated the IB80.

This unit is hardware-based. There is an interface card that is
mounted in an expansion slot of the computer. The computer
keyboard plugs into the Braillex itself, and there is a cable which runs
from the unit to the PC's keyboard input connector.

The Braillex is a heavy, well-constructed solid unit. It is housed
in a metal case and came with a hard suitcase-style carrying case. The
Braille display is located on the top of the machine near the front
edge. Behind it are 40 cursor routing buttons, one for every other
cell. One push of a button moves the cursor to the left of the two cells
it covers and a second press will move the cursor to the right-hand
cell. There are also three groups of buttons on the top of the machine.
On the left end are eight buttons in two vertical rows of four. They
are numbered like the dots of a Braille cell. To the right of the
display are five buttons, two long horizontal ones on the top and
bottom of the group and three buttons in between. These represent
the four arrow keys and a Home key which moves the display to line
one. Finally on the top plate of the machine are four buttons in a
vertical row, three function keys and a Shift key. The Shift key is
used in conjunction with other buttons to issue commands or change
settings. There are also control buttons on the front edge of the

machine, including two long bars to move the display up and down, another Home key located between the up and down bars and four additional buttons, two on each end of the front edge. These are used to move the Braille window when the Braille display is split into two banks.

The on/off switch is on the left side and the power cord and various connectors are on the back of the machine.

Strengths and weaknesses: The Braillex displays are complex and sophisticated systems. Since they are hardware-based, they provide access to the PC's display from the moment the computer is turned on. This would be of use to a systems programmer or someone who makes frequent changes to his/her computer, such as editing CONFIG.SYS and AUTOEXEC.BAT files. The 80-cell display can be split into two 40-cell banks so one of them can be parked on a portion of the screen for reference. There are also various commands to track different kinds of cursors and attributes. The system can also be set up to track a variety of foreground and background colors. One can then go to an attribute or color combination on the screen with the push of a single button. This could be useful when using spell-checkers and other sophisticated software.

This is a complex system, and the manual will take a good deal of study to figure everything out. Again, a Braille manual was not received with the unit received by the International Braille and Technology Center for the Blind. One had to be printed. Part of the problem was that Papenmeier changed dealers around the time that unit was purchased, but a Braille manual should come automatically with a $15,000 Braille device. There have been problems getting Braille manuals with many of the refreshable Braille displays, so the experience with the Braillex is not unique. The manual is above-average for a European manual, but still not great. There is some poor translation and poor writing, and some things are not explained very clearly.

Applicability to literacy: The Braille displays are probably best

suited for computer users with sophisticated needs. For basic word processing or other simple tasks there are less complicated displays on the market. However, for power users or those working with complex software or needing immediate access to the PC's display before the operating system is loaded, this may be the right display.

KeyBraille 360

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650; (916) 652-7253
    or (800) 722-3393
Manufacturer: PC-Visie, the Netherlands
Price: $6,995, $5,995 for 25-cell model
Size: 12.5 inches wide by 14.25 inches deep by 1.5 inches high
Weight: 7 pounds 11 ounces

Description: The KeyBraille is available in two models, a 25-cell and a 45-cell model. Five of the cells are used to display cursor and Braille display position information and status information. The KeyBraille is a flat, rectangular box with the Braille display on the top front edge. Behind it, and slightly elevated above, are six keys which are used to control the machine. These keys are located with three on each side of the machine. While the buttons are smaller, they are somewhat analogous to the six keys found on a Perkins Braille writer, and the manual refers to them in this manner.

The KeyBraille is designed to work with a Toshiba portable computer, although it will work with other portable and desk top systems. It will run on batteries and uses a Toshiba power supply. It hooks to the parallel port of a computer. It also requires the use of a software interrupt, normally IRQ 7.

The KeyBraille uses the Braille Writer key analogy when describing its commands. It does have a full set of commands, and a good deal of customization and configuring is possible.

Strengths and weaknesses: The quality of the Braille display on the KeyBraille is good. The Braille writer frame of reference used for commands is relatively easy to remember and will be familiar to virtually any Braille display user. However, in practice some of the combinations are a little awkward. For example dot 4 moves the display ahead 40 characters at a time and dot one moves it back by 40

characters at a time. Since many primarily read with the left hand, when they want to go back they either have to move the left hand from the display or reach over the left hand with the right to press dot 1. This is truly awkward. The KeyBraille does not have any cursor routing buttons, as do many displays.

There are problems getting the KeyBraille to work with some speech packages. Because it uses a parallel port and an interrupt, it was a little trickier than some to set up. Also, the memory-resident program necessary to run it is somewhat intrusive to the computer and will absorb some performance. Further, while there is a pass-through parallel port, its performance is adversely affected by the KeyBraille.

The unit will probably have its strongest appeal to those looking for a portable display they can use with a laptop computer.

Applicability to literacy: The use of the Braille writer paradigm for commands may make this device easier to teach than some. It also has a good Braille display. Finally, it may be of interest because of its potential portability.

KTS Brailloterm

Importer: American Thermoform Corp.
Address: 2311 Travers Avenue, City of Commerce, California 90040;
    (213) 723-9021
Manufacturer: KTS GmbH
Price: $6,995 for 40-cell model, $15,500 for 80-cell model
Size: 22 inches wide by 11.25 inches wide by 2 inches high
Weight: 10 pounds 12 ounces

Description: The KTS Brailloterm comes in 40- and 80-cell models. Across the front edge of the machine are either 40 or 80 metal studs or buttons, corresponding to the number of cells on that model. These are the cursor routing buttons. On the top front edge of the machine are the Braille cells. On either end of the Braille display there is a square button. The button on the left edge either goes back by 40 cells or by one line, depending on whether the device is a 40- or 80-cell model. The button on the right end of the display advances it down the screen. Behind the display is a slanting panel which contains 12 buttons. These buttons are used to control the different functions of the machine. They are labeled from left to right: zero through nine, Memory, and Pound (or Lozenge as the manual calls it). The slanted area then goes straight down to a flat surface which extends to the back of the machine. This platform can hold a keyboard. The back of the slanted area is straight up and down, creating a little wall which holds the keyboard in place behind the Braille display and control buttons. The back edge of the machine contains the power cord, on/off switch, and port for connecting the KTS to the computer. The connection is made via hardware, so there is no software to load. There is a half card which goes into an expansion slot of a PC. One may have a little trouble finding it a free memory address; it took a phone call from Germany for one user, but once that was done there were no further problems.

Strengths and weaknesses: The KTS Brailloterm has the best arrangement on the market for accommodating the Braille display and

computer keyboard. There is a flat platform to hold the keyboard and a small barrier to hold it in place. The only display that comes close to this convenience is the $25,000 Baum DMFM80. The numbered keys provide a simple way to enter line numbers for the display to go to directly. They can also be used as Brailling keys to enter search terms directly. The KTS is straightforward and relatively simple to operate. The up and down keys on either end of the Braille display are a useful feature which puts them where the hands are for reading. It is possible to monitor up to five lines for changes, with the KTS. There is also a memory key which will return the reader to a prior location. Finally, it is possible to program in an "offset" on the 40-cell model. If there is a left margin of spaces, the display can be made to ignore them, using this offset command.

On the negative side it is not possible to display characters and their attributes at the same time, as with some displays. It is necessary to toggle between a text and an attribute mode. There are also no status cells to display cursor and display location. One also must toggle to a status display, which is complex and cryptic. The 80-cell display is a little noisy when the lines of Braille snap into place.

There has been some difficulty getting a proper Braille manual from American Thermoform. The manual finally obtained was for a slightly different model from the one actually available. It is for a model intended to be used only with a Toshiba laptop computer. Finally, a call for technical help was ultimately answered by the manufacturer in Germany. This raises some concerns about the ability to provide technical support in the United States.

Applicability to literacy: As far as using this model for Braille literacy training is concerned, what has been said for the other devices applies. As displays go, this is one of the simpler units. A beginner could be reading with it fairly quickly.

Navigator

Vendor: TeleSensory, Inc.
Address: 455 North Bernardo Avenue, Post Office Box 7455,
     Mountain View, California 94039-7455; (415) 960-0920
Price: $4,500 to $16,000
Size: 12 inches wide by 12.5 inches deep by 1.75 inches high for 40-
     cell 6-dot model
Weight: 5 pounds, 11 ounces

Description: The Navigator is the refreshable Braille display
manufactured and sold by TeleSensory, Inc., of Mountain View,
California. It comes in 20-, 40- and 80-cell models. The 20-cell model
is only available in a 6-dot Braille configuration, the 40-cell model is
available with either 6-dot or 8-dot cells and the 80-cell model is only
available with 8-dot Braille cells. Some Navigator models are
equipped with and able to operate under battery power. The model
evaluated by the International Braille and Technology Center for the
Blind was a 40-cell 6-dot unit.

Like the other displays, the Navigator is a low, flat, rectangular
box. On the International Braille and Technology Center for the
Blind's model the front panel contains ten buttons in two groups of
five. The buttons are mirror images of each other. In between the
two groups is a jack, similar to a RJ-11 modular phone jack. This is
used to hook a BrailleMate to the Navigator. In this mode the Braille
keyboard on the BrailleMate can be used to input 6- or 8-dot Braille to
the Navigator and/or to display information from the BrailleMate on
the Navigator. The Navigator display can also be split, part of it used
for the BrailleMate and part of it for the Navigator itself.

The two panels of five buttons are arranged in a square of four
buttons with a smaller button to the side. In the middle of each
square are two long horizontal buttons. These are the up and down
buttons. On either side is a vertical button, one of course the left and
the other the right. The smaller button on the side performs a variety

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of functions depending on whether it is on the left side or the right side, and the mode of operation of the Navigator. These functions include an Enter key, linking and unlinking the Braille display window from the cursor, and invoking View2, the real-time Braille translator. For the most part, the right-hand panel of buttons controls the reading window and the left-hand panel controls the system cursor. The back panel of the Navigator contains input and output connectors, an on/off switch and power cord. The Navigator is hooked to the host computer via a serial port.

The Navigator comes with software called GATEWAY. This is the software that controls its functions and interactions with the host PC. It also comes with a utility called TRACK which allows the user to track alternate soft cursors with TeleSensory products—Navigator, Vert, Vista, etc.

Strengths and weaknesses: The Navigator is a capable, full-featured Braille display. There are lots of options and parameters which can be changed. Many of these are changed via command-line switches which are used at the time the GATEWAY program is invoked. A need to change, add, or delete parameters can be met by re-executing the GATEWAY program with these or additional parameters. The GATEWAY program allows use of either a standard QWERTY keyboard for input and control or conversion of eight keys for entry of data in Braille. It is also possible to use a BrailleMate, as mentioned above. The Navigator uses a variety of chorded commands in its operation. A chord is a command in which a character is typed and the space bar pressed at the same time. This kind of command is common to devices using a Braille keyboard. These chords are used with either QWERTY or Braille input.

The Navigator is also sold with a program called VBPC for VersaBraille PC. This program uses the PC to emulate the VersaBraille. VBPC is a menu-driven program that includes an editor, file reader, file and directory manager, print utilities and more. Some users contend that the program has a number of bugs which

TeleSensory does not seem anxious to fix. Some units have also had problems with Braille cell reliability, although panel members have not heard of any particular problems of late.

The TeleSensory line offers possibilities with integrating different systems, that is using speech, Braille, and/or large-print displays at the same time. While it is possible to get other products to work together, it may take some fiddling. The company has always pushed the fact that its products are designed to work with each other.

Applicability to literacy: The use of, and possible integration of, different access modalities when using Telesensory products, including the Navigator, may be of interest to some who are teaching Braille or computer skills. Other than that, the Navigator is a readable, fairly sophisticated refreshable Braille display.

MULTIPURPOSE BRAILLE DEVICES

The following devices serve more than one purpose. In general they can serve as a refreshable Braille display for a PC and have at least one other function, perhaps as a note-taker or as a stand-alone computer which can run other software.

Alva Braille Carrier

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650; (916) 652-7253
    or (800) 722-3393
Manufacturer: Alva
Price: $9,000
Size: 12 inches wide by 10.25 inches deep by 2 inches high (5.5 inches
    high when the Atari Portfolio is opened)
Weight: 6 pounds 10 ounces

Description: The Alva Braille Carrier (ABC) is a battery-
powered 43-cell refreshable Braille display with a built-in 8-dot Braille
keyboard and an Atari Portfolio personal organizer. The Portfolio,
which is fully integrated into the operation of the ABC, is a small
computer which runs a number of dedicated applications. These
include an address book, calendar and diary, editor and spreadsheet.
The user can run all of these applications using the ABC's Braille
keyboard, getting feedback from the Braille display. The applications
are simple, menu-driven programs, designed to aid an individual with
personal management. The Portfolio is quite small, approximately six
inches square and 3/4 of an inch thick when closed, and is mounted on
top of the ABC. The whole unit can run on batteries and is designed
to be portable. It comes with a carrying case with shoulder strap.

The ABC can also act as a refreshable Braille display for an IBM
or compatible computer. It is similar in operation to the Alva Braille
Terminal (see above). It is also possible to run the PC from the
Braille keyboard of the ABC.

Strengths and weaknesses: The applications on the Portfolio
seem to be straightforward and easy to use. They are not complex,
full-featured programs but would meet many individual needs. The
system comes with both serial and parallel interfaces, although only
one can be used at a time. A user can either store data on a RAM
card or transfer it to a PC. When used as a refreshable Braille

display, the ABC can either be hooked up as a serial or a parallel device, providing maximum flexibility. The device is on the expensive side, costing $9,000. An 8-dot Braille display generally sells for between $6,000 and $7,000, and an Atari Portfolio is a couple of hundred dollars. This means that a good deal of money is being paid for the Braille keyboard and the integration of the system. Like most systems employing a Braille keyboard, it is possible to produce all the keystrokes needed by a PC, such as Alt, Control, Shift, Escape, and other combinations, but some of the sequences get a little complicated.

Applicability to literacy: Pressing a key on the Portfolio causes the Braille character to appear on the Braille display. Thus it could be used with a sighted teacher or tutor to show, quiz, or test a Braille student. It is also possible to rotate the Portfolio by 180 degrees so it faces away from the person using the Braille keyboard and refreshable Braille display. This feature could facilitate communication and/or teaching between a deaf-blind person and a sighted teacher.

David

Importer: Baum U.S.A.

Address: Baum USA: Accessibility Technologies, 17525 Ventura
    Blvd., Suite 303, Encino, CA 91316; (818) 981-2253 or (800)
    225-3150

Manufacturer: Baum GMBH, Germany

Price: $15,000

Size: 12.75 inches wide by 10.5 inches deep by 2 inches high

Weight: 8 pounds

Description: The David is an 80386-based notebook-style
computer with a built-in 40-cell Braille display and a Braille keyboard.
The unit also has integrated speech synthesis based on technology from
Berkeley Speech Technologies. It is a fully functional MS-DOS
computer. The unit is battery-powered and can work as a portable.
It comes with a leather briefcase-style carrying case, and battery life is
from 3.5 to 5 hours.

From front to back the David has an 8-key Braille keyboard with
space bar and two extra keys called Extension keys. The Extension
keys are used for cursor movement or are the Escape key when
pressed together. To the right of the regular Braille keyboard is a PC-
style numeric keypad. Above the keyboard is the 8-dot, 40-cell Braille
display. There are also four status cells on the left side. Further,
there are three "Display" buttons on either end of the main Braille
display. These buttons, separately or in combination with each other,
are used to control the part of the computer screen the Braille display
is reading or moving to. Directly above the Braille display are 40
reference dots topped by 40 optical sensors which are used for cursor
routing and other functions. Finally, at the top are 12 function keys.
On the left side of the machine are a 3.5-inch 1.44 megabyte floppy
disk drive, the power adapter connector, on/off switch, speech
on/off/volume control, and earphone jack. On the right side are
connectors for a VGA monitor, external QWERTY keyboard, serial
and parallel devices, and an expansion connector. The computer does

not have any standard expansion slots.

Strengths and weaknesses: The David is a power user's dream or nightmare, depending on one's perspective. The David is a very powerful and complex device. Virtually all parameters and settings can be changed. The unit's speech synthesizer has four possible languages—English, Spanish, French, and German—and can switch between any three of them. It is also possible to load and use a variety of Braille input or output tables, including those used in the U.S., Europe, and Russia. Most commands can be issued from the keyboard, using the numeric keypad or using the display keys and/or with the function keys. Consequently, there are potentially hundreds of commands and variations, and the user can re-assign all of these commands. Further, some commands, macros, reading functions, etc., can be issued by using the optical sensors. All of this makes for a very powerful and complex device. For a power PC user with strong Braille skills and the need and/or desire to use a Braille PC, this is probably the ultimate device. For most of the rest of us, it is expensive and overly complex.

The David came to the International Braille and Technology Center for the Blind without a Braille manual. For the $15,000 price tag this is an inexcusable deficiency. The company has said that such a manual would be too large, that it is in process, and that the device is changing so that they didn't want to do the manual prematurely. This suggests that the device was probably released earlier then it should have been. There were a number of bugs in the software, some of the manual sections weren't done, and some promised software, such as a menu-driven PC control program called Vision, was not included at all. Baum has been talking about an upgrade for a number of weeks now, and at least one user has been testing it. The current machine has a real-time Grade 2 Braille translator in it. It is possible almost instantly to switch to Grade 2 Braille from Computer Braille. However, the translation is restricted to the current screen. One must switch out of it, bring up another screen, and invoke it again. The upgrade reportedly will have real-time translation with no

screen switching restrictions.

The David will ultimately probably be a very powerful and complete Braille computer, but at this point the software hasn't caught up with the hardware.

Applicability to literacy: Like most other refreshable Braille devices, the David has the potential to offer immediate feedback in Braille. It can also be used with a regular computer keyboard so someone who does not know Braille well could assist a student. However, because of its expense and complexity, this is probably not the ideal device for most students of Braille.

Notex 40

Importer: ATR Computers, Inc.
Address: ATR Computers, 4420 Norledge, Kansas City, Missouri
    64123; (800) 421-9775
Manufacturer: F.H. Papenmeier GmbH and Co.
Price: $6,995
Size: 11.5 inches wide by 8 inches deep by 2 inches high
Weight: 7 pounds

Description: The Notex is available in 25- and 40-cell models. The panel evaluated the Notex 40. It is a stand-alone refreshable Braille note-taking device. It can also serve as a refreshable Braille display for a PC and can be used in conjunction with a modem to communicate with other computers, on-line services, and/or electronic mail services.

The 8-dot Braille display is located on the top of the machine on the front edge. Directly behind it and slightly elevated are nine function keys which are used for controlling different aspects of the device. Behind these keys, toward the rear of the machine, are the eight Braille keys and four arrow keys which are used for moving the cursor. The rear panel of the machine contains an on/off switch, reset button, power adapter plug, and serial port.

Strengths and weaknesses: The Notex is designed primarily as a stand-alone Braille note-taker/editor. The editor is simple and easy-to-use. It offers basic editing functions, inserting, deleting, block moves, etc., but no more. There are also utilities to facilitate the transfer of data between the Notex and a PC. The device can also be used as a refreshable Braille display for a PC. In this mode it has adequate features, but nothing elaborate. A need primarily for a refreshable display suggests purchasing a unit intended for this purpose. If one wants a note-taker and a display, the Notex might suffice. The Notex has a menu-driven system for setting and changing parameters. It is straightforward and easy to use.

The basic design of this machine makes using it uncomfortable. Since the Braille display is in the front, function keys in the middle, and Brailling keys in the rear, one must constantly reach over everything to enter data. Papenmeier representatives say that it was designed this way because most people spend their time reading, not writing. This may be true; however, most like to rest their hands when writing, and this is not possible with this device. Further, the keyboard and other keys are totally unsatisfactory. They are rubber squares which stick up. That alone would not be so bad; however, they also wobble a lot when pressed down. The feel is uncomfortable, and it is difficult to tell if a key press has registered or not. It is very difficult to Braille rapidly and accurately on the keyboard, arguably the poorest keyboard on any Braille device in the International Braille and Technology Center for the Blind.

The Notex is somewhat slow in its operations, such as inserting and deleting characters, refreshing the Braille line after other operations, searching, etc. It does not use standard PC file conventions. It has 256K of memory, of which approximately 30K is used by the machine itself. The remaining memory is broken up into blocks which are used to store data. Multiple blocks can be used for contiguous data, but one must then navigate from block to block to find or place things. Users can also go directly to a block if they know its number. In transmitting data to a PC it is necessary to mark the beginning and end of the data so the device knows what to send. This is more awkward than using files. Further, for receiving data from a PC, it is necessary to mark out an area for it or existing data will be overwritten.

Users can enter data in whatever form they wish: Grade 1, Grade 2, or Computer Braille—the device doesn't care. There is no back translator, however, such as in the Braille 'n Speak. One can, of course, send data to a printer, and the Notex will do simple formatting.

Applicability to literacy: As mentioned earlier, this is a simple

and easy-to-use device. It would be relatively easy to teach someone how to use it to write and edit in Braille. However, its features are quite limited, and some things, such as the memory management scheme, are awkward at best. As a note-taker the device is expensive, large, heavy, and limited. As a refreshable Braille display, it is not as full-featured as its big brothers, including displays made by Papenmeier. Most people will outgrow the editor in the Notex in short order, so considering the price, weight, and limited features, it has little to recommend it.

Personal Touch

Importer: Blazie Engineering
Address: 105 East Jarrettsville Road, Forest Hill, Maryland 21050;
    (410) 893-9333
Manufacturer: Elinfa
Price: $3,995 for 20-cell model, $6,995 for 40-cell model
Size: 9 inches wide by 2.5 inches deep by 2 inches high (when closed)
    and 2.5 inches high (when opened)
Weight: 1 pound, 3 ounces

Description: The Personal Touch, which is made in France, is a small, portable note-taker with a 20-cell refreshable Braille display and a Braille keyboard. It uses 6-dot Braille, not 8-dot Braille.

When closed the Personal Touch is a compact rectangular unit. It comes with a leather carrying case. The top portion folds back from the base at a 90-degree angle, exposing the Braille keyboard. When viewed from the side, the Personal Touch is in the shape of a print L. The base contains the keyboard and the upright section contains the Braille display on the left and the cursor keys on the right. These things are located on the top edge of the upright section. The feel of the Braille display is very good.

Strengths and weaknesses: The Personal Touch is a basic note-taking device. Like some other portable devices, it allocates memory in blocks. It does use standard file conventions, unlike the Notex; and, unlike the Braille 'n Speak, it can allocate and deallocate memory blocks to files as needed. This makes file management on the Personal Touch relatively easy. It has basic editing functions—insert, delete, block moves and block deletes—but little else. It is a very simple editor. Unlike other devices, the cursor is never shown by a full cell or a special symbol such as dots 7 and 8. The cursor is always assumed to be at cell 20, at the right edge of the display. This takes a little getting used to, but it works fine.

In addition to acting as a note-taker, the Personal Touch can transfer files to and from a PC. It also has software for the PC which allows it to be used as a refreshable Braille display. This software is relatively simple, with limited options, but would give one basic access to the PC. It allows users to move around on the screen, search for text, or search for attributes, such as underlining and blinking text. There are no configuration options for customizing settings for an application and saving them. The device also has commands which will work with the disk drive that Blazie Engineering sells.

When the unit is showing the file list it beeps every two seconds. The beep is somewhat annoying and there is apparently no way to quiet it or turn it off. This could be a problem in a classroom or other public situation. The keyboard has a positive feel, but the space bar is located below the regular keys. Some may find this a little uncomfortable, but one likely would get used to it.

The Personal Touch is lightweight and compact. If one's need is for a basic Braille note-taker, this will do the job. However, its features are so basic that most people will outgrow it.

Applicability to literacy: As mentioned earlier, the Braille display has a good feel to it. The dots are easy to feel and aren't mushy, like some displays. The Personal Touch offers basic Braille note taking and PC access. It has one command which might be of interest to sighted persons and/or Braille teachers. It will automatically send data out the serial port, to a PC or other device, every time the Braille display changes. This would allow a sighted person who doesn't know Braille to follow what a Personal Touch user is doing.

(Note: Shortly after the completion of this review, Blazie Engineering discontinued sale of the Personal Touch.)

NOTE TAKERS

This category includes small, hand-held, computerized devices used for note-taking. Three out of four of the reviewed devices employ a Braille keyboard. All of the reviewed devices employ speech as their primary means of output. One device, the BrailleMate, has a one-cell Braille display.

These devices offer simple applications and are generally used for note-taking; simple writing; and the maintenance of calendars, diaries, and other schedule information.

The Braille 'n Speak, from Blazie Engineering, is probably the most successful access device to date, with well over 10,000 sold. At any gathering or meeting of blind persons you are likely to see one or more of the ubiquitous devices. We also expect a number of new devices in this category over the next two years.

BrailleMate

Manufacturer: TeleSensory, Inc.
Address: 455 North Bernardo Avenue, P.O. Box 7455, Mountain View, CA 94039-7455, (415) 960-0920 or (800) 227-8418
Size: 8 inches wide by 3 inches deep by 1.25 inches thick
Weight: 1 pound
Price: $1,595 for basic unit, $100 for carrying case and cables, and $295 for 512K RAM card
Battery Life: Up to 6 hours
Major Features:
> 8-dot Braille keyboard
> 8-dot refreshable Braille cell
> speech synthesizer (optional on international orders)
> serial port and combination serial/parallel port
> 128K internal memory
> external RAM cards for augmented storage
> 6-function calculator, phonebook, and appointment utilities.
> In addition, BrailleMate may be used as a speech synthesizer for a computer with any screen-reading program that supports a PORTTALK device.

Description: The BrailleMate is a portable, electronic note-taking device incorporating an 8-dot Braille keyboard (plus 2 function keys) as input and a single refreshable 8-dot Braille cell and speech synthesizer as output. Several ports are provided to interface BrailleMate with other devices such as TeleSensory's Navigator Braille display, computers and printers such that data may be transmitted from the BrailleMate to the Navigator, transmitted to either ink-print printers or Braille embossers from the BrailleMate or transferred between the BrailleMate and computers. The BrailleMate may also be used as a dumb terminal for communications with mainframe computers, BBS's and the like. External storage in the form of battery-powered RAM cards may be added to BrailleMate to augment its 128K bytes of internal memory.

Strengths: The 8-dot, refreshable Braille cell allows BrailleMate to be used by a deaf-blind person who knows Braille. Although BrailleMate normally uses tones to augment the information imparted by the Braille cell and speech output, a parameter may be set which instructs BrailleMate to substitute a vibrating Braille cell for the tones. Although the single Braille cell does not lend itself to reading of extended amounts of material, it does allow a deaf-blind person to use BrailleMate as a note-taker independently and, in the reviewer's opinion, provides a small, lightweight means for access of electronic data by a deaf-blind person. The single Braille cell also allows any user to check something quietly or see where the cursor is located.

Where extensive overwriting of material is required in order to correct errors, BrailleMate shines since one may go to any point in text already entered and overstrike as much text as is desired without the necessity of executing a command to overwrite each character. (BrailleMate has, of course, an "insert mode" also.)

Because of its 8-dot Braille cell, BrailleMate allows easy identification of capital letters without the necessity for use of phonetic spelling by the speech synthesizer.

BrailleMate can perform a search-and-replace operation in one step. That is, one need not find the text to be replaced, delete it, and then insert the desired text in separate operations. BrailleMate's phonebook and appointment book have fields automatically labeled and set up so that the user need only find the correct field and enter the appropriate data. The BrailleMate user need not be aware of memory management functions (such as sizing of memory files) except, perhaps, to check periodically to make sure that a prudent amount of memory is still available for the work in question.

Cursor (text pointer) movement may be done by either hand (the other hand, presumably, reading the Braille cell); leftward cursor movement key combinations are to the left of rightward cursor movement key combinations with either hand. BrailleMate can mark

up to 9 positions in each file in memory (internal or on RAM card), and one can immediately go to any one of those markers.

The BrailleMate can easily be attached to all printers, since it has a parallel and a serial port. The BrailleMate does provide some indication of battery charging rate. The BrailleMate software can be updated without the need to change hardware ROMs.

Weaknesses: Cursor movement key combinations are not symmetric. That is, the finger combination required to perform a given cursor movement by the left hand is not the same required to perform the identical cursor movement by the right hand. There is no true "one-handed" mode. That is, while the cursor may be moved by either hand (and thus text may be read by either hand), most other functions require depression of "chorded" combinations (depression of keys simultaneously with the space bar) and/or depression of the two function keys, known as Shift Left and Shift Right. This may require considerable finger dexterity and might prove difficult or impossible for those with hand movement restrictions or who only possess one hand. Further, some functions such as deleting by word, sentence, or paragraph take numerous keystrokes to perform.

The user is, to some extent, isolated from the format of documents which may be downloaded into the BrailleMate. For example, while there are "read word," "read sentence," and "read paragraph" commands to BrailleMate, paragraphs are indicated by the existence of a special print format code, $<\$p,>$ and there is no "read line" function per se. Thus, in order to format a received document such that it could be read paragraph-by-paragraph, one would have to do a global search-and-replace of the paragraph indicators (for example, two consecutive carriage-return/line-feed pairs) with the appropriate print format code. In similar fashion, BrailleMate recognizes a printer code to indicate, for purposes of printing a document in either print or Braille, that the printer should be forced to skip to a new line, rather than by use of a carriage-return/line-feed pair. Thus the user may feel isolated from the form of a received

document, and although the printed form of the document may not be relevant to reading, there are times when knowledge of the form might prove useful. The recent upgrade of the BrailleMate offers commands to read the previous, current, and next line although they use the aforementioned $1 indicator and not the more commonly used carriage return/line feed combination.

Viewing and setting of parameters controlling the various functions of BrailleMate tend to be cumbersome. Users often must go through a hierarchy of menus to get to the desired function, and they must then view the various choices in order to make a selection. Attributes such as whether the back translator is on or off and page formatting settings cannot be established and saved on a file-by-file basis, as with the Braille 'n Speak. They are set on a "global" basis.

Although 128K of memory is often quite adequate for normal note-taking and noting of phone numbers, addresses and appointments, it can prove inadequate when BrailleMate is used as a terminal communicating with mainframe computers or on-line data services such as CompuServe or GEnie when capturing large amounts of data. One must presumably use RAM cards with a capacity larger than 128K bytes in order to handle such situations.

There appears to be no way to transmit either a single line of text or a marked block of text to an I/O port from a file in either internal memory or on a RAM card; when doing file transfers, an entire file must be transmitted. The BrailleMate cannot handle file transfers in any but ASCII protocol. It cannot, for example, handle file transfers using Xmodem or Kermit protocols as can the Braille 'n Speak 640.

The original BrailleMate could not execute "macros". That is, it could not execute automatically a sequence of commands via a few keystrokes substituting for the much larger number of keystrokes required to carry out the commands. A recent upgrade adds "macro" capability. A macro can contain up to 255 characters.

There is no means to use an exceptions dictionary for words or phrases which are mispronounced.

Memory: 256K program memory, 128K user memory plus external RAM cards which come in several sizes, minimum 64K

Comments: To some extent, what computer-literate individuals may view as weaknesses in BrailleMate might be viewed by the computer novice as advantages. Thus, for those familiar with computers, an intimate knowledge of the content and format of files might be desirable. For computer-novices, however, what a received document looks like may be immaterial as long as it may be read satisfactorily. Hence, a function such as "read a line" may not be missed. Similarly, if one is taking notes, one is not likely to be concerned with format and will be content to let the note-taker do any required formatting if the notes are to be printed. Whether one prefers entering of format codes (as on the BrailleMate) or actual characters (as with other note-takers) is likely a matter of preference and what one has become used to. It should also be noted that in order to make a sensible accommodation to a refreshable Braille cell, TeleSensory had to make what amounts to two reading modes—one for Braille and one for speech. In the opinion of the panel, the reading mode using speech alone executes somewhat awkwardly although it works quite well.

The BrailleMate is a good electronic note-taker. It does the jobs for which it was intended well. Whether a single refreshable Braille cell provides enough benefits in most situations to warrant its inclusion in the device is a matter for debate. Also, certain design decisions (such as that to use external RAM cards for extra file storage capacity rather than interface BrailleMate to a disk drive) have placed limitations upon BrailleMate which may prove, in the long run, frustrating to the dedicated user.

Applicability to literacy: The BrailleMate, as well as the Braille 'n Speak, has some possibilities in the teaching of Braille. This is

primarily because of the built-in speech synthesizer, the device will say a letter or contraction as soon as the keys are pressed and released. The BrailleMate has the added advantage of the single Braille cell, so the user could feel what he/she has written. One must be realistic about the purpose and use of the single cell, but it does have possibilities.

Braille 'n Speak

Manufacturer: Blazie Engineering

Address: 105 East Jarrettsville Road, Forest Hill, MD 21050; (410) 893-9333

Size: Approximately 8 inches wide by 4 inches deep by 1.25 inches thick

Weight: Approximately 13 ounces

Price: $1,349; $1,299 if prepaid; three months warranty; $99 annual service contract

Battery life: 15 hours

Major features:
- note-taker
- word processor
- stopwatch
- four-function calculator
- scientific calculator
- smart appointment calendar
- speech synthesizer that can be used with most screen access programs; help file is included.

Description: Braille 'n Speak (BNS) gives an initial impression of simplicity itself; its only moving parts are the seven keys arranged like a Perkins keyboard, and the power on-off switch. It has two jacks—one for a power adapter, and one for an earphone or external speaker. It has two ports—one for connection to an external serial device, and one for connection to an auxiliary battery-operated disk drive. For users who prefer it, Blazie Engineering also markets a device called Type 'n Speak in which the Braille keyboard is replaced by a laptop-style QWERTY keyboard (See below for review.)

Strengths: The memory is non-volatile, so that no information is lost when the power is turned off; includes a "back-translator" which makes it possible to input text in Grade Two Braille and then print out or listen to the text in standard form. The device is extremely versatile and capable of performing many useful everyday functions.

Excellent technical support is available.

Weaknesses: BNS is not a full-fledged computer and its operating system is proprietary. Data is stored in the BNS's memory which will eventually become full. One must then either delete files—losing them forever, print them on paper, or transfer them to a computer or Blazie disk drive. Most people who own and use a Braille 'n Speak have had a "crash" at one time or another. This is generally, but not always, caused by allowing the batteries to discharge too far. Care must be taken to protect your data.

Output options: In addition to its synthetic speech output, BNS can be cabled to any external serial device such as a computer, a modem, a printer, a Braille embosser, or a refreshable Braille device such as the VersaBraille; it can also receive data from an external computer, modem, or refreshable Braille device through its serial port. A connecting cable comes with the BNS. A serial-to-parallel cable is also available at extra cost.

Memory: The BNS memory is nominally rated at 640K. Of this memory, about 40K is used for overhead, leaving in excess of 600K for unrestricted use. A less expensive version of BNS is still being sold with 256K of memory and fewer major features.

Interfacing options: In addition to the interfacing options described above, BNS can interface with an auxiliary battery-operated disk drive which uses 3.5-inch diskettes. Using BNS commands, a disk can be formatted, a file can be deleted from the disk, a file can be loaded from the disk into the BNS memory, a disk directory can be created, removed or interrogated, a file in the BNS memory can be saved or printed to the disk, and the disk volume label can be interrogated or changed. These diskettes are compatible with IBM or IBM-type computers, so that they can be freely ported from the BNS to a computer and conversely. The price of the auxiliary disk drive is $495. It comes with a 3-month warranty, and a $75 annual service contract is available.

Applicability to literacy: The Braille 'n Speak is undoubtedly the most widely used access aid for the blind. In some meetings of blind persons one strains to hear the speaker against a background of Braille 'n Speak key sounds.

Most people find it easier to learn to write Braille than to read it. This is a situation that the Braille 'n Speak perpetuates, although this isn't bad for everybody. There are diabetics who do not have the finger sensitivity to learn to read Braille, but they are very good BNS users because they can still use the keyboard. Further, the BNS will immediately say the letter or contraction when its keys are pressed, so it offers a lot of verbal reinforcement for a Braille student. It has been used in the teaching of Braille writing, and it can be very effective. It should not be substituted for basic skills, particularly learning to use a slate and stylus, but it does have its place in Braille literacy training.

Eureka A4

Manufacturer: Robotron, LTD.
Vendor: Integrated Assistive Technologies
Address: Integrated Assistive Technologies, 250 H Street, Box 751,
      Blaine, WA 98230; (800) 688-9538
Size: 12 inches wide by 8 inches deep by 1.25 inches thick
Weight: 3 pounds 14 ounces
Price: $2,195 to $2,584
Battery Life: Six to seven hours
Major features:
      note-taker
      word processor
      simple data base
      music composer
      diary
      clock/calendar
      thermometer
      BASIC computer language
      disk drive
      modem
Available accessories:
      color sensor
      light sensor
      volt meter
      hand scanner/OCR package

Description: The Eureka A4 is a portable computer/note-taker with a Braille keyboard and built-in speech synthesis. The unit is manufactured in Australia and has a decided Australian accent.

The Braille keyboard is on the top panel of the device, more toward the left side. To its right are five keys in a diamond shape, with the fifth key in the middle. These are the cursor control keys and a "shift" key that is used in conjunction with other keys. Above the Braille keyboard, which is 6-dot Braille, are eight function keys.

These keys invoke different applications that the machine has and perform other functions within those applications. Above the function keys, toward the right side are two sliders, one for volume and one for synthesizer speed. The back panel of the Eureka contains a serial port and power plug. On the right side is a 3.5-inch disk drive, and jacks for the built-in modem are on the left side of the Eureka.

The Eureka is intended as a total solution for a blind person, an information management system all in one package. It has a Braille keyboard, and input can either be in Grade 2 Braille or in Computer Braille, what the manufacturer calls Grade 0 Braille. When the user writes in Grade 2 Braille, contractions are reverse translated as they are written, and the correct characters are stored in the Eureka's memory, and/or on disk. What is maintained is an ASCII file, not a Grade 2 file. This is different from some Braille note-takers, such as the Braille 'n Speak, which back translates as one reads but maintains a Grade 2 file. There is a Grade 2 translator available for the Eureka called Braille Master. The use of this translator on the Eureka is quite slow since it involves some disk swapping. What are called "Star" commands must be inserted into the file to control formatting. Available are British or American Braille. Braille Master is also available in a PC version but isn't widely used in this country.

Strengths: The Eureka A4, while not widely used in the United States, has had more success overseas, particularly in Australia and England. Its following in North America is small but dedicated. It is available in a number of foreign language versions.

It is intended for the person who wants an electronic solution to his/her information needs but who doesn't want a full-fledged computer. Because of the number of built-in applications, it is able to meet the total needs of some people. There are limitations to the hardware, and some applications are better than others, but there is a lot there.

The word processor is essentially a version of WordStar with

added audio cues. Another popular major application of the Eureka is the Music Composer. The basic unit has a 4-voice synthesizer, and the advanced music option has a 9-voice model. At least on the basic model, though, one finds the music synthesizer voices to be very similar. The Eureka does give the blind musician the means to write music independently. One can do it either by entering notes, time signatures, etc. into the Eureka's memory, or by using arrow keys to move up and down the staff, marking the notes wanted. The Advanced Music Option then allows printing out in ink-print the music one has written. This could be a very powerful feature for the music student.

The Eureka A4 has the ability to run programs written for the CP/M operating system. While not all programs will work, and the unit doesn't provide a lot of tools to make applications talk better, some things do work and some users have had good success experimenting with this feature. In terms of writing music and/or BASIC programs for the Eureka, the machine has become a hobby for some of its users. There are some very loyal and dedicated users in this country and around the world.

One experienced user described the Eureka A4 as being somewhat like having an XT with no slots, WordStar 4.2 and an early version of Tandy's DeskMate. Depending on one's needs and expectations, this can either be a positive or a negative.

Weaknesses: The major drawback to the Eureka A4, at least for Americans, is the speech. The synthesizer sounds Australian and is very difficult to understand. Even some Australians visiting the International Braille and Technology Center for the Blind have been unable to understand the speech.

Another major deficiency is the keyboard. The keys, which are rubber, are well-shaped and well-placed. However, they rock back and forth when pressed. Secondly, the machine responds to the keyboard very slowly, so it is possible for a fast Braillist to type ahead

of it. Some users hook up a regular QWERTY keyboard to the Eureka.

The basic unit only comes with a 300 baud modem and the Advanced Communications Option has a 1200 baud modem. Both are on the slow side, and the communications program is also somewhat limited. It supports very few transfer protocols. The built-in calculator rounds off numbers after the seventh digit so calculation errors can occur. There is also no way to drop the result of a calculation directly into a document unless it is saved as a file and imported. An updated calculator has been released on disk that fixes the calculation errors.

When operating on batteries the machine goes from having an adequate charge to needing charging rather quickly. If power is lost, it is possible to lose data in the Database, Calculator, or the Music Composer.

The Eureka A4 is turned on by pressing three keys simultaneously: dot 3, F1, and the up arrow. It is possible to turn the machine on accidently, such as by packing it in a suitcase where all the keys get pressed at once. The machine also times out and turns itself off after 5 minutes. This can be lengthened to 15 minutes, but can be a problem in one of the applications that isn't saved to memory (See above.) A better on/off system would be desirable.

Output options: The Eureka A4 is equipped with a serial port which can be hooked to other devices. It also has speech output, as mentioned above.

Memory: The Eureka A4 has 512K of memory of which somewhat less than 200K is available for use. The rest is used by the system. Memory is allocated among different applications, so the 200K is not available in one block. The largest document that the word processor can handle is 48K. The Advanced Edition has additional memory, approximately twice as much.

Interfacing options: The Eureka A4 is equipped with a serial port. It could be connected to other devices via that port. There is also a program available called PC Alien. It allows the user to transfer files to and from the Eureka to a standard IBM or compatible computer. Essentially PC Alien defines the Eureka as another disk drive for your PC. It is a little tricky to set up for many users, but it does work.

The Type 'n Speak

Manufacturer: Blazie Engineering

Address: Blazie Engineering, 105 East Jarrettsville Road, Forest Hill,
MD 21050; 410-893-9333, BBS: (410) 893-8944,
Fax: (410) 836-5040

Size: 12 inches wide by 6 inches deep by 1-1/4 inches thick (plus
another 1/4 inch clearance for keys)

Weight: One pound

Price: $1,395

Battery Life: 8 hours or more

Major Features:

   built-in editing with full cursor control

   clock

   calendar

   stop watch

   automatic reminders

   built-in speech synthesizer

   parallel port, serial port, and disk drive port

   full typewriter style keyboard with function keys and cursor
      movement keys

   six key Braille writing mode

   Braille back-translator

   internal, rechargeable batteries, which can be recharged without
      removal

   capacity to run external programs

   firmware stored on flash RAM so that it can be updated from an
      update file stored on a disk

Description: The Type'n Speak is a lightweight and compact
portable note-taker with a self-contained speech synthesizer. It has no
visible display. In addition, it can perform simple word processing
functions, operate as a computer terminal, or even work as a speech
synthesizer on another computer.

Strengths: The full-sized keyboard permits the user to perform

most editing functions just as would be done on a computer. However, the "Braille mode" permits the Type 'n Speak keyboard to be used as a 6-key Braille keyboard for fast and easy entry of Braille. A reverse translator can be used to turn Grade 2 Braille into print. The ability to run external programs that are loaded into the Type 'n Speak via a modem or disk drive provides a means of continually broadening the uses to which it can be put.

Weaknesses: The controls over formatting of printed text are limited. Although one can specify left, right, top, and bottom margins, as well as ask for automatic page numbering, there is no provision for other automatic page headings or centering. However, the ease with which the Type'n Speak's firmware can be updated means that such weaknesses may well be short-lived. In general, the strengths and weaknesses of the Braille 'n Speak apply to the Type 'n Speak.

Output options: Text can be printed or Brailled. If text was entered in Grade 2 Braille, it can be transmitted to a Braille printer as is or reverse translated and sent to an ink-print printer. Text and data can also be stored on computer diskettes using the optional disk drive or by sending data to another computer.

Memory: 768K (the actual amount of free memory available may vary with the version of the firmware)

Interface options: The Type 'n Speak can send data to its serial or parallel ports. Either can be used to drive an ink-print or Braille printer. It also has a connector for an optional disk drive that makes it possible to store data on a computer diskette. Of course, the serial port can also be connected to a modem or to another computer.

Applicability to literacy: Here again, those things which are true for the Braille 'n Speak are true for the Type 'n Speak. Since six keys can be used on the QWERTY keyboard for Braille entry, it can be used as a Braille teaching device. However, this form of Braille entry

may not be as comfortable as using a true Braille keyboard.

PLANNED EVALUATIONS

The following software package and devices, though currently available, have not been reviewed at this time. The panel anticipates being able to provide information about them in the future.

Braille-n-Print
E-Z Braille
Notex 486
Mini Braille
Mprint
Papenmeier 2D

BRAILLE TECHNOLOGY EVALUATION

International Braille

and Technology Center

for the Blind

David Andrews, Editor

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ACKNOWLEDGEMENTS

INTRODUCTION

The following evaluations of Braille-related technology were made by members of the Technology Evaluation Panel of the National Federation of the Blind, under the auspices of a cooperative effort with the American Printing House for the Blind (APH). This effort is supported by a Braille Literacy Training Grant to APH from the U. S. Department of Education, National Institute on Disability and Rehabilitation Research, with technical assistance from the International Braille and Technology Center for the Blind at the National Center for the Blind in Baltimore, Maryland. Each evaluation includes factual and descriptive information about the piece of hardware or software in question, as well as a discussion of its strengths and weaknesses. Further, there is also discussion of the product's applicability to Braille literacy training for adults.

All of the equipment and software reviewed is housed in the International Braille and Technology Center for the Blind. It is available for demonstration and evaluation. To make an appointment one may call (410) 659-9314. Prices for the reviewed products are listed, but prospective purchasers should be aware that these prices will likely change. Also, products are discontinued and new products introduced to the market on a regular basis.

Members of the Technology Evaluation Panel were as follows: Curtis Chong, Tim Cranmer, Mike Freeman, Steve Jacobson, Dr. Abraham Nemeth, Lloyd Rasmussen, and Jim Willows. They were assisted by David Andrews, Director of the International Braille and Technology Center for the Blind.

BRAILLE EMBOSSERS

Introduction

The objective of this section is to provide information on all of the printers that are currently housed in the International Braille and Technology Center for the Blind. The Center has attempted to obtain representative models of as many known products as possible. Included is factual information as well as the overall evaluation of the Technology Panel for each unit. While prices are subject to change and could vary from those listed here, all of the printers listed are at the time of this writing available in the United States and may be inspected at the International Braille and Technology Center for the Blind. Unless otherwise stated, a paper size of 11 by 11.5 inches is assumed when stating figures for cells per line and lines per page.

Because of their cost, size, and speed, some of the printers (with respect to Braille the terms *printer* and *embosser* are used interchangeably) reviewed below are likely not to be used in literacy training situations. They are intended for medium- or high-volume Braille production facilities. However, there are many embossers which are appropriate for low-volume production by individuals. All embossers appear in order by their price (from highest to lowest).

Braillo 400S

Type: Interpoint printer
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue,
    City of Commerce, California 90040; (213) 723-9021
Price: $77,995
Lines per page: 26
Cells per line: 42
Speed: 400 characters per second
Size: 41 inches wide by 26.5 inches deep by 44 inches high
Weight: 528 pounds

Description: The Braillo 400S is a large floor-standing embosser. It looks somewhat like a squared-off refrigerator. The paper feeds in from the back to the front. There are metal shelves which attach to the back and front of the printer to handle the paper supply and collection.

There are L-shaped doors in the front and back of the printer which can be raised to expose the paper feed and printing mechanisms or lowered to reduce the sound level. There is a panel with 16 buttons on the front of the printer, plus the on/off switch. The buttons are used to set and control different functions of the machine. The printer keeps track of how many pages it has printed. This information and other messages are displayed on a small visual display, information from which is not available to blind persons. The machine runs on 220-volt current. A transformer which steps up 110-volt current is available.

Comments: This is a very large and heavy-duty printer. It prints interpoint Braille at approximately 1200 pages per hour. Users report it has been quite reliable. It seems a little noisy, but that is not a serious problem when one considers how much work it is doing. The Braille quality is very high.

Thiel BAX-10

Type: Interpoint printer
Manufacturer: Thiel GMBH of Germany
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville
        Road, Forest Hill, Maryland 21050; (410) 893-9333
Price: $55,000 approximately
Lines per page: 27
Cells per line: 42
Speed: 300 characters per second
Size: 29.5 inches wide by 27.5 inches deep by 52.5 inches
        high
Weight: 322 pounds

Description: The Thiel BAX-10 is a large high-speed interpoint embosser. The printing mechanism itself is not actually that big, but the unit comes in a large enclosure.   There is a bottom cabinet which houses the electronics unit and a stack of fan-fold Braille paper, located behind two hinged doors. The top two-thirds of the BAX-10 is a second cabinet which houses the printing part of the unit. The front and top of this unit is a large plexiglass door which is hinged at the top rear and which swings up to provide access to the unit somewhat like opening the trunk of a car. The paper feeds up through slots in both cabinets, up the front of the embosser unit, and across the top and out the back of the sound enclosure. There are four buttons on the front of the embosser used to control different functions.

Comments: This printer has been available since the fall of 1991. It is large because it comes in a big sound enclosure. Even without this enclosure it is very quiet, and with the enclosure it is extraordinarily quiet. It produces good Braille and should be reliable. The printer comes with a MS-DOS-based setup program on disk. The program is not easy to use with speech access technology, and like the other Thiel printers, it can be a little

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confusing to set up initially. There are also attachments available which will burst and bind paper automatically. If noise is a problem, this is the quietest printer on the market at any price.

Type: Single-side printer
Manufacturer: Elbicon of Belgium
Address: N. V. Interpoint, Celestijnenlaan 48, B-3001 Leuven-
Heverlee, Belgium; Phone (32) 16 20 12 30
Price: $42,200
Lines per page: NA
Cells per line: 40
Speed: 300 characters per second

Description: In approach and looks this is the most unusual embosser in the International Braille and Technology Center for the Blind. It prints on a continuous roll of paper, cutting it off into individual pages as it goes. The roll of paper is housed at one end, below the body of the printer.

The whole unit is on wheels and is high, rectangular, and boxy. In the front of the machine is a hinged door that folds back and lies on the top of the unit. Underneath is a basket for catching pages as they come out. Control buttons and switches are housed on the right front side of the unit, and the paper is all the way in the back underneath. Below the paper-catching basket are the electronic components for the unit.

The whole printer is made of metal, and while some may regard its appearance as a little home-made, it is very solid. The designer has installed a number of interlocks and safety measures. For example, one cannot print while the lid of the printer is off. There are also chains around the back, held up by posts similar to those used for guide ropes in movie theaters. These are designed to keep the operator away from the large paper roll, perhaps excessive caution based upon the designer's having been warned about the possibilities of lawsuits in the United States.

Comments: This printer was designed and manufactured by a university professor from Belgium. Because it uses a

continuous roll of paper, the lines per page figure is irrelevant. It can be adjusted anywhere from one line per page to a very large number. The printer can handle paper up to 11.5 inches wide; however, 40 cells is the most it can print on one line. The printer seems to be very heavily constructed and is intended as a high-volume production printer, running five to eight hours a day. It is not widely distributed in the U.S.; the International Braille and Technology Center for the Blind has the first. This is probably its major drawback. Blazie Engineering is considering representing the manufacturer but has not made a final decision. The designer reports that he is working on an interpoint model which will print up to 3,000 pages of Braille per hour.

Braillo 200

Type: Interpoint printer
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue,
        City of Commerce, California 90040; (213) 723-9021
Price: $37,995
Lines per page: 26
Cells per line: 42
Speed: 200 characters per second
Size: 34.5 inches wide by 26 inches deep by 23 inches high
Weight: 386 pounds

Description: The Braillo 200 is half the price and half the speed of its big brother, the Braillo 400S. Unlike the 400S it is a table-top unit, but the table had better be a strong one. Other than being smaller, it is similar in design and layout.

Comments: The Braillo 200 seems to be a good printer and a more reasonable alternative than the Braillo 400S if one needs a heavy-duty interpoint embosser for high-production situations. It is in use at a number of sites around the United States.

TED 600

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
    Jay Street, Stuart, Florida 34997; (703) 683-5818
    or (407) 283-4817
Price: $37,500
Lines per page: 27
Cells per line: 42
Speed: Approximately 350 characters per second
Size: 25 inches wide by 28 inches deep by 43 inches high
Weight: 200 pounds approximately

Description: The TED 600 has been around for a number of years. It is housed in a large wooden cabinet. The paper sits on a shelf at the bottom. Above it is a door which is hinged on the left side. When opened, it reveals the mechanical and electronic innards of the embosser. The paper proceeds from underneath, up through the printer, and out the top of the cabinet through a narrow slot. It then folds over and goes across the top of the printer and down the back, where it is caught in a wire basket. There are six buttons and a small display on the front left of the unit, near the top.

Comments: This printer is based on somewhat older technology. Users have reported various problems with the printer. It has generally required frequent adjustments to its printing mechanism to keep it working. The company has improved it a good deal. However, the panel is cautious about recommending it to just anyone since for most people, the printer seems to require fairly regular adjustment by a knowledgeable technician. The Braille quality on the International Braille and Technology Center's unit is good.

Braille Express

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
    Jay Street, Stuart, Florida 34997; (703) 683-5818
    or (407) 283-4817
Price: $18,750
Lines per page: 27
Cells per line: 44
Speed: 160 characters per second
Size: 19.75 inches wide by 15.5 inches deep by 7 inches high
Weight: 52 pounds

Description: The Braille Express, like most Enabling Technologies printers, is designed with a cover and handle so it can be easily moved. However, at 52 pounds, it probably isn't something a user would want to do often.

The paper is loaded from the front of the machine. It goes across the top, under the embossing mechanism and out the back. The printer is equipped with both push and pull tractors. There is a panel of 16 buttons at the right rear of the top of the machine. Most of these keys are laid out like a calculator pad with a few extra keys such as on-line/off-line, linefeed and form feed. The key layout and most of the functions are identical to most ET printers, including the Braille Express, Marathon, Book Maker, Romeo, and Juliet. Settings are changed by entering sequences of numbers with the keys. If the user works with them often they are fairly easy to remember; otherwise, one has to look them up in the manual. This method of control isn't as simple as some, but after initial setup most people will not have to change things often.

Comments: This is a relatively new printer and is basically a fast Braille BookMaker. The panel is aware of no major problems with it, but reports are few. The quality of the Braille is good. It is somewhat noisy, but quieter than the BookMaker.

Resus RS-214

Type: Single-side printer
Manufacturer: Resus of Holland
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue,
     City of Commerce, California 90040; (213) 723-9021
Price: $15,995
Lines per page: 27
Cells per line: 40
Speed: 140 characters per second
Size: 20.5 inches wide by 17.25 inches deep by 36 inches
     high
Weight: 93 pounds

Description: The Resus is a floor-standing model. The metal legs are built onto the printer. The paper sits on the floor underneath the machine and feeds in through the bottom. It comes out the front and goes across the top of the unit and down the back. The printer has three buttons on the front right side. These buttons take it on line and off line, and so on.

Comments: There are mixed reports on this printer, which isn't very widely used in the U.S. The panel is aware of no serious problems with the International Braille and Technology Center's unit during the last two and a half years or so, but there were some initial problems when it was placed into use. Other users have reported that it requires a good deal of initial adjustment. Overall, it produces good quality Braille, and operators seem to have no complaints. It is not especially noisy, but it does sound unusual, rather like a piece of farm machinery coming up to speed and working. The company indicates that it is most reliable when used continuously for longer runs of printing as opposed to many short documents where it starts and stops repeatedly.

Thiel Beta /X3

Type: Single-side printer
Manufacturer: Thiel GMBH
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road,
      Forest Hill, Maryland 21050; (410) 893-9333
Price: $12,000 approximately
Lines per page: 26
Cells per line: 42
Speed: 130 characters per second
Size: 16.25 inches wide by 22.25 inches deep by 5.75 inches
      high
Weight: 84 pounds

Description: Like a number of others, this embosser comes with a metal lid and has a handle. It can be moved, but it is heavy. The paper feeds in from the front and goes across the top of the printer. It is equipped with pull-type tractors. There are six buttons and a switch on the right front of the top of the unit. These are used to control the printer. There is a cutout on the right side which contains the input cable connector, power cord and on/off switch which is actually a key the operator turns. The connection to a computer is made via serial port; there is no parallel connection.

Comments: This printer, which has been available since the mid-1980's, is generally considered to be very reliable. The International Braille and Technology Center for the Blind owns a number of them and considers them real workhorses. While they tend to be expensive to repair, they generally go and go and go. They are also relatively quiet units. The Braille quality is good. This unit, like all Thiel printers, can be a little confusing to set up. There is a dialogue of yes/no questions which is answered by pressing different buttons on the printer. The dialogue takes place in Braille. Some of the questions can be a little confusing until one gets the hang of the process.

Marathon

Type: Single-side printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
    Jay Street, Stuart, Florida 34997; (703) 683-5818
    or (407) 283-4817
Price: $12,995
Lines per page: 27
Cells per line: 42
Speed: 200 characters per second
Size: 18 inches wide by 15.5 inches deep by 6 inches high
Weight: 65 pounds

Description: The Marathon looks similar to other Enabling Technologies embossers. It is a desktop unit equipped with a metal case and lid and a carrying handle. The paper feeds across the top from the front to the back. There are pull-type tractors. The keypad is in the top right corner along with a small visual display. There is also a knob for controlling the height of the Braille dots. This is Enabling Technologies' only printer with such a control. On most of their other machines one controls dot height with codes entered at the keypad. The power cord and the serial and parallel ports are located on the back of the unit.

Comments: There are a number of these printers at the National Center for the Blind in Baltimore, and success with them has been mixed. There are a couple that have been very good performers and at least one that has exhibited some problems. In fairness it should be added that it was a very early production unit, and staff of Enabling Technologies feel that they have resolved its problems. Panel members also note some problems adjusting some units to the thinner Braille paper currently being used by many consumers. While the panel cannot recommend this printer without reservations, overall it is a good unit. It is a little noisy, but fast and a good bargain, relatively speaking. Finally, Enabling

has been very willing to work toward resolving problems with this printer.

The Braille BookMaker

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
    Jay Street, Stuart, Florida 34997; (703) 683-5818
    or (407) 283-4817
Price: $10,500
Lines per page: 27
Cells per line: 44
Speed interpoint: 80 characters per second
Speed single-sided: 50 characters per second
Size: 20 inches wide by 15.5 inches deep by 6.5 inches high
Weight: 52 pounds

Description: This unit has the fairly standard Enabling Technologies design and layout. The top of the printer, which covers the embossing mechanism, etc., is made out of a plastic-like material. It is metal on some of the other units. Its layout and controls are much the same as with other units. The impression control setting is made by turning a small screw on the back. It is a little difficult to get it right since the range of motion for the screw is fairly limited. This is also true for the Braille Express.

Comments: This seems to be a reliable and well-made printer. It is a little on the noisy side. It very occasionally rips the paper; however, there is an adjustment that can take care of this problem. The machine has both "push" and "pull" tractor feeds. It is most reliable to use the pull tractors, but doing so wastes a sheet of paper at the top of each printout. If one uses the push tractors, once the first sheet has gone through, then both sets are engaged. There is some risk of jamming when the first sheet is going through the emboss heads and engaging the pull tractor, but once that is past, the user has the advantages of the pull tractor without wasting a sheet of paper.

Everest

Type: Interpoint printer
Manufacturer: Index of Sweden
Importer: TeleSensory, Inc.
Address: TeleSensory Incorporated, 455 North Bernardo
    Avenue, Post Office Box 7455, Mountain View, California
    94039-7455; (415) 960-0920
Price: $5,995
Lines per page: 26
Cells per line: 42
Speed: 100 characters per second
Size: 20 inches wide by 6.75 inches deep by 25 inches high
Weight: 25 pounds

Description: The Everest is not typical in its design. It is wide and tall, and not very deep. The printer uses single sheets of paper which are held in a paper feeder on the top of the unit. The paper goes down through the printer and comes out the bottom where it lands in a catch basket.

Along the front panel of the printer are a number of buttons used to control and change settings on the printer. The power cord and parallel cable connect to the back of the unit in plugs on one of the legs or supports. The power switch is also located there.

Comments: This embosser prints on single sheets of paper held in a sheet feeder at the top of the unit. The feeder holds from 100 to 150 sheets depending on the thickness of the paper. There have been occasional jams from this sheet feeder. The embosser comes with a stripped-down version of the Duxbury Braille translator in ROM. There is also a printer driver for WordPerfect so that it is possible to print directly from that program. While the quality of the translation is very good, the formatting abilities of the software are rather limited. It is suitable for quick Braille for personal use but would not be satisfactory for production work.

The importer rates the embosser at 100 characters per second. It would appear that this rating was measured while printing a single sheet of paper and does not include the time needed to change sheets. The unit also has a built-in speech synthesizer that vocalizes the buttons as they are pushed. The buttons also have Braille markings on them, although some of the Braille is oddly spaced. The speech is somewhat difficult to understand and is not as well-integrated as is the speech on the Braille Blazer. It also cannot be used as a separate speech synthesizer as can the Blazer. While this embosser seems to offer good value for the money, a number of questions still remain. This is a very new machine, and Index has had problems producing a workable interpoint printer in the past. As users have continued to work with the machine, paper jamming problems persist, on approximately one out of every three sheets or so. This has been verified by a TeleSensory representative who offers assurance that such experience is not typical. Typical or not, it does exist, and one would offer this caveat in recommending the printer at this time.

Ohtsuki BT-5000

Type: Single-side embosser (can produce Braille and print,
      Braille only, or print only
Manufacturer: Ohtsuki Printer Company of Japan
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue,
      City of Commerce, California 90040; (213) 723-9021
Price: $4,695
Lines per page: (Braille and print) 20
Cells per line: (Braille and print) 42
Lines per page: (Braille only) 25
Cells per page: (Braille only) 42
Lines per page: (print only) 58
Characters per line: (print only) 105
Speed: (Braille and print) 8 characters per second
Speed: (Braille only) 13 characters per second
Speed: (print only) 40 characters per second
Size: 20.5 inches wide by 11.5 inches deep by 5 inches high
Weight: 45 pounds

Description: The Ohtsuki looks somewhat more like a
conventional ink-print printer than most of the other embossers.
There are three buttons on the front panel used for control. There
is a plastic and metal flap on the top front of the unit which when
opened reveals the printing mechanism. The power cord, on/off
switch, and serial and parallel ports are on the back. The paper
also feeds in through the back of the unit and circles around the
roller and printing mechanism. It then comes out the back again,
just above where it goes in. The printer uses a special continuous
form paper which is slightly thinner than normal Braille paper. The
paper is sold by American Thermoform and is a little on the
expensive side.

Comments: This printer is very slow when producing Braille
and print. It is suggested that one use special paper which is
slightly lighter than normal Braille paper. The printer also uses a

friction feed system which occasionally slips and/or jams. Since the paper exits near where it enters the machine, it can go back inside the printer causing a loop and jamming the paper. This was observed at least once during evaluation, and the repairs cost some $350. The print is produced by "back translating" the Braille code. The back translator is somewhat inaccurate, and there is little evidence that this shortcoming has been addressed. This printer should only be considered where it is necessary to produce print and Braille on the same page. It is not a good candidate for Braille production only.

Juliet

Type: Interpoint printer
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
Jay Street, Stuart, Florida 34997; (703) 683-5818
or (407) 283-4817
Price $3,995
Speed: 40 to 56 characters per second
Size: 24.75 inches wide by 11.5 inches deep by 9 inches high
Weight: 50 pounds

Description: This embosser has a different design from that
of previous Enabling Technologies units. It is a desktop unit, not
designed as a portable or movable printer. Enabling Technologies
says that the design is to make the unit quieter than previous
models. The embosser has a rectangular base with a hinged lid
above it. The lid covers about two-thirds of the top surface. It is
filled with acoustic foam and when raised reveals the printing
mechanism cover and the standard Enabling Technologies control
pad.

The Juliet is equipped with push-type tractors. While this
avoids wasting a sheet at the top of each printout, it is not as
reliable in getting the first sheet through the printer. Further, push
tractors are not considered to be as reliable by the printer
industry, but many people bemoan the blank sheet at the top of
each printout. Many users simply save them for use in Braille
writers and prefer the reliability of the pull-type tractors. It is the
panel's understanding that Enabling Technologies has added a
single- sheet option to the Juliet. Only one member of the panel
has seen this arrangement yet, but the manufacturer indicates
there will be a new unit soon.

Comments: This is the newest machine from Enabling
Technologies. It is reportedly based on Romeo technology, so it
should be reliable. The Juliet is quieter then the Romeo and other

ET printers. The Braille quality is good. The embosser actually prints one line per second so the actual characters per second rating will depend on the line length. The Juliet will handle paper up to 15 inches wide. All in all this appears to be a very good machine, and it is expected to dominate its end of the market. It is the least expensive interpoint printer at this time.

Braillo Comet

Type: Single-side embosser
Manufacturer: Braillo Norway
Importer: American Thermoform Corp.
Address: American Thermoform Corp., 2311 Travers Avenue,
       City of Commerce, California 90040; (213) 723-9021
Price: $3,795
Lines per page: 26
Cells per line: 40
Speed: 75 to 50 characters per second
Size: 22.5 inches wide by 14 inches deep by 4.5 inches high
Weight: 45 pounds

Description: The Braillo Comet looks something like a number of printers. The paper feeds from the front, across the top, and off the back of the machine. The unit has pull-type tractor feeds. There are seven switches in the upper right corner which control different functions. The back panel contains serial and parallel connections, an on/off switch, and power cord.

The Comet will print at either 50 or 75 characters per second. It is presumed that the slower speed offers higher quality printing and less noise, although there is not a great difference in the quality.

Comments: The Comet replaces the Braillo 90. It has two speed settings, a graphics mode and the ability to print sideways, among other things. The Braille quality on the initial units was somewhat better then the previous model, the Braillo 90, but still not the best Braille around. The dots were a little dim and not consistent in their height. The printer strikes into a rubber matrix rather than a metal matrix like that most other printers use. Thus the dots are not as pronounced or as well-formed. However, an updated model was on display at a recent technology conference, and the Braille was much improved. The dots were better formed,

not dim, and of consistent quality. ATC is supposed to update the machine evaluated, which is a little noisy, in the near future.

Romeo RB-40

Type: Single-side embosser
Manufacturer: Enabling Technologies Company
Address: Enabling Technologies Company, 3102 Southeast
    Jay Street, Stuart, Florida 34997; (703) 683-5818 or
    (407) 283-4817
Price: $3,795
Lines per page: 27
Cells per line: 42
Speed: 40 characters per second
Size: 20.5 inches wide by 13 inches deep by 5 inches high
Weight: 30 pounds

Description: The Romeo is fairly standard in its configuration. The early models were housed in a metal case, with a metal lid and handle for transportation. The current model has a plastic housing. The paper feeds in from the front, across the top, under the embossing bar, and off the back. The control pad, on/off switch, power cord, and serial and parallel ports are all located on the top face of the printer, on the right side. There is a roller on the left side, making manual paper adjustment easy. The Romeo has pull-type tractors.

Comments: This seems to be a well-made and reliable printer. The company has worked hard at improving its image and service reputation, with some apparent success. The controls are not quite as simple to use as the VersaPoint, its main competitor; however, most of them are seldom used anyway. This printer has developed a reputation for being a real workhorse in its class. The Braille quality is good. The unit comes with a lid, and has a handle, so it can be relatively easily moved.

The embossing bar is held in place by two knurled nuts. If users wish to print graphics, they must remove the two nuts and flip over the bar. Further, adjusting the printer for a different thickness of paper requires removing the bar and adding or

removing little shims or spacers underneath. While not difficult, both these operations are somewhat inconvenient. Newer printers make these adjustments much easier. Most printers, including the Juliet from Enabling Technologies, can go into a graphics mode with a software command.

VersaPoint

Type: Single-side embosser
Manufacturer: Telesensory Systems, Inc.
Address: TeleSensory Systems Incorporated, 455 North
    Bernardo Avenue, Post Office Box 7455, Mountain View,
    California 94039-7455; (415) 960-0920
Price: $3,795
Lines per page: 26
Cells per line: 42
Speed: 40 characters per second
Size: 19.5 inches wide by 16 inches deep by 7.5 inches high
Weight: 39 pounds

Description: The VersaPoint is a desktop printer. The paper feeds in through the front, under a cover which is about two and a half inches high. It goes across the top of the printer and off the back. Serial and parallel connections are on the right side of the unit, and the power cord and on/off switch are on the back. There are four buttons, three switches, and a dial in the upper right-hand corner. The knob is for impression control. The buttons and switches are used for form feed, line feed, on-line/off-line etc. These controls are well marked in Braille and very easy to use. One nice touch is that it is possible to switch between serial and parallel input with the flip of a switch.

Comments: This printer has improved with each new model. The latest model, Model D, is quieter and has improved controls which are quite easy to use. This printer comes with a "push tractor feed mechanism" which means that it does not waste a sheet of paper at the top of each printout. However, in general, the printer industry does not consider this type of arrangement to be as reliable as pull-type tractor feeds for unattended operation. A push-type tractor feed is more prone to paper jams, and there are reports of this with the VersaPoint. It is also necessary to remove the embossing head cover to check paper position. It is not hinged (it just sits on top), so once it is taken off a place must

be found to put it down somewhere. This arrangement can be annoying. All in all, setting top of form on this printer is also on the annoying side. The quality of the Braille is good.

Index Basic

Type: Single-side embosser
Manufacturer: Index of Sweden
Dealer: Young Opportunities
Address: Young Opportunities, Inc., 464 Sylvania Avenue,
    Glenside, PA 19038; (215) 572-5882
Price $2,995
Lines per page: 26
Cells per line: 40
Speed: 50 characters per second
Size: 20 inches wide by 11.75 inches deep by 7.5 inches high
Weight: 14 pounds

Description: The Index Basic is somewhat lighter and smaller than competing printers. As with most, the paper is fed from the front to the back, across the top of the unit. There are four switches and an impression control knob on the top plate of the printer in the rear left corner. There are a serial and parallel port, on/off switch, and power cord on the back.

Comments: This printer is quieter than most. While it is a good bargain, service remains the unknown. It has a new distributor, and the previous distributor has said that there were some reliability problems with it. The panel has been unable to determine the nature of the problems. The Index has changed importers once again, and in fact it is uncertain who is the official importer at this time since there is litigation involved. It is still available in the U.S., but details are unclear. There appear to be a number of people selling the printer, and they are getting it wherever they can. Overall the Braille quality is rather good. While not the absolute best, it is quite readable; and the printer represents a good bargain for the money.

Romeo RB-20

Type: Single-side embosser
Manufacturer: Enabling Technologies
Address: Enabling Technologies Company, 3102 Southeast
     Jay Street, Stuart, Florida 34997; (703) 683-5818
     or (407) 283-4817
Price: $2,995
Lines per page: 27
Cells per line: 42
Size: 20.5 inches wide by 13 inches deep by 5 inches
     high
Speed: 20 characters per second
Weight: 27 pounds

Description: This embosser is virtually identical to the
Romeo RB-40. See above for information.

Comments: The performance of this embosser is virtually
identical to that of the Romeo RB-40 except that it prints at half the
speed.

Mountbatten Brailler

Type: Single-side printer, electronic Braille writer, and note
    taker
Manufacturer: Quantum Technologies
Importer: HumanWare, Inc.
Address: HumanWare, Inc., 6245 King Road, Loomis,
    California 95650; (916) 652-7253 or (800) 722-3393
Price: $2,595 to $3,250
Lines per page: 26
Cells per line: 40
Speed: 8 characters per second
Size: 17.5 inches wide by 9 inches deep and 3.5 inches high
Weight: 10.75 pounds

Description: The Mountbatten is fundamentally an electronic
Braille writer which can also work as an electronic note taker
similar to a Braille 'n Speak or a BrailleMate. The unit also has the
capacity to back- and forward-translate Braille and transfer files to
and from a PC. Finally, it can also be used with a regular computer
keyboard to produce Grade 2 Braille.

The Mountbatten Brailler is approximately seventeen and a
half inches wide by nine inches deep by three and a half inches
high. It weighs ten and three quarters pounds and can run on its
built-in batteries. According to its manufacturer, it can print
approximately thirty pages of Braille while battery-operated. When
used as an electronic note taker, without printing, it will operate
for approximately sixteen hours. It has a carrying handle that
slides out of the front of the machine and a plastic snap-on cover
which protects the embossing area. However, it does not have a
full carrying case.

The feel of the keyboard is more similar to a computer's than
to a Perkins Braille Writer's. The keys are quiet and don't require
much pressure. This would offer advantages to a young child or a
person with physical weakness in the hands or arms. The keys

differ from those of a Perkins Braille Writer in their placement and layout. The regular Brailling keys (Dots one, two, three, four, five, and six) are not lined up straight across the machine but are arranged in a shallow v shape. It does take some getting used to. The producer maintains that this layout keeps the user from twisting and therefore possibly injuring the hands and wrists. This may be true, but the position does not seem inherently more comfortable. Perhaps being very familiar with the keyboard of the Perkins makes this one take a good deal of getting used to.

There is a small round key located between the two sets of three Brailling keys, but this is not the space bar. It is the Command Key, used in conjunction with other keys to issue commands. The space bar and the line space keys are located in the middle, below the Brailling keys. For those used to the Perkins keyboard, this also takes a good deal of adjustment. Most people likely would prefer the space bar in the more traditional, higher location. However, the apparent rationale is that with the lower placement the user can hit the space bar or line space keys easily with the thumbs while Brailling. The machine can produce either six- or eight-dot Braille. There are two extra keys with which to produce dots seven and eight. The machine also has the capacity to switch to a wide variety of foreign language Braille codes and keyboard layouts.

The Mountbatten Brailler can be set so that it automatically goes to the beginning of a new line when the user Brailles to the end of the current line. The embossing mechanism prints at about eight characters per second. A good Braillist can write faster than that, but the machine is able to buffer the characters and doesn't seem to drop any. When Brailling, the Mountbatten is a little on the noisy side; it makes a sharp clacking sound. This could be a disadvantage in a classroom. The machine is grey, black, yellow, and blue in color. The body is grey, and the keys are black or blue. The area under the keys and some other parts are yellow.

The Mountbatten Brailler uses single sheets of Braille paper. It can handle a variety of thicknesses and sizes, and it adjusts to new paper automatically. Loading paper is a little tricky. The sheet must be all the way to the left, or the machine will not operate at all. It does not automatically position the paper for Brailling on the first line. The user must position the paper by hand so that the first line appears where he or she wishes. This is a little awkward because, if one is not careful, the paper will become crooked. The paper insertion is tricky enough to constitute a problem for small children, one of the target audiences for this device.

Most people will use the Mountbatten Brailler as an electronic Braille Writer. It does aid in correcting mistakes. The user can rub out an incorrect character and replace it with the right letter. There are actually two ways to correct a mistake: have the machine rub out the bad cell by pressing the space and backspace keys simultaneously or replace the wrong letter with the proper one by pressing the new letter while pressing the backspace key. Though convenient, this method does not erase the dots as completely as the first.

Commands for the Mountbatten Brailler are issued from the keyboard. In general the user first presses the Command Key, then types in the command and terminates input by pressing the Margin Release key, located on the right side of the machine. While there are a large number of commands, most of them are logical words or mnemonic abbreviations for words or phrases. As an electronic Braille Writer, note taker, printer, and translator the Mountbatten has a full complement of easy-to-use features. It is also possible to move text to and from a computer and do basic page formatting.

A good manual in Braille is provided with the machine. Interestingly enough, the International Braille and Technology Center for the Blind has received a number of very expensive Braille devices without Braille manuals or with totally inadequate manuals. The Mountbatten manual is divided into several volumes. Each is self-contained, and users can tackle a new one as they

need the features it offers. There are, for example, a basic manual, an advanced manual, and manuals for forward- and back-translation. The manuals are well written and easy to understand. There are also instructions for using the Mountbatten with other devices such as the Braille 'n Speak and the Eureka A4.

The Mountbatten Brailler comes in two models. The Mountbatten Brailler Standard has 32K of memory, which will hold approximately thirty-five to forty pages of text. It costs $2,595. The Mountbatten Brailler Educational Package, which costs $3,295, has additional memory (160K) and comes with forward and reverse Braille translation software and an interface box. This version has serial and parallel ports and a connector for a standard computer keyboard. The interface faculties greatly amplify the power of the Mountbatten, facilitating its connection to other computers, Braille or ink-print printers, or regular keyboards. With a keyboard and the Braille translation software, a sighted person who knows little or nothing about Braille can enter text into the machine and produce relatively well-formatted Grade II Braille. This would be particularly useful in public schools. The Basic model does come with one serial port and an external keyboard connector. However, the Educational model is needed to get a second serial port and a parallel port. In fact, it has two parallel ports.

Comments: Everyone has heard the definition of a camel as a horse designed by a committee. Though it may be stretching a point, in some ways the Mountbatten Brailler strikes the panel as a Braille writer designed by a technology committee, every member of which had individual notions of what was essential. All in all, however, the Mountbatten Brailler does accomplish what it sets out to do. It can perform a variety of functions and is a compact and portable unit. However, if a user is just looking for a Braille printer, the Braille Blazer is faster and cheaper. If one seeks merely an electronic note taker, both the Braille 'n Speak and the BrailleMate are more powerful, smaller, and cheaper. If a person wants an electronic Braille Writer, then the Mountbatten is worth considering, although it is on the expensive side. It appears that

this device is best suited for an individual or school that could use a number of its functions. It would then be much easier to justify the steep cost. Nevertheless, for what it costs to purchase the Mountbatten Educational Package, one could purchase a Braille Blazer, a Blazie disk drive, and a standard Braille 'n Speak. While not a compact, one-piece unit, each of the Blazie components is better or more powerful then the comparable features in the Mountbatten, and the disk drive gives one the ability to store unlimited numbers of files.

When asked how the multi-colored machine looked, one sighted person consulted responded succinctly, "It looks like something from Fisher-Price." [a prominent toy manufacturer] This high-contrast color scheme is intended to aid the visually impaired. The feature holds no great appeal for most who have seen it, but it may be of assistance to some. One fails to understand, however, what advantage is gained by watching the Brailling keys. The real objection is that such a color design is not typical of machines used in business and would draw more attention to the equipment than one would wish it to receive.

Porta-Thiel

Type: Single-side embosser
Manufacturer: Thiel GMBH
Importer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road,
        Forest Hill, Maryland 21050; (410) 893-9333
Price: $1,895
Lines per Page: 27
Cells per line: 32
Speed: 10 characters per second
Size: 15.25 inches wide by 14 inches deep by 3.5 inches high
Weight: 11 pounds 2 ounces

Description: The Porta-Thiel is a low, flat printer. The paper goes in the front and comes out the back. Extending from the back of the printer is a flat platform called the "reading table." This provides a flat surface to read on as paper emerges from the printer. The controls and connections for the printer are located on the sides. The printer rests in part on a bar which extends from the back of the printer on two supports. This bar can also be used as a handle.

On the left end is one button, a DIN connector for a keyboard, and a parallel connector. On the right end are two buttons, a serial connector, and the power cord. Commands are issued by pressing one or more of the three buttons.

Comments: This is the newest entry from Thiel. It is a small, lightweight unit. It uses a friction feed system and can accept single sheets or continuous form paper. If the continuous paper is used, the tractor feed strips should be left on because the device uses them in the paper sensing process. The Braille quality is good but not exceptional. The unit is also on the slow side and like its big brothers can be a little tricky to set up.

The setup dialogue is conducted in Braille. There is a series of yes/no questions, which aren't always clear. If one answers wrong, the dialogue ends and must be started over again. It takes many people a number of tries to get it right. The printer has a little rubber pointer that sticks out from the embossing mechanism, which is covered up by the top case of the printer. When the user makes choices in the setup dialogue, they are printed, and the pointer is then placed on the first one. One of the control buttons is used to move the pointer to the choice desired. It is a rather ingenious system.

The machine does offer the ability to print jumbo Braille, which may be of interest to some. This could be of use in adult literacy teaching situations. The Porta-Thiel also has built-in speech, but it is not used very effectively. It signals when the unit is ready or a few error conditions exist but little else. The machine seems to be well-built, and Thiel has a reputation for reliability. However, for less money the Braille Blazer offers more features, better Braille, and a faster speed. Thiel is reportedly going to modify the unit so it will print up to a 40-cell line and is also supposed to be working on an interpoint model. With these considerations the embosser warrants watching.

Braille Blazer

Type: Single-side embosser
Manufacturer: Blazie Engineering
Address: Blazie Engineering, 105 East Jarrettsville Road,
　　　Forest Hill, Maryland 21050; (410) 893-9333
Price: $1,695
Lines per page: 27
Cells per line: 34
Speed: 15 characters per second
Size: 14.75 inches wide by 9.5 inches deep by 5 inches high
Weight: 14 pounds 5 ounces

Description: The Blazer is a small, portable unit. It is housed in a plastic case. The paper feeds from the front, across the top, and off the back. There is a dust cover that hinges at the back and covers the tractor feeds, which are pull-type, and the embossing bar. The cover also reduces the noise and holds the paper flat as it enters the printer. There are three buttons on the right side of the unit and a rocker switch on the left. The buttons control the functions of the printer as well as walk the user through a set of menus, used for setting parameters. The rocker switch moves both ways, forward and backward, and advances the paper in the direction it is pushed. The Braille Blazer's back panel contains serial and parallel ports, power switch, electrical cord, and a handle.

The Braille Blazer has a built-in speech synthesizer. In fact, the unit can be used as a fully functional synthesizer in conjunction with a screen review program. It emulates a Braille 'n Speak in this mode. The synthesizer also voices all button pushes and menus. It is totally possible to set up the printer using speech. In fact, if one knows a little about printers and what the three buttons do, it may not be necessary to read the manual at all.

Comments: This is only one of two printers that will not use 11 by 11.5-inch paper. The maximum size it will handle is 8.5 by

11 inches. It is relatively quiet and produces very high quality and consistent Braille. This is a very good personal use printer, but it isn't intended for production situations. It would also be satisfactory for low-volume institutional or business use. This is also probably the best printer for a beginner or new Braille user because of its relatively low cost and ease of use.

BRAILLE TRANSLATORS

Introduction

Following are reviews of all the major Braille translation programs currently available in the United States. With one exception, the reviewed programs all run on IBM or compatible computers. One program, the Duxbury Braille Translator, also has a version for the MacIntosh, and one other, the Ransley Braille Interface, is hardware-based and will work with a variety of computers. The panel has stuck to the IBM and compatible varieties for two reasons. First, this is where the majority of the development is going on and secondly these computers are the ones used by most blind adults.

One point of comparison that was used in examining translators is that of speed of translation. Unless every translator is installed on the same computer and the same document used with each, an absolute comparison is difficult. The broad-based experience of the staff and volunteers associated with the International Braille and Technology Center for the Blind was used to give some meaning to this comparison without setting up an elaborate testing procedure.

The applicability of each translation system to adult literacy training is not specifically discussed. However, each review gives enough information about the features, strengths and weaknesses of each system that anyone reading them should be able to pick out the best product that meets his/her needs, budget etc. Any of these products could be used in training situations and could be made a part of a Braille or computer training sequence.

Auto Braille

Type of system: Software
Name of vendor or manufacturer: KANSYS, Inc.
Address: 1016 Ohio Street, Lawrence, KS 66044;
  (800) 279-4880 or (913) 843-0351
Price: $295 (currently bundled with Turbo Braille)
Computer for which software is written: IBM and compatible
  computers
Operating system under which software can run (e.g., DOS,
Windows, etc.): PC/MS-DOS

Description: Auto Braille is a memory-resident translator and
the only product of its type which is available as a stand-alone.
The program is run before any other application; and it intercepts,
translates, and formats output as it is sent to a printer. This
allows printing in Braille as one would in print.

Speed of translation process: This is dependent on the
computer but is somewhat slower than with some translators.
Translation is going on in the background and is somewhat
dependent on the speed at which the application being used
processes and sends data to the printer.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
Auto Braille does not normally use source files, although one
could send an ASCII file to it. It is a memory-resident Braille
translator. That is, the software is loaded before running another
application such as WordPerfect. Then when output of that
application is directed to a printer, Auto Braille intercepts it, does
translation of the data stream, formats it, and sends it on to the
printer. It is not necessary to exit the application to print in
Braille. Auto Braille has a variety of input options. It can receive
data from a serial or parallel port or take it from a text window on

the screen. This output can then be directed to a variety of output options.

Method for fixing Braille translation errors: The user is unable to fix translation errors.

Strengths: Auto Braille enables a user to print Braille from within another application. To print one turns it on with a hot key, normally Alt-3, and prints data as with an ink-print printer. Auto Braille can be loaded into expanded memory, so it takes up little conventional memory. Options are easily changed when the program is loaded or at any time using a utility program called Auto Braille Commander "ABC." ABC is entered on the command line with the options it is desired to change. The program offers a variety of input and output options.

Once installed and configured, Auto Braille is easy to use. This should make it easy for beginners to get Grade 2 Braille out of their application programs without a lot of fuss.

Weaknesses: The major weakness of Auto Braille at this time is poor formatting. It does minimal formatting, and the user isn't able to exercise that much control. The author reports that he is in the process of making major changes to the program, which should improve formatting capabilities. In theory the program should format Braille as well as the Turbo Braille program, which is written and marketed by the same company. While not perfect, Turbo Braille in general formats well. However, at this time Auto Braille could only be used for personal use Braille. If and when it is upgraded, however, it will be as much translator as most people will need for personal use.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): The output of Auto Braille can be directed to a parallel port, serial port, or a "Braille Window" on the computer screen. With the

output directed to the screen, this means that a Braille display could receive real-time Grade 2 Braille translation for display.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Auto Braille does not use Word processor codes directly. It intercepts ASCII output intended for printing and uses this information to perform formatting tasks. In its present version this ability is weak. Centering, page numbering and running headers are not supported. Further, line breaks and paragraphs are not always correct. It is hoped that this will be corrected in a future version. The user could format the source text in such a way that the desired output would be achieved; however, this would be a trial-and-error proposition. Auto Braille is best suited for quick Braille for personal use.

Mechanism/command structure for controlling format of Braille output: There are not any specific embedded commands to control formatting. The Auto Braille Commander has commands to set page length, page offset (a margin for binding), and a few other characteristics of the Braille page.

Memory requirements: Auto Braille takes 48K of conventional memory. However if expanded memory is available, it will use that. When using expanded memory Auto Braille occupies 2K of conventional memory and 48K of expanded memory.

Ability to support output to a Braille display as opposed to hard copy: Auto Braille has a variety of input and output options. As mentioned earlier, output can be sent to a parallel port, a serial port, or a pre-defined window on the screen. There are also memory-resident programs available that will intercept output sent to a serial or parallel port and save it as a file. Using one of these options, Auto Braille will support virtually any output device.

Braille Talk

Type of system, (hardware or software): Software

Name of vendor or manufacturer: GW Micro

Address: GW Micro, 310 Racquet Drive, Fort Wayne, Indiana 46825; (219) 483-3625

Price: $195

Computer for which software is written: Apple II, IBM PC's and Compatibles

Operating system under which software can run (e.g., DOS, Windows, etc.): PC/MS-DOS

Description: BrailleTalk is a simple, menu-driven Braille translator. It is easy to use but somewhat limited in its features and potential.

Speed of translation process: The MS-DOS version was tested. Like all others, speed is dependent on the computer. The translation speed of Braille Talk seems to be slightly above average.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): ASCII only

Method for fixing braille translation errors: The user can create an exceptions file. This file contains three items: the incorrect word, how it should be written, and the number of the rule to apply. There is a set of rules which govern when the exception should be applied, for example, always if it occurs in a certain part of the word, etc. In the second entry, the corrected word, the user must know the ASCII character that the printer expects to produce the desired Braille symbol, for example 1 for ea.

Strengths: Braille Talk is an easy-to-use menu-driven program. The user can practically use it without the manual, and even reading the manual only takes another half hour. The program will also support a variety of speech synthesizers even without a screen review program.

Weaknesses: Although the program is simple and inexpensive, it has little else going for it. In informal tests the panel found it to be the least accurate of all the available translators currently on the market. Further, it has very limited formatting possibilities and capabilities. It prematurely ends lines with fair regularity and occasionally skips to many blank lines. It also will center lines if they are preceded by at least ten spaces. This action could cause false centering in some cases and uncentered lines in others. Braille Talk has not been upgraded in some time and has not kept up with the times. The PC program is essentially a port of the Apple II program and doesn't utilize the additional power of the PC.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be directed to either a file or Braille embosser. There are no other options.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Braille Talk only accepts ASCII files as input. It does not use codes from WordPerfect or other programs. It gets its formatting information from the ASCII file, which is somewhat inaccurate at best.

Mechanism/command structure for controlling format of Braille output: Braille Talk has a few embedded commands, but not many. They include commands to set tabs, control the level or grade of translation, center lines, advance to a new page, and indent subsequent pages. These are the only formatting commands offered.

Memory requirements: 128K

Ability to support output to a Braille display as opposed to hard copy: Not supported

Duxbury Braille Translator

Type of system, (hardware or software): Software

Name of vendor or manufacturer: Duxbury Systems, Inc.

Address: Duxbury Systems, Inc., 435 King Street, Post Office Box 1504, Littleton, Massachusetts 01460; (508) 486-9766

Price: $495

Computer for which software is written: The software reviewed runs on IBM compatibles. Other versions exist for the Apple MacIntosh, VersaBraille II, Navigator, CP/M, and some minicomputers.

Operating system under which software can run (e.g., DOS, Windows, etc.): This set of programs runs under DOS and has a text interface.

Description: The Duxbury Braille Translator is widely used and has become the standard against which others are measured. It is as accurate as any translator, full-featured and complex if one delves into all its possibilities.

Speed of translation process: Speeds are approximately those logged for DUXWP, when running from a WordPerfect file to formatted Braille. Translation takes about 50% of the time, with WP to TXT taking 25% and unformatted to formatted Braille taking another 25%. In all cases, this program runs a file through one process, then runs that file through another process, and so on. Thus, when one goes from WordPerfect to formatted Braille, two intermediate files have been created, processed, then deleted when no longer needed. This is why it is so slow when it is run while logged onto a floppy drive.

Capacity for back translation: By running the appropriate batch files, Braille files can be back-translated. If they contain formatting commands beginning with a vertical bar symbol, formatted print can be created. A range of controls and tricks can be used to correct mistakes and ambiguities in the back

translation process. On the IBM version, it would be difficult to produce print enhancements such as boldfacing, underlining, and changes of print size without loading the file into a word processor for final touch-up. Until one gets accustomed to the back translation process, documents should be proofread carefully.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): The Duxbury Braille Translator accepts source files in ASCII or in WordPerfect 5.0 or 5.1 formats. For best results, the user should try to get a properly coded WordPerfect file for input.

Method for fixing Braille translation errors: Although translation errors can often be corrected in a WordPerfect or page-image file, the greatest control can be achieved when working on a TXT file. This is an ASCII, untranslated file containing formatting and translation control codes. It looks like an ordinary text file, but is sprinkled with codes such as "$p" for new paragraph, $l" for new line, "$hds ... $hde" around a centered heading, "$cbi" to go into Computer Braille Code with the CBC indicator sign, or "$d" to produce the next word in direct Braille. The length of lines is not important, but any line ending with a hyphen in the original text should have two in the TXT version. Dollar signs that are not to be acted upon by the program should be doubled.

Some people using the program with a Braille display prefer to work with the BRU file, a translated version containing Grade 2 Braille, interspersed with "lp", "ll", and other formatting commands.

Strengths: This translator has been on the market and used by major Braille producers for the past sixteen years. Its output has been scrutinized by more proofreaders than that of any other translation program. With all this input from a wide range of Braille producers, these programs have evolved into a very flexible tool for producing a wide range of Braille codes and formats. The

author has taken great pains to conform to BANA rules for Braille, as far as a computer can automatically interpret them.

It is possible, if one knows the consequences of breaking contractions, to enter "$-" commands in a TXT file, which will cause words to be hyphenated at those points if necessary. If a file contains a large number of instances of a long word like "rehabilitation", a few lines can be saved by telling Duxbury where it can be hyphenated. This feature must be used with caution. The program can be configured to produce simulated Braille on a laser or dot-matrix printer, and the Braille lines can have the corresponding print shown between them. The Computer Braille Code is fully implemented. The translator must be told which parts of the text are to be transcribed in CBC. The WordPerfect and page-image bridge programs can assist in determining which portions need such treatment.

If batch files are customized for the user's needs, translating a file can be a very simple operation. The program can be run from batch files, a "response file", or by answering some or all of its questions when it is run. A short help message can be displayed by typing control-E at any of the questions. But with the number of options that are possible, it is better to create batch files for various tasks than to answer all the questions each time the program is run. A large number of batch files are provided to get started, but one should be prepared to make copies of some of these and include personal modifications.

Some rather complicated formats can be produced, including tables with left, center, decimal or right tabulations, line-numbered text, tables of contents, and dictionaries with guide words at the foot of each page, or odd-numbered pages. Some of these formats can be produced by the WordPerfect Bridge, but others are provided as commands which the user must add to a TXT file.

The Duxbury translator is really not a single program, but a collection of tools (small specialized programs) connected

together by batch files. These tools include prompted word search/replacement, automatic character replacement with state variables to define context, a file browser, a text-find utility, and more. Some of these programs can be driven by batch files supplied by Duxbury, and others are best suited to an experienced programmer.

Weaknesses: Because the Duxbury translator started at large installations, running on minicomputers, a certain amount of computer experience has always been assumed by the authors. As the program has migrated to PC's and MacIntoshes, the number of customers and technical support calls has mushroomed. As a result, the quality of the documentation and the simplicity of operation have improved significantly and are continuing to evolve. Because of the number of programs involved and their long history and need for backward compatibility, the number of commands and options can be overwhelming to a new user.

Some of the documentation files are not provided in print or Braille but can be printed from disk or translated into Braille by the user. The disk documentation is broken up into a large number of files, and without referring to the "CTL-LIST" or some other master file, it can take some time to find the information one needs at a particular moment.

Much of the documentation still has a mainframe flavor, reflecting its origins. It does not provide a lot of basic information or hand-holding. This program may not be the best choice for the beginner or casual and/or occasional user.

As discussed in the DUXWP review below, it is easy to produce terribly formatted Braille with this program or any other if the user does not examine the source file and correct its problems.

HINT: Questions about how something in a TXT file being edited will look in translated form may be answered through use of

the following procedure: A copy of the whole file should be saved. A few lines of it should be marked and saved to another TXT file (both must be saved as ASCII). The user then temporarily exits ("shells out") to DOS and runs the small block through the translator and formatter. The BRF file can then be viewed with a favorite editing program or the Duxbury browser. One then exits from DOS and returns to work on the large file. Because the program can run automatically from batch files, someone needs to study enough of the documentation so that these files can be customized to meet local needs. Many good batch files are supplied by Duxbury, but a user is likely to produce some more. If a menu-driven user interface is wanted, the user should consider getting DUXWP instead of, or in addition to, this program. No Braille translator can relieve users of the necessity of having persons knowledgeable about Braille in their organizations. Quality assurance procedures are needed for the files produced and for the hard copies a printer embosses.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Translated or formatted files can be sent to a wide range of devices. A sophisticated printer driver is included for sending data to serial or parallel devices. Output can only go to one destination at a time.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Duxbury can do automatic formatting from WordPerfect files by means of its WordPerfect Bridge WPBRI, or from ASCII print image files using PIMBRI, the page image bridge. Both of these programs produce TXT files with formatting and translation codes. Of the two bridges, the WordPerfect bridge is more complete. If there is a choice between ASCII or WP files for translation, it is almost always better to start from the WP 5.0 or 5.1 version. Before using either of these bridges, one must know whether the file has sudden changes of margins, changes from tables to text, a section printed in two columns, and other features that can

confuse these bridges. In a WP file, every hard return in print will cause a hard return in Braille, which is often not desirable. The better a user knows WordPerfect and the Duxbury program, the better Braille from WP files can be.

Mechanism/command structure for controlling format of Braille output: Formatting can be controlled either by adjusting the format of a page image file or WP file or by adjusting the formatting commands which Duxbury bridges put into the TXT file. It takes some time to learn the differences between a "$tab", "$tas" or "$taa" tab command, or between "$inm" and "$ind". But once these things are learned, the user has absolute control over the format of the Braille output.

Memory requirements: The Duxbury programs can run in 256K of free RAM, but 512K is recommended by the manufacturer. A hard disk is recommended for processing larger files.

Ability to support output to a Braille display as opposed to hard copy: Braille files can be sent to Braille display devices. Batch files and tables for the SCRUB program exist, so that many of the linear Braille format symbols can be produced.

DUXWP

Type of system, (hardware or software): Software
Name of vendor or manufacturer: Duxbury Systems, Inc.
Address: Duxbury Systems, Inc., 435 King Street, Post Office
Box 1504, Littleton, Massachusetts 01460;
(508) 486-9766
Price: $295
Computer for which software is written: IBM PC and
compatibles with at least 512K RAM
Operating system under which software can run (e.g., DOS,
Windows, etc.): MS-DOS. The program uses a text-based
Windows-like user interface.

Description: DUXWP is a menu-driven translator by the publishers of the Duxbury Braille translator. It only accepts as input WordPerfect files. It automatically formats these files for output to Braille devices.

Speed of translation process: After all selections have been made, translation from WordPerfect file to Braille file takes 33 seconds on hard disk with SMARTDRV disk cache, 42 seconds without. Will take well over one minute if floppy drive is the source and destination for the file, and four minutes if also logged onto that floppy drive, because of the number of intermediate files which are written and read. See Turbo Braille review below for comments on system used and size of file processed.

Capacity for back translation: There is no back translator for DUXWP.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): Source files should be WordPerfect 5.0 or 5.1 only.

Method for fixing Braille translation errors: Some types of translation errors can be fixed in the WordPerfect file.

The translator will switch to Grade 1 if a non-English language is selected. If the user configuration file is set properly, the program will go into Computer Braille Code wherever the font has been set to Courier. If a Braille font has been installed in WordPerfect, switching to that font puts the translator into direct Braille mode until a normal font is reinstated. If the user learns the ampersand codes (such as &+ for a forced letter sign), these symbols will go through the process. The dollar commands which are customarily used by the Duxbury programs for formatting or translation control will not go through DUXWP properly. Duxbury is working on this deficiency. If the user owns the full Duxbury Braille Translator, DUXWP can generate TXT files which can be completely manipulated by the user and which contain representations of all the supported WordPerfect codes.

Strengths: Because the program is fully menu-driven and mouse-aware, producing hard-copy Braille, a Braille file, or simulated Braille could not be much easier. Since the Duxbury translators are in use at all of the U.S. Braille book and magazine production facilities, their output has been scrutinized by more proofreaders than that from any other translation system. Although translation is never perfect, it is likely to be right more of the time than the other programs can be. But no matter how accurate a translator is, it has no reliable way of knowing whether the letter V is a Roman numeral and should not have a letter sign, is the letter V by itself and should have a letter sign, is followed by a period or parentheses in an outline and should not have a letter sign, or is the last word of a sentence and should have a letter sign. DUXWP supports a large number of WordPerfect formatting and emphasis commands, so the Braille copy can reflect the print format quite accurately. Format codes supported include left, center, right, and decimal tabs; left or left/right indents; margin changes; centering; block protect; footnotes; and more. The manuals for the DUXWP program and the Tips document describing proper input file formats are quite well written and should not pose problems for experienced WordPerfect and DOS users.

Weaknesses: This program and others make Braille so easy to produce that there is a noticeable increase in the amount of Braille which has not been proofread. Since the translation and printing processes are so easy, one is tempted to run Braille copies off without checking the input file first. It is especially easy to produce strange-looking Braille because a file has hard returns at some places where they don't belong, tabs after soft returns, spaces instead of tab, indent and centering codes, frequent left margin changes, wide tables within the text, block protect codes that make sense for the print copy but make no sense in Braille, etc. Generally, if a person formats a file so that its appearance is not affected by changes in print size, the Braille format will be the most consistent. The better one uses WordPerfect, the better the Braille copy will look.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be to a file, Braille embosser, Braille display device, or simulated Braille on paper. Output can only go to one device at a time.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Formatting is as automatic as the state of the art permits. Nearly all codes that can be logically transferred to Braille are supported.

Mechanism/command structure for controlling format of Braille output: One controls the format by proper coding of the WordPerfect file. In addition, handling of paragraphs, multiple skipped lines, and soft and hard page breaks, plus the scale factor relating print tabs to Braille tabs, can be adjusted and saved in the user's configuration file.

Memory requirements: 500K

Ability to support output to a Braille display as opposed to

hard copy: Braille could be sent to a paperless Braille device, but the "linear Braille" format indicators are not produced.

Hot Dots

Type of system, (hardware or software): Software
Name of vendor or manufacturer: Raised Dot Computing
Address: Raised Dot Computing, Inc., 408 South Baldwin
        Street, Madison, Wisconsin 53703; (608) 257-9595
Price: $350
Computer for which software is written: IBM and compatible
        computers
Operating system under which software can run (e.g., DOS,
Windows, etc.): PC/MS-DOS

Description: HotDots is a full-featured and accurate
translator. It offers many possibilities for input, output and
display. There are a number of batch files provided to automate
and/or facilitate the Braille production process.

Speed of translation process: Partly due to the wide variety
of computer systems in use today, it is difficult to judge the speed
at which Hot Dots is able to perform all of its functions:
importation, translation, formatting, and ultimately embossing. If,
instead of sending output to an embosser, one sends it to a disk
file to achieve the maximum "throughput," it takes a 20MHZ
computer at least ten seconds to run through a rather small
document which ultimately results in eight Braille pages. Because
the entire process has been broken down into four discrete steps,
there is a certain amount of time that must be allowed for the
machine cycles necessary to move between tasks. The longest
step in the entire process seems to be the importation phase.
Once this has been completed, everything else seems to fly.

Capacity for back translation: yes

Source files that can be used, (e.g., ASCII, WordPerfect, etc.):
Hot Dots is capable of processing ASCII files, print image files,
and files generated by more than thirty word processing systems.
This is accomplished using the Hot Dots importing feature, which

converts a document into a format that Hot Dots, in its native mode, will recognize. Generally speaking, only basic word processing formatting commands are recognized and properly converted by the importation process. These include commands to center a line of text, generate a new paragraph, and italicize or underline a section of text. Word processor file types supported include WordPerfect, MicroSoft Word, WordStar, and many, many more. Using the import feature, the user needs to know what word processor created the file the program to process. Incorrect specification of the file type will generate an error message.

In most cases, users of Hot Dots need to maintain only one version of their document: the one intended to be used with the word processor of their choice. However, if there are unique Braille translation and/or formatting requirements, users may find it desirable to maintain two versions of their document: one for printing with their preferred word processor and the other for brailling with Hot Dots.

Method for fixing Braille translation errors: With Hot Dots a variety of strategies can be employed to correct Braille translation errors. One can place an "@i" sequence between letters of a document that are not to be contracted. An "@f" sequence can be placed in the document to force the next character to be sent as is. The global search and replace utility can be used to correct translation errors that appear in the final translated file prior to having it formatted. These are only a few of the methods that can be used. There is no Grade II translation table that can be modified by the user. Raised Dot Computing is always on the lookout for new translation errors, and the company encourages users to report any consistent errors in translation that may be discovered.

Strengths: The biggest strength of the Hot Dots system is its ability to interpret native word processing files and convert them into a standard format that can be edited with relative ease. It was not possible for the panel to determine how well the package

worked with all of the thirty-plus word processors supported, but WordPerfect did seem to work well as long as no extraordinary formatting was used (i.e., tables of contents, page centering, running headers/footers, etc.). The customer support provided by Raised Dot Computing is always exemplary and geared for the non-technical user. This, irrespective of the merits of Hot Dots, should definitely be kept in mind when translation software purchasing decisions are to be made.

Another strength of Hot Dots is the abundance of convenient batch files provided with the product. Using batch files, the user can completely process a document, from importation to embossing, or partially process a document using different batch files. There is even a batch file supplied to emboss multiple copies and another to ascertain the number of pages to be embossed before committing anything to paper.

Anyone familiar with RDC's BEX product for the Apple II line will be familiar with many of the Hot Dots formatting commands. Hot Dots can be controlled either from the DOS command line, when the program is first invoked, or one can use the menu system that comes with the product. The batch files make Hot Dots a lot easier to use. For example, with a simple command, followed by three or four parameters, one can instruct Hot Dots to import, translate, format, then emboss a file. It is as simple as entering a line of commands as follows:

DOTS1234 SAMPLE.WP5 WPF5 LPT1

If the Hot Dots menu is used, each process must be invoked manually.

Weaknesses: The panel finds that a major weakness in Hot Dots is the lack of status messages during its operation. When the user is processing a document from start to finish, messages are displayed telling the user that a document is being imported, translated, formatted, or embossed. However, during the

formatting phase, for example, one cannot learn what page is being formatted or how much further the program has to go before the process is finished. This more than anything else proved to be the most frustrating deficiency in Hot Dots.

There are a great many formatting commands and commands to control the translation activity. Depending upon a user's sophistication, this can be either a blessing or a curse. The ideal situation would be for the user never to have to learn any of these commands.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.) With the aid of the many batch files provided, Hot Dots enables Braille output to be routed to a variety of communication ports or simply to a disk file. Configuration of the serial port requires some understanding of the DOS MODE command unless the embosser used is already configured to receive data at 9600 baud, eight data bits, no parity, and with one stop bit. If the embosser is so configured, the MODE command is not necessary.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format) As mentioned above, Hot Dots can read the native formats of some 30 word processor types. It can convert these files into intermediate files, which can be edited, or send the output directly to a file, a Braille device, or the screen.

Mechanism/command structure for controlling format of Braille output: When Hot Dots imports a file, it converts many of the internal word processing formatting commands into what it calls "dollar sign commands." These are commands that are stored in an intermediate file. They are not translated into Grade II Braille but control how the final Braille output will be formatted. Some of the dollar sign commands are as follows:
$p   New paragraph.
$l   New line (not a paragraph).

$$c Center text in current output line plus all subsequent
     output lines until next new line command.
$$l# Set line spacing to #, e.g., $$l2 for double spacing.
$$np Place page numbers on all pages.
$$p# Place text at absolute character position # on the
      output line.

Hot Dots also provides a set of commands to control how the translator will behave. All of these commands begin with an "at" sign (@). Throughout the document, one can change translation modes from Grade II, Grade I, British Braille (without capitalization), or no translation (often referred to as computer Braille). Using the "at" sign codes, accent marks can be forced into Braille output or letter signs inserted or removed.

Memory requirements: 256K

Ability to support output to a Braille display as opposed to hard copy: Hot Dots includes support for a variety of Braille-producing devices, including refreshable Braille devices such as TeleSensory's VersaBraille. Support is also included for such esoteric devices as Dipner Dots, the Ohtsuki, and the Cranmer Brailler. The manual also includes instructions for configuring these devices for proper attachment to the computer.

MegaDots

Type of system, (hardware or software): Software
Name of vendor or manufacturer: Raised Dot Computing
Address: Raised Dot Computing, Inc., 408 South Baldwin
        Street, Madison, Wisconsin 53703; (608) 257-9595
Price: $500
Computer for which software is written: IBM PC and
        compatible computers
Operating system under which software can run (e.g., DOS,
        Windows, etc.): PC/MS-DOS

Description: MegaDots is more than just a forward and backward Grade II Braille translation software package. It can also double as a WYSIWYG (What you see is what you get) word processor capable of editing text in either print or Braille format. The user can instantly switch between print and Braille translations, and a variety of display options are available.

Unlike other translation systems which rely upon specialized codes to control the format of Braille output, MegaDots uses a "style system." A style is simply a set of format descriptions which can be associated with individual paragraphs within a document. For example, most paragraphs would be normally formatted text or "body text" as they are called in MegaDots. Other paragraphs might be headings of different levels. One style of heading might cause the text to be centered while another might cause the text to be underlined and aligned with the left margin.

MegaDots is clearly a tool for the no-nonsense Braille transcriber. With a single keystroke, one can flip between print or Braille representations of a document and can determine right on the screen how a particular section of text will appear when it is printed or Brailled. Skilled Braillists can enter Braille text directly using six keys on the computer keyboard, and MegaDots even permits the display of Braille output as dots on the screen.

Speed of translation process: Braille translation with MegaDots is extremely fast on a 386/486 processor. It has to be since the nature of the program is such that users are encouraged to switch back and forth between Braille and print modes with the touch of a single key. On a 20MHZ machine, the process of translating a 60-page document takes approximately ten seconds.

Capacity for back translation: yes

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): MegaDots has a basic set of file converters which enable documents created by other word processors to be converted into a form that can be processed by the MegaDots program. ASCII files and documents created by WordPerfect are among the basic conversions supported. For an additional fee, supplemental conversion packages can be supplied. Whenever MegaDots is told to open a file, it automatically recognizes the type of file that is being opened and performs all of the conversions necessary to create a reasonably well formatted MegaDots file (a file with the .MEG extension). It is the MegaDots file that is actually modified when editing takes place. The original file that was imported is untouched.

Method for fixing Braille translation errors: MegaDots does not require the user to update a Braille translation table in order to fix translation errors. Instead, since it is a relatively quick process to switch between print and Braille display modes, one can find in print the Braille word that was produced in error, switch to Braille mode with a single keystroke, correct the resultant Braille word displayed on the screen, and revert to the print mode. The correction is preserved by MegaDots. Another method that can be used is to employ the program's global search and replace feature when the document is being displayed in the Braille mode. Both options require that the user have some knowledge of Braille and the various ways of displaying Braille output on the computer screen. MegaDots provides a rules file that can be used repeatedly to make certain changes in different documents.

However, rules file processing is not invoked automatically but must be initiated by the user when the document is displayed on the screen.

Strengths: MegaDots is a unique departure from traditional Grade II translation software systems, being in its own right a word processor, a print and Braille utility, and a translator. The extensive on-line help supplied with the program is extremely useful, even though much of the information is not reproduced in the manual.

It is extremely simple to correct formatting problems: simply change the style used for a particular paragraph. For sighted or blind users who are not skilled readers of Braille, the architecture of the program makes it simple to determine the format of Braille output before committing it to paper. This is, in the view of the panel, one of the program's greatest strengths.

MegaDots has a variety of display modes to suit both blind and sighted users. For people who like windows, tiling, pull down menus, and the like, MegaDots can make extensive use of highlight bars and pull-down menus, and it also can be controlled using a mouse. For blind users with speech or Braille screen access technology, MegaDots can display menus and the like on a blank screen, and it can be instructed to make minimal use of color.

MegaDots comes with extensive on-line and context-sensitive help screens. At any point, the user can press the F1 key to bring up a help screen dealing with the feature of the program in use.

MegaDots makes extensive use of menus which are fairly easy to navigate through. Keystrokes used to navigate through the menus are consistent and easy to remember, and with the latest version, the DOS cursor follows the highlight bar. In earlier versions, the failure of the cursor to follow highlight bars or to be

moved at all was a considerable problem for persons who wanted to use the program with screen access technology for the blind.

MegaDots has had a number of upgrades and removals of system bugs since it was initially released in the summer of 1992. The company is also promising a number of interesting features in upcoming versions. This is a powerful and sophisticated program that is breaking new ground in the Braille translation/formatting arena. Raised Dot Computing has a long-term commitment to Braille and some of the best customer support in the business. The program warrants watching.

Weaknesses: MegaDots currently consumes a huge amount of memory: 500K in some cases. The vendor is in the process of producing a new version which uses some of the high memory available on 386/486 processors. Because MegaDots is an extremely powerful and sophisticated program, it is rather difficult to learn at first. However, once a user "dives in", many of its operations become self-evident. There does not seem to be a reliable way to fix permanently Braille translation errors that may crop up. No translator is 100% perfect, and MegaDots provides only short-term methods for fixing errors. One cannot update a permanent table of Braille rules to fix translation errors.

MegaDots seems to be keeping pace with modern software development--that is, getting more power by using more memory and consuming large amounts of disk space. The vendor indicates that MegaDots cannot run on a computer that does not have a hard disk. The program and supporting files take up about 2 megabytes on a hard disk. Given today's rapidly growing computer capacity and rapidly plummeting prices, this may not be as big a problem as it once was.

MegaDots makes use of some fairly esoteric key sequences (e.g., Control-Insert, Control-Down Arrow, etc.). Although Raised Dot Computing is to be commended for now attempting to resolve conflicts with screen access technology for the blind, one cannot

help wondering why such problems were not considered during the initial design.

Raised Dot Computing is to be commended for working on a new manual. The original manual supplied with MegaDots does not contain enough information to help the user achieve a thorough understanding of the program before throwing it onto the computer.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): MegaDots can route Braille output to any one of the parallel ports or to any one of the serial ports, depending upon where the embosser is attached to the computer. In addition, MegaDots can be instructed to direct Braille output into a file. When users instruct MegaDots to begin Brailling, they can indicate how many copies to generate, which Braille pages to emboss, the number of lines to emboss on a Braille page, and the number of Braille cells to produce on a line.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): MegaDots can import files created by a wide variety of word processors. Whenever MegaDots is told to open a file, it automatically recognizes the type of file that is being opened and performs all of the conversions necessary to create a reasonably well-formatted MegaDots file (a file with the .MEG extension). It is the MegaDots file that is actually modified when editing takes place. The original file that was imported is untouched.

Mechanism/command structure for controlling format of Braille output: MegaDots uses the "style system" to control the format of Braille output. Documents are divided up into paragraphs, each of which has its own unique "style." For example, to have a single line of text centered, one simply gives it the style of a heading. To have a block of text treated as a normal paragraph, it is simply given the style of "normal body text."

When a file is imported, MegaDots makes its "best guess" about the style that should be assigned to each paragraph. The panel found that the importing of WordPerfect files was not 100% perfect. More often than not, it was necessary to change the style associated with certain paragraphs to achieve the desired Braille output format. However, this was relatively easy to do and consumed relatively little time.

Memory requirements: 512K MegaDots is a memory-hungry program. It is advisable to have at least 640K of memory to allow room for MegaDots, DOS, and any access software one might be running. Raised Dot Computing is testing a version of the program for 386 and higher computers which uses a special protected memory mode. A minimum of 2 megabytes of extended memory is recommended for this mode.

Ability to support output to a Braille display as opposed to hard copy: MegaDots can generate linear Braille format output for paperless Braille devices. MegaDots can also generate computer Braille output for computer programs and the like. For print users, MegaDots has a mode whereby Braille dots can be printed along with the back-translated print information to show what is actually being Brailled.

NFBTRANS

Type of system, (hardware or software): Software
Name of vendor or manufacturer: Roudley Associates
Address: Roudley Associates, Post Office Box 608, Owings
     Mills, Maryland 21117; (410) 363-0834 or (800) 333-7049
Price: $395
Computer for which software is written: IBM and compatible
     computers
Operating system under which software can run (e.g., DOS,
Windows, etc.): PC/MS-DOS

Description: NFBTRANS is an easy-to-use menu-driven Braille translation program. It provides the user with a simple set of commands which must be inserted into a source file to control formatting.

Speed of translation process: It is difficult to judge the speed of a Braille translation program because of the variety of factors that need to be considered. These factors include the speed of the embosser (if translation and embossing occur simultaneously), the speed of the computer processor, and disk access time. Assuming that one is translating directly into a file for later embossing, NFBTRANS produces Braille pages at a rate that can vary anywhere from one Braille page every ten seconds (on an old 8086 processor) to three Braille pages per second (on the new 80486 processors).

Capacity for back translation: NFBTRANS is a forward translator only. It does not "back translate" from Grade II Braille to print.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): NFBTRANS was originally written to process pure ASCII text or print image files and later evolved to handle files created by some versions of WordStar. Today, this is still the case. In other words, one can prepare an NFBTRANS document with any word

processor, but that word processor must be able to convert the document into an ASCII file containing only normal text, carriage return/line feed sequences, and special codes recognized by NFBTRANS to control the format of Braille output. NFBTRANS does not recognize internal word processing commands (e.g., centering, running headings, italics, etc.) that are native to specific word processors.

Method for fixing Braille translation errors: No Grade II Braille translation software is 100% perfect. There are going to be words that are not Brailled correctly by even the best translator. NFBTRANS provides a Braille translation table which can be updated and compiled by the computer user, provided that appropriate caution is exercised. The steps to follow for making simple table modifications are spelled out in the documentation, and users are strongly encouraged to contact the program's developer, Charles Cook, through Roudley Associates if more sophisticated changes are required. Most often, however, it is only necessary to insert the incorrect word into the table with the proper translation codes specified. This does require a certain amount of knowledge about how ASCII symbols displayed on the computer screen are embossed in Braille.

The vertical bar "|" symbol can also be used in the text to suppress Braille translation. (Actually, the vertical bar tells NFBTRANS to send the immediately following character as is to the embosser without any attempt at translation.)

Strengths: NFBTRANS is a Grade II Braille translation program written to run on IBM PCs and compatible machines. It was developed by the National Federation of the Blind (1800 Johnson Street, Baltimore, Maryland 21230, Phone: (410) 659-9314). The NFB originally developed NFBTRANS on a DEC minicomputer for internal use. It was later moved to PCs and marketed to others at a reasonable cost when some other programs cost thousands of dollars.

NFBTRANS comes with a simple print spooling program (NFBSPOOL) which is handy for re-routing printed output to a disk file. In addition, NFBTRANS comes with a resident help program (NFBHELP) which can be "popped up" while running a text editor. NFBTRANS contains a feature called External Format Language which can be used to aid in the production of standard columnar computer reports. The External Formatting Language codes are stored in a file that can be edited using any word processor. (Actually, the file must ultimately be converted into ASCII text.) External Format Language essentially tells NFBTRANS how to process specific lines or ranges of lines in the input file. NFBTRANS can be instructed to ignore or process the lines and even to process certain lines only if specific character strings are encountered.

Unlike other translators, NFBTRANS both translates and formats Braille output in a single pass. There is no separate format step required before a document can be embossed. In its default mode, NFBTRANS presents the user with a series of menu prompts. All of these prompts can be bypassed, however, through the use of parameters that can be passed to the program on the command line when it is first invoked. With a single command, for example, users can instruct NFBTRANS to translate and emboss a file, then exit the program. As text is being translated and formatted, NFBTRANS provides a running commentary on the screen, telling the user which Braille page and which Braille copy is being embossed. If translation and formatting are being done into a file, this provides an excellent means to determine ahead of time how many Braille sheets will be required for the final embossing operation. NFBTRANS seems to be best suited for people who know little or nothing about Braille translation and/or Braille formatting. There is a set of simple commands which must be inserted in a file. These commands control translation and formatting. The manual explains their use in a simple straightforward way. By following the manual, persons who know little about Braille can be relatively sure that they are producing accurate, well-formatted Braille. In conclusion, NFBTRANS is

relatively easy to learn and easy to use. It takes up relatively little memory (approximately 64K). Its menu prompts are consistent and easy to understand. Finally, since there are no hidden codes, it is easy to predict how the program will format Braille output given knowledge of how an ASCII file is formatted.

Weaknesses: Unless one is using NFBTRANS in its short form mode, it will always present the same menu prompts each time the program is entered. However, it is not possible to return to an earlier menu once the user has responded to a particular prompt. If users make mistakes, they have to force their way out of the program and start all over again. And there is no "clean" way to exit the program. It gives every appearance of being designed to be run without ever being exited.

NFBTRANS has not matched the progress made by other Braille translation software in terms of its ability to handle files created by various word processors in their native mode. This forces the maintenance of two files: one for printing and the other to be used for producing Braille hard copy. Further, it will not automatically insert formatting codes into a file, so this step must always be done by the user.

Braille translation errors are not easy to fix. The process of updating then compiling the translation table requires more care and technical understanding than the average non-technical computer user possesses.

Re-routing Braille output to the serial port requires too much in the way of technical knowledge and sophistication. The average user is hardly likely to understand the use of the DOS MODE command.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): NFBTRANS has the ability directly to translate and format Braille into a file or to translate and emboss directly to an embosser

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attached to the computer's LPT1 parallel port. The program cannot directly address other parallel ports such as LPT2 or LPT3. To send Braille output from NFBTRANS to an embosser connected to a serial port (e.g., COM1 or COM2), the user is required to redirect printed output away from LPT1 to the correct COM port using the DOS MODE command before entering NFBTRANS.

Using NFBSPOOL, one can "outfake" the NFBTRANS program. In other words, NFBTRANS can "think" that it is embossing to the LPT1 port, but NFBSPOOL can take the output and stick it into a file. Later, through the use of the DOS COPY or PRINT commands, the file produced by NFBTRANS can be embossed directly.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): NFBTRANS cannot automatically format files unless the formatting codes it uses have been inserted into the text.

Mechanism/command structure for controlling format of Braille output: NFBTRANS provides a full set of commands that control the format of Braille output produced. These commands are denoted using either the tilde (~) character or the caret (^). Using NFBTRANS formatting commands, one can center lines of Braille output, generate running headers or footers, produce page numbers in Roman or Arabic numerals, italicize specific Braille text, add Braille letter signs, generate blank lines, and much more.

Here is a partial list of the commands that NFBTRANS recognizes:

~A   Put next word only in Grade I.
~C   Center immediately following text.
~D   Double space Braille output.
~E   Switch to poetry format.
~T   Switch to normal text format.
~H   Running header.

~I   Generate Braille italics indicator.
~S   Insert a Braille blank line.
~0   Disable all translation.
~1   Translate to Grade I Braille.
~2   Translate to Grade II Braille.

These commands must be inserted into any document that a user intends to have translated into Grade II Braille. If a file processed by NFBTRANS contains no such commands, the program will eliminate all blank lines from the output and will only generate a Braille paragraph if it comes across two carriage return/line feed sequences in a row or an indented line. A Braille page number will be generated on all Braille pages except the first. This is not the way Braille is typically produced. Users will probably want to do some centering of text, at a bare minimum.

Memory requirements: 64K

Ability to support output to a Braille display as opposed to hard copy: NFBTRANS output can be redirected to a file or to another DOS device. While some knowledge of DOS will be necessary it would be possible to translate a file and send it elsewhere. There is however no specific support for non-hard-copy or non-file devices.

Note: As a gift to the computer community the National Federation of the Blind has released the source code for NFBTRANS. Further, anyone who purchases the program will also get a copy of the source code.

Individuals are encouraged to modify the source code, which is in the computer language Pascal, and to freely pass the improved program around. The only restriction on the release of the source code is that people not use it to create a commercial product from which they intend to make money.

The source code can be downloaded from NFB NET, the computer bulletin board system run by the NFB itself. NFB NET may be reached by calling (410) 752-5011. The BBS supports connections at baud rates from 300 to 9600 baud, no parity, 8 data bits and 1 stop bit. A user has also converted the source code into the computer language C, and made modifications. The new source code is also available via NFB NET and users are urged to upload their work to NFB NET so that it can be shared with others.

PC-Braille

Type of System: Software

Manufacturer: Arts Computer Products Inc.

Address: Arts Computer Products, 121 Beach Street, Suite 400, Boston, MA 02111-2501; (800) 343-0095 or (617) 547-7520

Price: PC-Braille: $495; WP-Sift: $180; PC-Sift: $180; PC-Braille Pro (Includes all three): $795

Computer for which software is written: IBM PC and compatibles

Operating System under Which software can be run: MS-DOS or PC-DOS 2.1 or higher

Description: PC-Braille is a command-driven full-featured translation program. It offers additional programs which can be used to provide automatic formatting of text or WordPerfect files.

Speed of Translation: Below Average

Capacity for back translation: No

Types of Source Files Supported: WordPerfect and ASCII text files when used with optional PC-SIFT and WP-SIFT programs

Method of Correcting Translation Errors: Tables controlling contraction rules and exceptions can be modified by the user. Commands are provided to suspend translation temporarily when necessary.

Strengths: PC-Braille provides many formatting commands, including conditional end-of-page, headers, footers, and temporary indentation. A macro language including symbolic substitution permits the experienced user to build specialized formatting and translating commands. The ability to define sequences of numbers allows paragraph numbering to be done automatically. This feature permits PC-Braille to handle usefully some of

WordPerfect's automatic numbering features when used with WP-SIFT. PC-Braille formatting commands can be placed within WordPerfect documents as "comments" with an identifying prefix. So treated, they do not appear in printed output but are still recognized by WP-SIFT and PC-Braille. Finally, it is perhaps the only Braille translator that can generate a table of contents with Braille page numbers. However, this ability also depends upon WordPerfect and the WP-Sift formatting program.

Weaknesses: Although PC-Braille is a very powerful translator with many formatting commands, no automatic formatting is available without purchasing either PC-Sift or WP-sift. The inclusion of one or both of these programs makes PC-Braille the most expensive software-based translator for personal computers currently on the market. Although PC-Braille has great flexibility from the command line, there are no menus to assist the casual user. There is no on-line help available. Little indication of progress is provided when translating large documents, with long periods of silence.

Output types supported: Translated Braille can be stored in a file, sent to the screen in ASCII Braille, printed in ink-print using periods, or printed on modified daisy-wheel printers in readable Braille using periods; and a number of Braille printers are supported. The user can create new printer definitions.

Automatic Formatting Capabilities: Formatting can be extracted from WordPerfect and ASCII text files using WP-SIFT and PC-SIFT respectively. These programs are available at extra cost.

Mechanism/Command Structure for Controlling Format of Braille Output: Many formatting commands are available. Generally, each command begins with a period and appears on a line by itself. In addition to the expected commands such as temporary and permanent indentation, centering, running headers and footers, and conditional end-of-page, PC-Braille provides numerous options that control such things as use of capitalization,

termination signs, and the transition characters in numbers (characters that can appear in numbers without causing an additional number sign to be printed).

Memory Requirements: 512K

Ability to support output to a Braille display as opposed to hard copy: Yes, but device may need to be defined.

Ransley Braille Interface

Type of system (hardware or software): Hardware
Name of vendor or manufacturer: Manufactured by Pulse Data
    International, Limited of Christ Church, New Zealand
    and imported by HumanWare, Inc.
Address: HumanWare, Inc., 6245 King Road, Loomis,
    California 95650; (916) 652-7253; (800) 722-3393
Price: $995
Computer for which software is written: (not applicable)
Operating system under which software can run (e.g., DOS,
Windows, etc.): Since the Ransley is hardware-based, it will
    operate under any operating system

Description: The Ransley Braille Interface is a hardware-based device. It is a box that attaches to the serial or parallel output of any computer, intercepts data from the computer, performs translation and formatting tasks, and sends Braille output to either a serial or parallel port. Consequently, it will work with any computer that has a serial or parallel output port.

Speed of translation process: Even though it is hardware-based, the Ransley Braille Interface is no faster than software-based translators. In fact, it is slower than some, doing a page approximately every two seconds.

Capacity for back translation: No

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): This device accepts a data stream from a computer. It is only necessary to print to the device as with any other printer.

Method for fixing Braille translation errors: The translation tables are not accessible to the user.

Strengths: This device is relatively simple to use. If one must perform Braille translation on a variety of computers, the

Ransley is a portable solution. It would work for multiple computers, which could be the same or different. It could also be installed on a print server on a network, and output directed to it from a variety of sources. The Ransley is a good choice where a variety of computers, operating systems, and/or software packages are used.

Weaknesses: The RBI is on the expensive side. It is also a little slow. It will do some basic pre-processing and formatting on its own; however, these capabilities are somewhat limited. The results might be acceptable for personal use, but would not be appropriate for Braille that is given to others. There is a good set of basic commands to control formatting and translation. They are relatively straightforward and easy to use, but not as sophisticated as with some translation systems. It would be more difficult to do elaborate formatting with the Ransley. The translation accuracy seems to be acceptable, but not outstanding.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output is either sent to a serial or parallel port. Thus, one could theoretically direct output to any device with a serial or parallel port that would accept a data stream. Primarily, this means a printer but could also include things such as a VersaBraille, Braille 'n Speak, etc. Anything that would accept a file as input should work.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): The Ransley Braille Interface pre-processes a file before translation. It will strip out extra spaces, such as in margins. It can be directed to take out blank lines also. It does not act upon word processor codes, however, since it expects an ASCII stream of data. It will act upon its own embedded codes if it finds them.

Mechanism/command structure for controlling format of

Braille output: Most Ransley commands begin with two exclamation points (!!) and are followed by a letter and possibly a number. For example, !!C centers text and !!c stops centering. The program differentiates between the uppercase and lowercase c. As mentioned above the list of commands is adequate but not extensive.

Memory requirements: Not applicable

Ability to support output to a Braille display as opposed to hard copy: The output could be directed to a Braille display as long as the display could accept serial or parallel output directly, without the intervention of another computer. Devices such as a VersaBraille, Braille 'n Speak, BrailleMate, Notex, and the Personal Touch would meet these requirements.

Turbo Braille

Type of system, (hardware or software): Software
Vendor or Manufacturer: KanSys, Inc.
Address: KANSYS, Inc., 1016 Ohio Street, Lawrence, KS
    66044; (800) 279-4880 or (913) 843-0351
Price: $295
Computer for which software is written: IBM and
    compatibles
Operating system under which software can run (e.g., DOS,
Windows, etc.): MS-DOS (interface is text-based.)

Description: Turbo Braille is a fast, command-driven Braille
translator. While not as full-featured as some, it does have more
than adequate features and good translation accuracy; and it is
available at an affordable price.

Speed of translation process: File-to-file translation speeds
as follows: Hard disk with SMARTDRV enabled: 17 seconds.
Hard disk without SMARTDRV 18 seconds. Data files on floppy,
program files on hard disk: 70 seconds.

Tests were run on a 40 Mhz clone 80386 computer with
Vocal-Eyes screen review program running and speech silenced
with the control key. When SMARTDRV is enabled, it is 2.1
megabytes. These numbers are for a 97K WordPerfect 5.1 file,
producing a 79-page (72.5K) Braille file and no intermediate files.
The CHECKIT program rates this PC as 32 times as fast as an IBM
XT. Since Braille translation depends partly on disk speed as well
as processing speed, I would guess that this computer is more like
20 times as fast as an XT for this task. In general, the panel finds
Turbo Braille to be one of the faster translators around. This is in
part because it is just one program; multiple processes do not
have to be called.

Capacity for back translation: No back translator is available. The program attempts to do Grade 3 and does not produce the Computer Braille Code.

Source files that can be used, (e.g., ASCII, WordPerfect, etc.): Directly supports ASCII, WordStar, and WordPerfect 4.2 through 5.1 source files.

Method for fixing Braille translation errors: Braille translation and formatting errors can be fixed if a BIF (Braille intermediate file) is created. Most formatting commands are on individual lines and begin with a period. Examples of these commands are .pp for new paragraph, .sp for skip line, .ce for centering, .br to break to a new line, etc. Translation can be controlled using two-character commands imbedded in the text, such as \1 for Grade 1, \2 for Grade 2, etc. When the BIF file has been properly tweaked, it can be run through the translator, just like an ASCII, WordStar or WordPerfect file.

Strengths: Turbo Braille is fairly easy to learn, as Braille translation programs go. Its on-line help facility is not context-sensitive, but it contains practically all of the information in the manual. The manual is not extremely long. This means that some functions of the program are not explained in great detail. But it also means that one need not search through a large amount of material to find information on a command or function.

Turbo Braille uses small configuration files to guide its operation. They can be placed in the directory where the program was installed. These "global" configuration instructions can be overridden by a "local" configuration file in the current directory, or by command line parameters or interactive commands. Control commands can be stored in a text file that is read in by a command in the file being translated. All of this provides the user with a great deal of flexibility, but this flexibility does not make the program unnecessarily complicated.

Turbo Braille is especially good with ASCII files, provided they do not contain any control characters that fool the program into thinking that the file is in WordStar format. The program is fast, and usually produces good Braille which does not waste space. The \:, \., and \- commands are especially useful in creating two- to four-column tables, with judicious tweaking of the intermediate file.

This program is breaking new ground in Braille production by producing Grade 3, directly supporting WordPerfect graphics, and generating embossed block letters. The author has also provided commands which offer above-average support for interpoint embossers. Although it does not support the full Computer Braille Code and does not conform to BANA's requirements that mathematical symbols such as plus, equals, greater-than, braces, and others must be Brailled as words, anyone familiar with the Nemeth Code and a little of the Computer Code will find that Turbo Braille does a sensible job of translating a wide variety of documents.

Weaknesses: When translating WordPerfect files, Turbo Braille supports some WP codes, but ignores many others. Format codes in the WP file are translated into a small set of Braille format control commands. For example, different levels of indention and tabs in the print file will not produce different levels of indention in the Braille document. This means that less space is wasted, but outlines are not represented accurately unless the intermediate file is adjusted. Footnotes are completely skipped.

When editing an intermediate file, dot commands must remain on their own lines and must always start at the left margin. It might be advantageous to use an ASCII file editor, such as the DOS 5 editor, QEDIT, PC-Write, or the WordPerfect program editor, in order to keep the hard returns from moving around while editing an intermediate file.

The translator is reasonably good, but rules continue to be added as users find errors. One persistent problem is that when

lines end with "for" or "of", and the next line begins with a word which can be joined to those words in Braille, they will not be joined. These words are properly joined together under most other conditions.

Although Grade 3 Braille can be produced, it is not very readable. Further work needs to be done to improve the Grade 3 translation, outlining and word-spacing rules. An obstacle to accomplishing this is that few blind people use Grade 3 at present, it was never adopted as an American Standard Braille Code, and manuals which describe the code contain some contradictory advice and are out of print.

As stated above, the author has tried to produce Braille that is practical for people to use and does not put a high priority on producing Braille that conforms to the literary Braille code. Some symbols, such as letter signs, the transcriber's note symbol, computer Braille code indicators, and reference indicators would need to be put into the file by switching to direct Braille, then back to Grade 2.

Output options supported (e.g., can output be directed to a file, screen, paper in ink-print, specific embossers supported, etc.): Output can be sent to a file, a Braille printer, or both simultaneously. Most of the commonly available embossers are supported.

Automatic formatting capability (i.e., ability to interpret word processor codes and convert to appropriate Braille format): Automatic formatting is supported for several kinds of files and is discussed in previous sections.

Mechanism/command structure for controlling format of Braille output: As mentioned earlier, the user can completely control the format and translation by manipulating a Braille Intermediate File. This is not really a Braille file, but is an ASCII

file containing all the instructions needed to translate and format the information into Braille.

Memory Requirements: Turbo Braille runs in a minimum of 256K of memory.

Ability to support output to a Braille display as opposed to hard copy: Braille can be sent to any serial or parallel device, including a Braille display. Line length can be adjusted. The "linear Braille" symbols such as $p for paragraph cannot be directly generated by the program.

REFRESHABLE BRAILLE DISPLAYS

Introduction

The following reviews are for devices which are generally called "refreshable" or "paperless" Braille displays. These displays have small pins that pop up and down, forming Braille letters. The displays generally have either 20, 40, or 80 cells, which means that they can show a quarter, half or full line. All of the refreshable Braille displays which are reviewed here work with IBM or compatible computers.

It should be mentioned that these displays, while expensive, provide the user with detailed information about what is on the screen as well as the format of the data. These products are sometimes preferred by computer programmers, customer service personnel working on the telephone, and by persons doing detailed editing. There are also of course people who are Braille-oriented rather than speech-oriented. (Use of such equipment traditionally has been more common in Europe since some countries there are more willing to purchase the expensive equipment.)

It should also be noted that the refreshable Braille displays provide their information in so-called Computer Braille. This is the same code that Braille printers use. It is basically Grade 1 Braille with different symbols for punctuation. The code allows for a one-to-one correspondence between the character on the screen and the character shown on the Braille display; that is, there are no two-cell symbols used to display anything. While there have been some attempts at providing real-time Grade 2 translation, they have for the most part suffered from limitations. All current displays have all of their Braille cells on one horizontal line. Without the use of a multi-line layout, scanning and very fast reading are difficult. The current technology does not permit such a multi-line layout.

While expensive, refreshable Braille displays offer a variety of opportunities in the teaching of Braille. Despite this potential advantage, we are not aware of any computerized Braille instruction programs employing this technology.

Alva Braille Terminal

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650; (916) 652-7253, or (800) 722-3393
Manufacturer: ALVA the Netherlands
Price: $14,495 for 83-cell model, $8,995 for 43-cell model
Size: 23.5 inches wide by 11 inches deep by 1 inch high
Weight: 11 pounds 6 ounces

Description: The Alva Braille Terminal is a flat, low, rectangular unit in a plastic housing. Across the front edge are seven buttons, three round ones on the left, and two long and two shorter bars to the right with the long keys being in the middle and the shorter ones on the outside. From left to right these keys are Program, Home, Cursor, Line Up, Line Down, Line Down and Line Up. On the top front edge is the Braille display. The unit reviewed has an 80-cell display with three additional status cells on the left. The ABT is also available as a 40-cell unit. The first two cells show the position of the Braille display, that is if it is on line 01, line 17, line 25, etc. The third cell shows attribute information.

Above the Braille cells is a line of 80 dots. Each of the dots is located above a Braille cell and is the cursor routing dot for that cell. If one presses the dot above a given cell, the ABT will move or "route" the applications cursor to that cell, provided that the cursor can be moved to that point. The cursor cannot be moved at the DOS prompt, for example, but it can be moved in the editing screen of WordPerfect. This is a convenient way to find and correct errors. The back edge of the ABT contains the power cord, on/off switch, and the input and output connectors.

Strengths and Weaknesses: The Alva Braille Terminal is straightforward and easy to use. It accepts data via the parallel port of a computer. It has a parallel port of its own to replace the one it occupies on the computer. Unlike the KeyBraille, its parallel port seems to operate normally, without any degradation in

performance. The memory-resident control software also operates without any adverse effects on your computer. It is easy to install, doesn't adversely affect performance and seems to be very tolerant of other memory-resident programs and stand-alone applications.

It is possible on the ABT to display both characters and attribute information, a feature some find very useful. It is possible to move the system's cursor with the up and down bars, which will be useful in some programs, particularly word processors. The Braille on the ABT is a little mushy but not bad. It is still acceptably readable. Since most of the Braille displays use cells from the same two or three companies, the differences are minor.

Applicability to Literacy: The Alva Braille Terminal is an all-around good choice for most users. It is simple and effective. Combined with the right software it can be useful in Braille instruction and/or reinforcement.

Baum DMFM-80

Importer: Baum USA

Address: Baum USA: Accessibility Technologies, 17525
Ventura Blvd., Suite 303, Encino, CA 91316;
(818) 981-2253 or (800) 225-3150

Manufacturer: Baum Elektronik GmbH

Price: $25,000

Size: 25.5 inches wide by 14.75 inches deep by 2.25 inches
high

Weight: 16 pounds 14 ounces

Description: The DMFM-80 is as much a Braille work station
as a refreshable Braille display. It contains an 80-cell Braille
display, four status cells, Optical Sensor Cursor Routing, 8-dot
Braille keyboard, two 12-cell satellite Braille displays, and a
numeric keypad.

Starting at the front of the machine, in the center, there is an
8-dot Braille keyboard. There is of course a space bar. On either
side of this keyboard is a bank of 12 Braille cells. These are
independent banks of cells which can be set to monitor any part of
the screen independently from each other and from the main
display. They can also be attached to the cursor position in some
manner allowing one to scan more than one line at a time. At the
bottom right of the bottom portion of the work station is a 16-key
numeric style keypad. It can be used as a standard computer
numeric keypad or switched to one of 15 levels. Each key can
then be programmed for a specific function, command or macro, in
that level. This yields hundreds of possible commands. This
portion of the work station is known as the FM-80.

Above the FM-80 is the DM-80/OSCR, which is the main
portion of the work station. There are four status cells on the left
side. To their right are two buttons, an up and a down button.
Then there is the main 80-cell Braille display. Above each cell is a
dot, for reference and above that is the photocell sensor for the

OSCR system. OSCR stands for Optical Sensor Cursor Routing. To the right of the display are five buttons. There are two vertical rows of two with a single button in between. This button is a Return key, and the buttons on the left duplicate the two buttons all the way to the left of the Braille display. The other two buttons, to the right of the Return key, control additional functions of the DMFM-80. In addition, combinations of the five right-hand buttons, as well as the left-hand and right-hand buttons, control additional functions.

Behind the Braille display is a corrugated or wavy platform where a standard computer keyboard can be set, either for regular QWERTY input or Braille input through 8 of its keys.

To the left and right of the keyboard platform are vertical OSCR strips for vertical cursor positioning. To the right of the right-hand OSCR strip are six switches, in a vertical row. They are used to control different functions of the Machine such as 6- or 8-dot Braille, display of screen attributes, etc.

On the rear edge of the machine is a cable which goes to the PC through attachment to an expansion board which must go into a slot in the PC. The DMFM-80 gets its power from the PC; there is no separate power connection. Finally, there is memory-resident software which must be run to activate and control the DMFM-80.

Strengths and Weaknesses: Like the David, which is also from Baum, the DMFM-80 is a complex and sophisticated device. It is probably the ultimate refreshable Braille display. Its two additional 12-cell displays, built-in Braille keyboard, optical sensors, and keypad which can be programmed for hundreds of commands and macros give it vast amounts of power and flexibility. There are a number of U.S., European, and Russian Braille tables available, and users can customize their own. While there is some built-in speech capability, this function has not been taken as far as with the David. Further, the DMFM-80 does not have the Grade 2 Braille display capabilities that the David has.

The manual lists a command for Grade 2 Braille translation display, but it does nothing.

There are a number of ways users can issue most commands. They can be issued from or assigned to different levels of the numeric keypad, issued by pressing different combinations of the keys to the left and right of the Braille display, or entered as chorded commands using the Braille or QWERTY keyboard. This allows for great flexibility and diversity. It also yields hundreds and hundreds of possible key combinations, all of which can be reassigned or changed. The quality of the Braille on the displays is good.

The International Braille and Technology Center for the Blind did not receive a Braille manual with the DMFM-80, a fact which necessitated printing one from a disk. This is an inexcusable failure for a $25,000 Braille product. Baum USA says that the manual is in progress and that the device and its commands are changing, so that they didn't want to release the manual yet. Recently, they have reported that some of the commands are being changed to make the DMFM-80 more like the David. It could be argued that, considering all of this, the product was released prematurely. With both the Baum products available in the United States, the software seems to lag behind the hardware. This is, however, a chronic problem in the computer industry as a whole.

One problem with this display, and the other 80-cell displays, for that matter, is the size. An 80-cell line is quite wide, and a reader's arms can get tired after a lot of reading. Further, it is difficult to find a comfortable place for the keyboard, where it and the display can both be easily reached and used. With the DMFM-80, it is a long stretch to the QWERTY keyboard. With it and many of the other displays, there is no easy place to rest one's hands during typing. The DMFM-80's corrugated keyboard platform does hold it in place. On some displays, namely the Braillex IB80 and Alva Braille Terminal, if a user puts the keyboard behind the Braille display, it slides and moves around. The prototype of the DMFM-

80 viewed in December of 1991 was housed in a custom piece of computer furniture. This special desk did help some with the ergonomics. A full-time refreshable Braille display user might want to investigate finding a good platform or having something made.

Applicability to Literacy: Because of its expense and complexity, this is a power user's product. It is unlikely that it would be used by a beginner. A fair amount of computer knowledge and Braille competency is required to utilize effectively the DMFM-80.

Braillex IB80

Importer: ATR Computer
Address: ATR Computers, 4420 Norledge, Kansas City,
    Missouri 64123; (800) 421-9775
Manufacturer: Papenmeier GmbH Co.
Price: $15,000 for IB80 and $10,000 for 4040
Size: 29 inches wide by 11.5 inches deep by 1.25 inches high
Weight: 20 pounds 2 ounces

Description: The Braillex comes in 40- and 80-cell models,
the 4040 and IB80 respectively. In addition to the regular Braille
cells there are also four status cells on the left side of each model.
The panel evaluated the IB80.

This unit is hardware-based. There is an interface card that is
mounted in an expansion slot of the computer. The computer
keyboard plugs into the Braillex itself, and there is a cable which
runs from the unit to the PC's keyboard input connector.

The Braillex is a heavy, well-constructed solid unit. It is
housed in a metal case and came with a hard suitcase-style
carrying case. The Braille display is located on the top of the
machine near the front edge. Behind it are 40 cursor routing
buttons, one for every other cell. One push of a button moves the
cursor to the left of the two cells it covers and a second press will
move the cursor to the right-hand cell. There are also three
groups of buttons on the top of the machine. On the left end are
eight buttons in two vertical rows of four. They are numbered like
the dots of a Braille cell. To the right of the display are five
buttons, two long horizontal ones on the top and bottom of the
group and three buttons in between. These represent the four
arrow keys and a Home key which moves the display to line one.
Finally on the top plate of the machine are four buttons in a
vertical row, three function keys and a Shift Key. The Shift key is
used in conjunction with other buttons to issue commands or
change settings. There are also control buttons on the front edge

of the machine, including two long bars to move the display up and down, another Home key located between the up and down bars and four additional buttons, two on each end of the front edge. These are used to move the Braille window when the Braille display is split into two banks.

The on/off switch is on the left side and the power cord and various connectors are on the back of the machine.

Strengths and Weaknesses: The Braillex displays are complex and sophisticated systems. Since they are hardware-based, they provide access to the PC's display from the moment the computer is turned on. This would be of use to a systems programmer or someone who makes frequent changes to his/her computer, such as editing CONFIG.SYS and AUTOEXEC.BAT files. The 80-cell display can be split into two 40-cell banks so one of them can be parked on a portion of the screen for reference. There are also various commands to track different kinds of cursors and attributes. The system can also be set up to track a variety of foreground and background colors. One can then go to an attribute or color combination on the screen with the push of a single button. This could be useful when using spell-checkers and other sophisticated software.

This is a complex system, and the manual will take a good deal of study to figure everything out. Again, a Braille manual was not received with the unit received by the International Braille and Technology Center for the Blind. One had to be printed. Part of the problem was that Papenmeier changed dealers around the time that unit was purchased, but a Braille manual should come automatically with a $15,000 Braille device. There have been problems getting Braille manuals with many of the refreshable Braille displays, so the experience with the Braillex is not unique. The manual is above-average for a European manual, but still not great. There is some poor translation and poor writing, and some things are not explained very clearly.

Applicability to Literacy: The Braille displays are probably best suited for computer users with sophisticated needs. For basic word processing or other simple tasks there are less complicated displays on the market. However, for power users or those working with complex software or needing immediate access to the PC's display before the operating system is loaded, this may be the right display.

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650;
    (916) 652-7253 or (800) 722-3393
Manufacturer: PC-Visie, the Netherlands
Price: $6,995, $5,995 for 25-cell model
Size: 12.5 inches wide by 14.25 inches deep by 1.5 inches
    high
Weight: 7 pounds 11 ounces

Description: The KeyBraille is available in two models, a 25-cell and a 45-cell model. Five of the cells are used to display cursor and Braille display position information and status information. The KeyBraille is a flat, rectangular box with the Braille display on the top front edge. Behind it, and slightly elevated above, are six keys which are used to control the machine. These keys are located with three on each side of the machine. While the buttons are smaller, they are somewhat analogous to the six keys found on a Perkins Braille writer, and the manual refers to them in this manner.

The KeyBraille is designed to work with a Toshiba portable computer, although it will work with other portable and desktop systems. It will run on batteries and uses a Toshiba power supply. It hooks to the parallel port of a computer. It also requires the use of a software interrupt, normally IRQ 7.

The KeyBraille uses the Braille Writer key analogy when describing its commands. It does have a full set of commands, and a good deal of customization and configuring is possible.

Strengths and Weaknesses: The quality of the Braille display on the KeyBraille is good. The Braille writer frame of reference used for commands is relatively easy to remember and will be familiar to virtually any Braille display user. However, in practice some of the combinations are a little awkward. For example dot 4

moves the display ahead 40 characters at a time and dot one moves it back by 40 characters at a time. Since many primarily read with the left hand, when they want to go back they either have to move the left hand from the display or reach over the left hand with the right to press dot 1. This is truly awkward. The KeyBraille does not have any cursor routing buttons, as do many displays.

There are problems getting the KeyBraille to work with some speech packages. Because it uses a parallel port and an interrupt, it was a little trickier than some to set up. Also, the memory-resident program necessary to run it is somewhat intrusive to the computer and will absorb some performance. Further, while there is a pass-through parallel port, its performance is adversely affected by the KeyBraille.

The unit will probably have its strongest appeal to those looking for a portable display they can use with a laptop computer.

Applicability to Literacy: The use of the Braille writer paradigm for commands may make this device easier to teach than some. It also has a good Braille display. Finally, it may be of interest because of its potential portability.

KTS Brailloterm

Importer: American Thermoform Corp.
Address: 2311 Travers Avenue, City of Commerce, California
90040; (213) 723-9021
Manufacturer: KTS GmbH
Price: $6,995 for 40-cell model, $15,500 for 80-cell model
Size: 22 inches wide by 11.25 inches wide by 2 inches high
Weight: 10 pounds 12 ounces

Description: The KTS Brailloterm comes in 40- and 80-cell models. Across the front edge of the machine are either 40 or 80 metal studs or buttons, corresponding to the number of cells on that model. These are the cursor routing buttons. On the top front edge of the machine are the Braille cells. On either end of the Braille display there is a square button. The button on the left edge either goes back by 40 cells or by one line, depending on whether the device is a 40- or 80-cell model. The button on the right end of the display advances it down the screen. Behind the display is a slanting panel which contains 12 buttons. These buttons are used to control the different functions of the machine. They are labeled from left to right: zero through nine, Memory, and Pound (or Lozenge as the manual calls it). The slanted area then goes straight down to a flat surface which extends to the back of the machine. This platform can hold a keyboard. The back of the slanted area is straight up and down, creating a little wall which holds the keyboard in place behind the Braille display and control buttons. The back edge of the machine contains the power cord, on/off switch, and port for connecting the KTS to the computer. The connection is made via hardware, so there is no software to load. There is a half card which goes into an expansion slot of a PC. One may have a little trouble finding it a free memory address; it took a phone call from Germany for one user, but once that was done there were no further problems.

Strengths and Weaknesses: The KTS Brailloterm has the best arrangement on the market for accommodating the Braille

display and computer keyboard. There is a flat platform to hold the keyboard and a small barrier to hold it in place. The only display that comes close to this convenience is the $25,000 Baum DMFM80. The numbered keys provide a simple way to enter line numbers for the display to go to directly. They can also be used as Brailling keys to enter search terms directly. The KTS is straightforward and relatively simple to operate. The up and down keys on either end of the Braille display are a useful feature which puts them where the hands are for reading. It is possible to monitor up to five lines for changes, with the KTS. There is also a memory key which will return the reader to a prior location. Finally, it is possible to program in an "offset" on the 40-cell model. If there is a left margin of spaces, the display can be made to ignore them, using this offset command.

On the negative side it is not possible to display characters and their attributes at the same time, as with some displays. It is necessary to toggle between a text and an attribute mode. There are also no status cells to display cursor and display location. One also must toggle to a status display, which is complex and cryptic. The 80-cell display is a little noisy when the lines of Braille snap into place.

There has been some difficulty getting a proper Braille manual from American Thermoform. The manual finally obtained was for a slightly different model from the one actually available. It is for a model intended to be used only with a Toshiba laptop computer. Finally, a call for technical help was ultimately answered by the manufacturer in Germany. This raises some concerns about the ability to provide technical support in the United States.

Applicability to Literacy: As far as using this model for Braille literacy training is concerned, what has been said for the other devices applies. As displays go, this is one of the simpler units. A beginner could be reading with it fairly quickly.

Navigator

Vendor: TeleSensory, Inc.
Address: 455 North Bernardo Avenue, Post Office Box 7455,
      Mountain View, California 94039-7455; (415) 960-0920
Price: $4,500 to $16,000
Size: 12 inches wide by 12.5 inches deep by 1.75 inches high
      for 40-cell 6-dot model
Weight: 5 pounds, 11 ounces

Description: The Navigator is the refreshable Braille display manufactured and sold by TeleSensory, Inc., of Mountain View, California. It comes in 20-, 40- and 80-cell models. The 20-cell model is only available in a six-dot Braille configuration, the 40-cell model is available with either 6-dot or 8-dot cells and the 80-cell model is only available with 8-dot Braille cells. Some Navigator models are equipped with and able to operate under battery power. The model evaluated by the International Braille and Technology Center for the Blind was a 40-cell 6-dot unit.

Like the other displays, the Navigator is a low, flat, rectangular box. On the IBTCFB's model the front panel contains ten buttons in two groups of five. The buttons are mirror images of each other. In between the two groups is a jack, similar to a RJ-11 modular phone jack. This is used to hook a BrailleMate to the Navigator. In this mode the Braille keyboard on the BrailleMate can be used to input six- or eight-dot Braille to the Navigator and/or to display information from the BrailleMate on the Navigator. The Navigator display can also be split, part of it used for the BrailleMate and part of it for the Navigator itself.

The two panels of five buttons are arranged in a square of four buttons with a smaller button to the side. In the middle of each square are two long horizontal buttons. These are the up and down buttons. On either side is a vertical button, one of course the left and the other the right. The smaller button on the side performs a variety of functions depending on whether it is on

the left side or the right side, and the mode of operation of the Navigator. These functions include an Enter key, linking and unlinking the Braille display window from the cursor, and invoking View2, the real-time Braille translator. For the most part, the right-hand panel of buttons controls the reading window and the left-hand panel controls the system cursor. The back panel of the Navigator contains input and output connectors, an on/off switch and power cord. The Navigator is hooked to the host computer via a serial port.

The Navigator comes with software called Gateway. This is the software that controls its functions and interactions with the host PC. It also comes with a utility called TRACK which allows the user to track alternate soft cursors with TeleSensory products--Navigator, Vert, Vista, etc.

Strengths and Weaknesses: The Navigator is a capable, full-featured Braille display. There are lots of options and parameters which can be changed. Many of these are changed via command-line switches which are used at the time the GATEWAY program is invoked. A need to change, add, or delete parameters can be met by re-executing the Gateway program with these or additional parameters. The Gateway program allows use of either a standard QWERTY keyboard for input and control or conversion of eight keys for entry of data in Braille. It is also possible to use a BrailleMate, as mentioned above. The Navigator uses a variety of chorded commands in its operation. A chord is a command in which a character is typed and the space bar pressed at the same time. This kind of command is common to devices using a Braille keyboard. These chords are used with either QWERTY or Braille input.

The Navigator is also sold with a program called VBPC for VersaBraille PC. This program uses the PC to emulate the VersaBraille. VBPC is a menu-driven program that includes an editor, file reader, file and directory manager, print utilities and more. Some users contend that the program has a number of

bugs which TeleSensory does not seem anxious to fix. Some units have also had problems with Braille cell reliability, although panel members have not heard of any particular problems of late.

The TeleSensory line offers possibilities with integrating different systems, that is using speech, Braille, and/or large-print displays at the same time. While it is possible to get other products to work together, it may take some fiddling. The company has always pushed the fact that its products are designed to work with each other.

Applicability to Literacy: The use of, and possible integration of, different access modalities when using Telesensory products, including the Navigator, may be of interest to some who are teaching Braille or computer skills. Other than that, the Navigator is a readable, fairly sophisticated refreshable Braille display.

MULTIPURPOSE BRAILLE DEVICES

Introduction

The following devices serve more than one purpose. In general they can serve as a refreshable Braille display for a PC and have at least one other function, perhaps as a note taker or as a stand-alone computer which can run other software.

Alva Braille Carrier

Importer: HumanWare, Inc.
Address: 6245 King Road, Loomis, California 95650;
     (916) 652-7253 or (800) 722-3393
Manufacturer: Alva
Price: $9,000
Size: 12 inches wide by 10.25 inches deep by 2 inches high
     (5.5 inches high when the Atari Portfolio is opened)
Weight: 6 pounds 10 ounces

Description: The Alva Braille Carrier (ABC) is a battery-powered 43-cell refreshable Braille display with a built-in 8-dot Braille keyboard and an Atari Portfolio personal organizer. The Portfolio, which is fully integrated into the operation of the ABC, is a small computer which runs a number of dedicated applications. These include an address book, calendar and diary, editor and spreadsheet. The user can run all of these applications using the ABC's Braille keyboard, getting feedback from the Braille display. The applications are simple, menu-driven programs, designed to aid an individual with personal management. The Portfolio is quite small, approximately six inches square and 3/4 of an inch thick when closed, and is mounted on top of the ABC. The whole unit can run on batteries and is designed to be portable. It comes with a carrying case with shoulder strap.

The ABC can also act as a refreshable Braille display for an IBM or compatible computer. It is similar in operation to the Alva Braille Terminal (see above.) It is also possible to run the PC from the Braille keyboard of the ABC.

Strengths and Weaknesses: The applications on the Portfolio seem to be straightforward and easy to use. They are not complex, full-featured programs but would meet many individual needs. The system comes with both serial and parallel interfaces, although only one can be used at a time. A user can either store data on a RAM card or transfer it to a PC. When used as a

refreshable Braille display, the ABC can either be hooked up as a serial or a parallel device, providing maximum flexibility. The device is on the expensive side, costing $9,000. An eight-dot Braille display generally sells for between $6,000 and $7,000, and an Atari Portfolio is a couple of hundred dollars. This means that a good deal of money is being paid for the Braille keyboard and the integration of the system. Like most systems employing a Braille keyboard, it is possible to produce all the keystrokes needed by a PC, such as Alt, Control, Shift, Escape, and other combinations, but some of the sequences get a little complicated.

Applicability to Literacy: Pressing a key on the Portfolio causes the Braille character to appear on the Braille display. Thus it could be used with a sighted teacher or tutor to show, quiz, or test a Braille student. It is also possible to rotate the Portfolio by 180 degrees so it faces away from the person using the Braille keyboard and refreshable Braille display. This feature could facilitate communication and/or teaching between a deaf-blind person and a sighted teacher.

David

Importer: Baum U.S.A.
Address: Baum USA: Accessibility Technologies, 17525
     Ventura Blvd., Suite 303, Encino, CA 91316;
     (818) 981-2253 or (800) 225-3150
Manufacturer: Baum GMBH, Germany
Price: $15,000
Size: 12.75 inches wide by 10.5 inches deep by 2 inches high
Weight: 8 pounds

Description: The David is an 80386-based notebook-style
computer with a built-in 40- cell Braille display and a Braille
keyboard. The unit also has integrated speech synthesis based on
technology from Berkeley Speech Technologies. It is a fully
functional MS-DOS computer. The unit is battery-powered and can
work as a portable. It comes with a leather briefcase-style carrying
case, and battery life is from 3.5 to 5 hours.

From front to back the David has an eight-key Braille
keyboard with space bar and two extra keys called Extension keys.
The Extension keys are used for cursor movement or are the
Escape key when pressed together. To the right of the regular
Braille keyboard is a PC-style numeric keypad. Above the
keyboard is the 8-dot, 40-cell Braille display. There are also four
status cells on the left side. Further, there are three "Display"
buttons on either end of the main Braille display. These buttons,
separately or in combination with each other, are used to control
the part of the computer screen the Braille display is reading or
moving to. Directly above the Braille display are 40 reference dots
topped by 40 optical sensors which are used for cursor routing
and other functions. Finally, at the top are 12 function keys. On
the left side of the machine are a 3.5-inch 1.44 megabyte floppy
disk drive, the power adapter connector, on/off switch, speech
on/off/volume control, and earphone jack. On the right side are
connectors for a VGA monitor, external QWERTY keyboard, serial

and parallel devices, and an expansion connector. The computer does not have any standard expansion slots.

Strengths and Weaknesses: The David is a power user's dream or nightmare, depending on one's perspective. The David is a very powerful and complex device. Virtually all parameters and settings can be changed. The unit's speech synthesizer has four possible languages--English, Spanish, French and German-- and can switch between any three of them. It is also possible to load and use a variety of Braille input or output tables, including those used in the U.S., Europe, and Russia. Most commands can be issued from the keyboard, using the numeric keypad or using the display keys and/or with the function keys. Consequently, there are potentially hundreds of commands and variations, and the user can re-assign all of these commands. Further, some commands, macros, reading functions, etc., can be issued by using the optical sensors. All of this makes for a very powerful and complex device. For a power PC user with strong Braille skills and the need and/or desire to use a Braille PC, this is probably the ultimate device. For most of the rest of us, it is expensive and overly complex.

The David came to the International Braille and Technology Center for the Blind without a Braille manual. For the $15,000 price tag this is an inexcusable deficiency. The company has said that such a manual would be too large, that it is in process, and that the device is changing so that they didn't want to do the manual prematurely. This suggests that the device was probably released earlier then it should have been. There were a number of bugs in the software, some of the manual sections weren't done, and some promised software, such as a menu-driven PC control program called Vision, was not included at all. Baum has been talking about an upgrade for a number of weeks now, and at least one user has been testing it. The current machine has a real-time Grade 2 Braille translator in it. It is possible almost instantly to switch to Grade 2 Braille from Computer Braille. However, the translation is restricted to the current screen. One must switch

out of it, bring up another screen, and invoke it again. The upgrade reportedly will have real-time translation with no screen switching restrictions.

The David will ultimately probably be a very powerful and complete Braille computer, but at this point the software hasn't caught up with the hardware.

Applicability to Literacy: Like most other refreshable Braille devices, the David has the potential to offer immediate feedback in Braille. It can also be used with a regular computer keyboard so someone who does not know Braille well could assist a student. However, because of its expense and complexity, this is probably not the ideal device for most students of Braille.

Importer: ATR Computers, Inc.
Address: ATR Computers, 4420 Norledge, Kansas City,
    Missouri 64123; (800) 421-9775
Manufacturer: F.H. Papenmeier GmbH and Co.
Price: $6,995
Size: 11.5 inches wide by 8 inches deep by 2 inches high
Weight: 7 pounds

Description: The Notex is available in 25- and 40-cell models.
The panel evaluated the Notex 40. It is a stand-alone refreshable
Braille note-taking device. It can also serve as a refreshable
Braille display for a PC and can be used in conjunction with a
modem to communicate with other computers, on-line services,
and/or electronic mail services.

The 8-dot Braille display is located on the top of the machine
on the front edge. Directly behind it and slightly elevated are nine
function keys which are used for controlling different aspects of
the device. Behind these keys, toward the rear of the machine, are
the eight Braille keys and four arrow keys which are used for
moving the cursor. The rear panel of the machine contains an
on/off switch, reset button, power adapter plug, and serial port.

Strengths and Weaknesses: The Notex is designed primarily
as a stand-alone Braille note taker/editor. The editor is simple and
easy-to-use. It offers basic editing functions, inserting, deleting,
block moves, etc., but no more. There are also utilities to facilitate
the transfer of data between the Notex and a PC. The device can
also be used as a refreshable Braille display for a PC. In this
mode it has adequate features, but nothing elaborate. A need
primarily for a refreshable display suggests purchasing a unit
intended for this purpose. If one wants a note taker and a display,
the Notex might suffice. The Notex has a menu-driven system for
setting and changing parameters. It is straightforward and easy to
use.

The basic design of this machine makes using it uncomfortable. Since the Braille display is in the front, function keys in the middle, and Brailling keys in the rear, one must constantly reach over everything to enter data. Papenmeire representatives say that it was designed this way because most people spend their time reading, not writing. This may be true; however, most like to rest their hands when writing, and this is not possible with this device. Further, the keyboard and other keys are totally unsatisfactory. They are rubber squares which stick up. That alone would not be so bad; however, they also wobble a lot when pressed down. The feel is uncomfortable, and it is difficult to tell if a key press has registered or not. It is very difficult to Braille rapidly and accurately on the keyboard, arguably the poorest keyboard on any Braille device in the International Braille and Technology Center for the Blind.

The Notex is somewhat slow in its operations, such as inserting and deleting characters, refreshing the Braille line after other operations, searching, etc. It does not use standard PC file conventions. It has 256K of memory, of which approximately 30K is used by the machine itself. The remaining memory is broken up into blocks which are used to store data. Multiple blocks can be used for contiguous data, but one must then navigate from block to block to find or place things. Users can also go directly to a block if they know its number. In transmitting data to a PC it is necessary to mark the beginning and end of the data so the device knows what to send. This is more awkward than using files. Further, for receiving data from a PC, it is necessary to mark out an area for it or existing data will be overwritten.

Users can enter data in whatever form they wish: Grade 1, Grade 2, or Computer Braille--the device doesn't care. There is no back translator, however, such as in the Braille 'n Speak. One can of course send data to a printer, and the Notex will do simple formatting.

Applicability to Literacy: As mentioned earlier, this is a simple and easy-to-use device. It would be relatively easy to teach someone how to use it to write and edit in Braille. However, its features are quite limited, and some things, such as the memory management scheme, are awkward at best. As a note taker the device is expensive, large, heavy, and limited. As a refreshable Braille display, it is not as full-featured as its big brothers, including displays made by Papenmeier. Most people will outgrow the editor in the Notex in short order, so considering the price, weight, and limited features, it has little to recommend it.

Importer: Blazie Engineering
Address: 105 East Jarrettsville Road, Forest Hill, Maryland
          21050; (410) 893-9333
Manufacturer: Elinfa
Price: $3,995 for 20-cell model, $6,995 for 40-cell model
Size: 9 inches wide by 2.5 inches deep by 2 inches high
          (when closed) and 2.5 inches high (when opened)
Weight: 1 pound, 3 ounces

Description: The Personal Touch, which is made in France, is a small, portable note taker with a 20-cell refreshable Braille display and a Braille keyboard. It uses 6-dot Braille, not 8-dot Braille.

When closed the Personal Touch is a compact rectangular unit. It comes with a leather carrying case. The top portion folds back from the base at a 90-degree angle, exposing the Braille keyboard. When viewed from the side, the Personal Touch is in the shape of a print L. The base contains the keyboard and the upright section contains the Braille display on the left and the cursor keys on the right. These things are located on the top edge of the upright section. The feel of the Braille display is very good.

Strengths and Weaknesses: The Personal Touch is a basic note-taking device. Like some other portable devices, it allocates memory in blocks. It does use standard file conventions, unlike the Notex; and, unlike the Braille 'n Speak, it can allocate and deallocate memory blocks to files as needed. This makes file management on the Personal Touch relatively easy. It has basic editing functions--insert, delete, block moves and block deletes-- but little else. It is a very simple editor. Unlike other devices, the cursor is never shown by a full cell or a special symbol such as dots 7 and 8. The cursor is always assumed to be at cell 20, at the right edge of the display. This takes a little getting used to, but it works fine.

In addition to acting as a note taker, the Personal Touch can transfer files to and from a PC. It also has software for the PC which allows it to be used as a refreshable Braille display. This software is relatively simple, with limited options, but would give one basic access to the PC. It allows users to move around on the screen, search for text, or search for attributes, such as underlining and blinking text. There are no configuration options for customizing settings for an application and saving them. The device also has commands which will work with the disk drive that Blazie Engineering sells.

When the unit is showing the file list it beeps every two seconds. The beep is somewhat annoying and there is apparently no way to quiet it or turn it off. This could be a problem in a classroom or other public situation. The keyboard has a positive feel, but the space bar is located below the regular keys. Some may find this a little uncomfortable, but one likely would get used to it.

The Personal Touch is lightweight and compact. If one's need is for a basic Braille note taker, this will do the job. However, its features are so basic that most people will outgrow it.

Applicability to Literacy: As mentioned earlier, the Braille display has a good feel to it. The dots are easy to feel and aren't mushy, like some displays. The Personal Touch offers basic Braille note taking and PC access. It has one command which might be of interest to sighted persons and/or Braille teachers. It will automatically send data out the serial port, to a PC or other device, every time the Braille display changes. This would allow a sighted person who doesn't know Braille to follow what a Personal Touch user is doing.

NOTE TAKERS

Introduction

This category includes small, hand-held, computerized devices used for note taking. Three out of four of the reviewed devices employ a Braille keyboard. All of the reviewed devices employ speech as their primary means of output. One device, the BrailleMate, has a one-cell Braille display.

These devices offer simple applications and are generally used for note taking; simple writing; and the maintenance of calendars, diaries, and other schedule information.

The Braille 'n Speak, from Blazie Engineering, is probably the most successful access device to date, with well over 10,000 sold. At any gathering or meeting of blind persons you are likely to see one or more of the ubiquitous devices. We also expect a number of new devices in this category over the next two years.

BrailleMate

Manufacturer: TeleSensory, Inc.
Address: 455 North Bernardo Avenue, P.O. Box 7455,
     Mountain View, CA 94039-7455, (415) 960-0920 or
     (800) 227-8418
Size: 8 inches wide by 3 inches deep by 1.25 inches thick
Weight: 1 pound
Price: $1,595 for basic unit, $100 for carrying case and
     cables, and $295 for 512K RAM card
Battery Life: Up to 6 hours

Major Features: 8-dot Braille keyboard, 8-dot refreshable Braille cell, speech synthesizer (optional on international orders), serial port and combination serial/parallel port, 128K internal memory, external RAM cards for augmented storage, 6-function calculator, phonebook, and appointment utilities. In addition, BrailleMate may be used as a speech synthesizer for a computer with any screen-reading program that supports a PORTTALK device.

Description: The BrailleMate is a portable, electronic note-taking device incorporating an eight-dot Braille keyboard (plus 2 function keys) as input and a single refreshable 8-dot Braille cell and speech synthesizer as output. Several ports are provided to interface BrailleMate with other devices such as TeleSensory's Navigator Braille display, computers and printers such that data may be transmitted from the BrailleMate to the Navigator, transmitted to either ink-print printers or Braille embossers from the BrailleMate or transferred between the BrailleMate and computers. The BrailleMate may also be used as a dumb terminal for communications with mainframe computers, BBS's and the like. External storage in the form of battery-powered RAM cards may be added to BrailleMate to augment its 128 K bytes of internal memory.

Strengths: The 8-dot, refreshable Braille cell allows BrailleMate to be used by a deaf-blind person who knows Braille. Although BrailleMate normally uses tones to augment the information imparted by the Braille cell and speech output, a parameter may be set which instructs BrailleMate to substitute a vibrating Braille cell for the tones. Although the single Braille cell does not lend itself to reading of extended amounts of material, it does allow a deaf-blind person to use BrailleMate as a note-taker independently and, in the reviewer's opinion, provides a small, lightweight means for access of electronic data by a deaf-blind person. The single Braille cell also allows any user to check something quietly or see where the cursor is located.

Where extensive overwriting of material is required in order to correct errors, BrailleMate shines since one may go to any point in text already entered and overstrike as much text as is desired without the necessity of executing a command to overwrite each character. (BrailleMate has, of course, an "insert mode" also.)

Because of its 8-dot Braille cell, BrailleMate allows easy identification of capital letters without the necessity for use of phonetic spelling by the speech synthesizer.

BrailleMate can perform a search-and-replace operation in one step. That is, one need not find the text to be replaced, delete it, and then insert the desired text in separate operations. BrailleMate's phonebook and appointment book have fields automatically labeled and set up so that the user need only find the correct field and enter the appropriate data. The BrailleMate user need not be aware of memory management functions (such as sizing of memory files) except, perhaps, to check periodically to make sure that a prudent amount of memory is still available for the work in question.

Cursor (text pointer) movement may be done by either hand (the other hand, presumably, reading the Braille cell); leftward cursor movement key combinations are to the left of rightward

cursor movement key combinations with either hand. BrailleMate can mark up to 9 positions in each file in memory (internal or on RAM card), and one can immediately go to any one of those markers.

The BrailleMate can easily be attached to all printers, since it has a parallel and a serial port. The BrailleMate does provide some indication of battery charging rate. The BrailleMate software can be updated without the need to change hardware ROMs.

Weaknesses: Cursor movement key combinations are not symmetric. That is, the finger combination required to perform a given cursor movement by the left hand is not the same required to perform the identical cursor movement by the right hand. There is no true "one-handed" mode. That is, while the cursor may be moved by either hand (and thus text may be read by either hand), most other functions require depression of "chorded" combinations (depression of keys simultaneously with the space bar) and/or depression of the two function keys, known as Shift Left and Shift Right. This may require considerable finger dexterity and might prove difficult or impossible for those with hand movement restrictions or who only possess one hand. Further, some functions such as deleting by word, sentence, or paragraph take numerous keystrokes to perform.

The user is, to some extent, isolated from the format of documents which may be downloaded into the BrailleMate. For example, while there are "read word," "read sentence," and "read paragraph" commands to BrailleMate, paragraphs are indicated by the existence of a special print format code, "$p," and there is no "read line" function per se. Thus, in order to format a received document such that it could be read paragraph-by-paragraph, one would have to do a global search-and-replace of the paragraph indicators (for example, two consecutive carriage-return/line-feed pairs) with the appropriate print format code. In similar fashion, BrailleMate recognizes a printer code to indicate, for purposes of printing a document in either print or Braille, that the printer

should be forced to skip to a new line, rather than by use of a carriage-return/line-feed pair. Thus the user may feel isolated from the form of a received document, and although the printed form of the document may not be relevant to reading, there are times when knowledge of the form might prove useful. The recent upgrade of the BrailleMate offers commands to read the previous, current, and next line although they use the aforementioned $l indicator and not the more commonly used carriage return/line feed combination.

Viewing and setting of parameters controlling the various functions of BrailleMate tend to be cumbersome. Users often must go through a hierarchy of menus to get to the desired function, and they must then view the various choices in order to make a selection. Attributes such as whether the back translator is on or off and page formatting settings cannot be established and saved on a file-by-file basis, as with the Braille 'n Speak. They are set on a "global" basis.

Although 128K of memory is often quite adequate for normal note taking and noting of phone numbers, addresses and appointments, it can prove inadequate when BrailleMate is used as a terminal communicating with mainframe computers or on-line data services such as CompuServe or GEnie when capturing large amounts of data. One must presumably use RAM cards with a capacity larger than 128K bytes in order to handle such situations.

There appears to be no way to transmit either a single line of text or a marked block of text to an I/O port from a file in either internal memory or on a RAM card; when doing file transfers, an entire file must be transmitted. The BrailleMate cannot handle file transfers in any but ASCII protocol. It cannot, for example, handle file transfers using Xmodem or Kermit protocols as can the Braille 'n Speak 640.

The original BrailleMate could not execute "macros." That is, it could not execute automatically a sequence of commands via a

few keystrokes substituting for the much larger number of keystrokes required to carry out the commands. A recent upgrade adds "macro" capability. A macro can contain up to 255 characters.

There is no means to use an exceptions dictionary for words or phrases which are mispronounced.

Memory: 256K program memory, 128K user memory plus external RAM cards which come in several sizes, minimum 64K

Comments: To some extent, what computer-literate individuals may view as weaknesses in BrailleMate might be viewed by the computer novice as advantages. Thus, for those familiar with computers, an intimate knowledge of the content and format of files might be desirable. For computer-novices, however, what a received document looks like may be immaterial as long as it may be read satisfactorily. Hence, a function such as "read a line" may not be missed. Similarly, if one is taking notes, one is not likely to be concerned with format and will be content to let the note-taker do any required formatting if the notes are to be printed. Whether one prefers entering of format codes (as on the BrailleMate) or actual characters (as with other note-takers) is likely a matter of preference and what one has become used to. It should also be noted that in order to make a sensible accommodation to a refreshable Braille cell, TeleSensory had to make what amounts to two reading modes--one for Braille and one for speech. In the opinion of the panel, the reading mode using speech alone executes somewhat awkwardly although it works quite well.

The BrailleMate is a good electronic note-taker. It does the jobs for which it was intended well. Whether a single refreshable Braille cell provides enough benefits in most situations to warrant its inclusion in the device is a matter for debate. Also, certain design decisions (such as that to use external RAM cards for extra file storage capacity rather than interface BrailleMate to a disk

drive) have placed limitations upon BrailleMate which may prove, in the long run, frustrating to the dedicated user.

Applicability to literacy: The BrailleMate, as well as the Braille 'n Speak, has some possibilities in the teaching of Braille. This is primarily because of the built-in speech synthesizer, the device will say a letter or contraction as soon as the keys are pressed and released. The BrailleMate has the added advantage of the single Braille cell, so the user could feel what he/she has written. One must be realistic about the purpose and use of the single cell, but it does have possibilities.

Braille 'n Speak

Manufacturer: Blazie Engineering
Address: 105 East Jarrettsville Road, Forest Hill, MD 21050;
     (410) 893-9333
Size: Approximately 8 inches wide by 4 inches deep by 1.25
     inches thick
Weight: Approximately 13 ounces
Price: $1,349; $1,299 if prepaid; three months warranty; $99
     annual service contract
Battery life: 15 hours

Major features: Note-taker, word processor, stopwatch,
four-function calculator, scientific calculator, smart appointment
calendar, speech synthesizer that can be used with most screen
access programs; help file is included.

Description: Braille 'n Speak (BNS) gives an initial impression
of simplicity itself; its only moving parts are the seven keys
arranged like a Perkins keyboard, and the power on-off switch. It
has two jacks -- one for a power adapter, and one for an earphone
or external speaker. It has two ports -- one for connection to an
external serial device, and one for connection to an auxiliary
battery-operated disk drive. For users who prefer it, Blazie
Engineering also markets a device called Type 'n Speak in which
the Braille keyboard is replaced by a laptop-style QWERTY
keyboard (See below for review.)

Strengths: The memory is non-volatile, so that no information
is lost when the power is turned off; includes a "back-translator"
which makes it possible to input text in Grade Two Braille and
then print out or listen to the text in standard form. The device is
extremely versatile and capable of performing many useful
everyday functions. Excellent technical support is available.

Weaknesses: BNS is not a full-fledged computer and its
operating system is proprietary. Data is stored in the BNS's

memory which will eventually become full. One must then either delete files--losing them forever, print them on paper, or transfer them to a computer or Blazie disk drive. Most people who own and use a Braille 'n Speak have had a "crash" at one time or another. This is generally, but not always, caused by allowing the batteries to discharge too far. Care must be taken to protect your data.

Output options: In addition to its synthetic speech output, BNS can be cabled to any external serial device such as a computer, a modem, a printer, a Braille embosser, or a refreshable Braille device such as the VersaBraille; it can also receive data from an external computer, modem, or refreshable Braille device through its serial port. A connecting cable comes with the BNS. A serial-to-parallel cable is also available at extra cost.

Memory: The BNS memory is nominally rated at 640K. Of this memory, about 40K is used for overhead, leaving in excess of 600K for unrestricted use. A less expensive version of BNS is still being sold with 256K of memory and fewer major features.

Interfacing Options: In addition to the interfacing options described above, BNS can interface with an auxiliary battery-operated disk drive which uses 3.5-inch diskettes. Using BNS commands, a disk can be formatted, a file can be deleted from the disk, a file can be loaded from the disk into the BNS memory, a disk directory can be created, removed or interrogated, a file in the BNS memory can be saved or printed to the disk, and the disk volume label can be interrogated or changed. These diskettes are compatible with IBM or IBM-type computers, so that they can be freely ported from the BNS to a computer and conversely. The price of the auxiliary disk drive is $495. It comes with a 3-month warranty, and a $75 annual service contract is available.

Applicability to Literacy: The Braille 'n Speak is undoubtedly the most widely used access aid for the blind. In some meetings

of blind persons one strains to hear the speaker against a background of Braille 'n Speak key sounds.

Most people find it easier to learn to write Braille than to read it. This is a situation that the Braille 'n Speak perpetuates, although this isn't bad for everybody. There are diabetics who do not have the finger sensitivity to learn to read Braille, but they are very good BNS users because they can still use the keyboard. Further, the BNS will immediately say the letter or contraction when its keys are pressed, so it offers a lot of verbal reinforcement for a Braille student. It has been used in the teaching of Braille writing, and it can be very effective. It should not be substituted for basic skills, particularly learning to use a slate and stylus, but it does have its place in Braille literacy training.

Eureka A4

Manufacturer: Robotron, LTD.
Vendor: Integrated Assistive Technologies
Address: Integrated Assistive Technologies, 250 H Street, Box
        751, Blaine, WA 98230; (800) 688-9538
Size: 12 inches wide by 8 inches deep by 1.25 inches thick
Weight: 3 pounds 14 ounces
Price: $2,195 to $2,584
Battery Life: 6 to 7 hours

Major features: The Eureka A4 has a number of built-in applications including a note taker, word processor, simple database, music composer, diary, clock/calendar, thermometer, BASIC computer language, disk drive, and a modem. Available accessories include a color sensor, light sensor, volt meter, and a hand scanner/OCR package.

Brief description: The Eureka A4 is a portable computer/note taker with a Braille keyboard and built-in speech synthesis. The unit is manufactured in Australia and has a decided Australian accent.

The Braille keyboard is on the top panel of the device, more toward the left side. To its right are five keys in a diamond shape, with the fifth key in the middle. These are the cursor control keys and a "shift" key that is used in conjunction with other keys. Above the Braille keyboard, which is six-dot Braille, are eight function keys. These keys invoke different applications that the machine has and perform other functions within those applications. Above the function keys, toward the right side are two sliders, one for volume and one for synthesizer speed. The back panel of the Eureka contains a serial port and power plug. On the right side is a 3.5-inch disk drive, and jacks for the built-in modem are on the left side of the Eureka.

The Eureka is intended as a total solution for a blind person, an information management system all in one package. It has a Braille keyboard, and input can either be in Grade 2 Braille or in Computer Braille, what the manufacturer calls Grade 0 Braille. When the user writes in Grade 2 Braille, contractions are reverse translated as they are written, and the correct characters are stored in the Eureka's memory, and/or on disk. What is maintained is an ASCII file, not a Grade 2 file. This is different from some Braille note takers, such as the Braille 'n Speak, which back translates as one reads but maintains a Grade 2 file. There is a Grade 2 translator available for the Eureka called Braille Master. The use of this translator on the Eureka is quite slow since it involves some disk swapping. What are called "Star" commands must be inserted into the file to control formatting. Available are British or American Braille. Braille Master is also available in a PC version but isn't widely used in this country.

Strengths: The Eureka A4, while not widely used in the United States, has had more success overseas, particularly in Australia and England. Its following in North America is small but dedicated. It is available in a number of foreign language versions.

It is intended for the person who wants an electronic solution to his/her information needs but who doesn't want a full-fledged computer. Because of the number of built-in applications, it is able to meet the total needs of some people. There are limitations to the hardware, and some applications are better than others, but there is a lot there.

The word processor is essentially a version of WordStar with added audio cues. Another popular major application of the Eureka is the Music Composer. The basic unit has a 4-voice synthesizer, and the advanced music option has a 9-voice model. At least on the basic model, though, one finds the music synthesizer voices to be very similar. The Eureka does give the blind musician the means to write music independently. One can

do it either by entering notes, time signatures, etc. into the Eureka's memory, or by using arrow keys to move up and down the staff, marking the notes wanted. The Advanced Music Option then allows printing out in ink-print the music one has written. This could be a very powerful feature for the music student.

The Eureka A4 has the ability to run programs written for the CP/M operating system. While not all programs will work, and the unit doesn't provide a lot of tools to make applications talk better, some things do work and some users have had good success experimenting with this feature. In terms of writing music and/or BASIC programs for the Eureka, the machine has become a hobby for some of its users. There are some very loyal and dedicated users in this country and around the world.

One experienced user described the Eureka A4 as being somewhat like having an XT with no slots, WordStar 4.2 and an early version of Tandy's DeskMate. Depending on one's needs and expectations, this can either be a positive or a negative.

Weaknesses: The major drawback to the Eureka A4, at least for Americans, is the speech. The synthesizer sounds Australian and is very difficult to understand. Even some Australians visiting the International Braille and Technology Center for the Blind have been unable to understand the speech.

Another major deficiency is the keyboard. The keys, which are rubber, are well-shaped and well-placed. However, they rock back and forth when pressed. Secondly, the machine responds to the keyboard very slowly, so it is possible for a fast Braillist to type ahead of it. Some users hook up a regular QWERTY keyboard to the Eureka.

The basic unit only comes with a 300 baud modem and the Advanced Communications Option has a 1200 baud modem. Both are on the slow side, and the communications program is also somewhat limited. It supports very few transfer protocols. The

built-in calculator rounds off numbers after the seventh digit so calculation errors can occur. There is also no way to drop the result of a calculation directly into a document unless it is saved as a file and imported. An updated calculator has been released on disk that fixes the calculation errors.

When operating on batteries the machine goes from having an adequate charge to needing charging rather quickly. If power is lost, it is possible to lose data in the Database, Calculator, or the Music Composer.

The Eureka A4 is turned on by pressing three keys simultaneously: dot 3, F1, and the up arrow. It is possible to turn the machine on accidently, such as by packing it in a suitcase where all the keys get pressed at once. The machine also times out and turns itself off after 5 minutes. This can be lengthened to 15 minutes, but can be a problem in one of the applications that isn't saved to memory (See above.) A better on/off system would be desirable.

Output options: The Eureka A4 is equipped with a serial port which can be hooked to other devices. It also has speech output, as mentioned above.

Memory: The Eureka A4 has 512K of memory of which somewhat less than 200K is available for use. The rest is used by the system. Memory is allocated among different applications, so the 200K is not available in one block. The largest document that the word processor can handle is 48K. The Advanced Edition has additional memory, approximately twice as much.

Interfacing options: The Eureka A4 is equipped with a serial port. It could be connected to other devices via that port. There is also a program available called PC Alien. It allows the user to transfer files to and from the Eureka to a standard IBM or compatible computer. Essentially PC Alien defines the Eureka as

another disk drive for your PC. It is a little tricky to set up for many users, but it does work.

The Type 'n Speak

Manufacturer: Blazie Engineering
Address: 105 East Jarrettsville Road, Forest Hill, MD 21050;
    410-893-9333, BBS: 410-893-8944, Fax: 410-836-5040
Size: 12 inches wide by 6 inches deep by 1-1/4 inches thick
    (plus another 1/4 inch clearance for keys)
Weight: One pound
Price: $1,395
Battery Life: 8 hours or more

Brief Description: The Type'n Speak is a lightweight and compact portable note taker with a self-contained speech synthesizer. It has no visible display. In addition, it can perform simple word processing functions, operate as a computer terminal, or even work as a speech synthesizer on another computer.

Major Features: Built-in text editing with full cursor control; clock; calendar; stopwatch; automatic reminders; built-in speech synthesizer, serial, parallel, and disk drive connectors, full typewriter-style keyboard with function and cursor movement keys; six-key Braille writing mode; Braille back-translator; internal rechargeable batteries which can be charged without removal; capacity to run external programs; firmware updating requiring no electrical work.

Strengths: The full-sized keyboard permits the user to perform most editing functions just as would be done on a computer. However, the "Braille mode" permits the Type 'n Speak keyboard to be used as a six-key Braille keyboard for fast and easy entry of Braille. A reverse translator can be used to turn grade two Braille into print. The ability to run external programs that are loaded into the Type 'n Speak via a modem or disk drive provides a means of continually broadening the uses to which it can be put.

Weaknesses: The controls over formatting of printed text are limited. Although one can specify left, right, top, and bottom margins, as well as ask for automatic page numbering, there is no provision for other automatic page headings or centering. However, the ease with which the Type'n Speak's firmware can be updated means that such weaknesses may well be short-lived. In general, the strengths and weaknesses of the Braille 'n Speak apply to the Type 'n Speak.

Output Options: Text can be printed or Brailled. If text was entered in grade two Braille, it can be transmitted to a Braille printer as is or reverse translated and sent to an ink-print printer. Text and data can also be stored on computer diskettes using the optional disk drive or by sending data to another computer.

Memory: 768K (the actual amount of free memory available may vary with the version of the firmware)

Interface options: The Type 'n Speak can send data to its serial or parallel ports. Either can be used to drive an ink-print or Braille printer. It also has a connector for an optional disk drive that makes it possible to store data on a computer diskette. Of course, the serial port can also be connected to a modem or to another computer.

Applicability to Literacy. Here again, those things which are true for the Braille 'n Speak are true for the Type 'n Speak. Since six keys can be used on the QWERTY keyboard for Braille entry, it can be used as a Braille teaching device. However, this form of Braille entry may not be as comfortable as using a true Braille keyboard.

PLANNED EVALUATIONS

The following software package and devices, though currently available, have not been reviewed at this time. The panel anticipates being able to provide information about them in the future.

Braille-n-Print
E-Z Braille
Notex 486
Mini Braille
Mprint
Papenmeier 2D