Trace Center

Trace Research and Development Center

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A multidisciplinary research and resource center on technology and human disability

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OCT 29 1996

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Office of the Secretary
Federal Communications Commission
1919 F Street NW, Room 222
Washington, DC 20554

October 28, 1996

Attached please find an original significant copy of a letter from Dr. Vanderheiden, along with nine copies of his comments and a disk with the text file of the comments.

The letter and copies were delivered via courier service on Monday, October 28, but we were unable to include the disk with that package.

The original signature copy of the letter and the copies of the comments are included here for your convenience; the copies yesterday were from a faxed copy.

If there is any confusion on this matter, or I can be of any assistance, please do not hesitate to call me. I can be reached directly at 608-263-5865.

Sincerely,

Christine J. Thompson

Christine J. Thompson
Assistant to the Director

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1919 F Street NW
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October 28, 1996

Attached are comments in response to FCC NOI 96-382, Access to Telecommunications Services, Telecommunications Equipment and Customer Premises Equipment by Persons with Disabilities.

A copy of these comments is also being sent on disk via Federal Express.

Sincerely,

Gregg C. Vanderheiden, Ph.D.
Professor, Dept. of Industrial Engineering
Director, Trace R&D Center

GCV:cjt

Internet **gv@trace.wisc.edu**

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OCT 29 1996
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Comments submitted by
Gregg C. Vanderheiden, Ph.D.
Trace R&D Center
University of Wisconsin-Madison

in response to the Federal Communication Commission's
Notice of Inquiry 96-198
released September 19, 1996

Thank you for the opportunity to provide comment in the matter of accessibility of telecommunications services, telecommunications equipment, and customer premises equipment. For convenience, I will order my comments in order by section within the NOI, and will keep them as brief as possible.

Let me precede my comments, however, with a couple of discussions which will then relate to a number of the points that will be made in these comments.

Thin and Very Thin Clients: What Is CPE?

It has been widely known that developing accessibility guidance and guidelines in this area would be difficult because of the very rapidly changing nature of the technology as was pointed out in the NOI. In fact, even interpreting the law will be difficult.

In talking about Customer Premise Equipment, I believe that it was the intent of the law that the interface on customer premise equipment be accessible whenever readily achievable. However, with the currently emerging technologies, it turns out that the interface (the "buttons" and other controls as well as the information displays) may not be completely defined by or under the control of the CPE manufacturer. In fact, on some types of technologies being introduced, the majority of the interface may be defined by the telecommunication information service provider. This leads to some interesting problems and to situations where the interface that the user encounters on his or her CPE may not be covered at all by access guidelines unless the guidelines apply to telecommunication information service providers as well.

Let me briefly explain what I am referring to.

In the past, telecommunication devices have had keyboards, volume controls, buttons, dials etc. on them as well as LCD numeric or alphanumeric displays etc. These, along with the software in the telecom device (which defines how it works and behaves),

comprised the interface, the part of the telecommunication aid that the person uses to interact with and control the telecommunication device.

Modern technologies are now allowing us to introduce a new approach called network computing or "thin clients". With this approach, the behavior of the CPE (and it's interface) are not defined by software in the device, but by software which is downloaded from the telecommunication/information service provider. With a very thin client, the telecommunication CPE may have only enough intelligence (when it is turned on) to know to connect to a service provider (as it is turned on), and download its software. This downloaded software would then tell it how to function. The telecom aid itself would in effect not have a user interface until one was downloaded from the service provider.

We don't have very thin client aids yet, but we do have thin clients and a host of clients that already download software which defines major portions of their human interface for carrying out telecommunication and transactions.

CONCERN: If the telecommunication access guidelines are applied only to CPE (and carrier) HARDWARE manufacturers, then it is entirely possible that technology evolution would result in many (and eventually most?) telecommunication interfaces being exempt from any access guidelines - because the interfaces will not be defined by the CPE when it is purchased (but rather by the service providers software which is downloaded to the CPE as it is used).

RECOMMENDATION: That the term "Customer Premise Equipment User Interface" be coined. That it refer to the user interface that the user experiences when using their CPE for telecommunication (to "originate, route, or terminate" the "transmission, between or among points specified by the user, of information"). And that the CPE interface be considered an integral part of the CPE. Thus, the user interface that the user experiences when using their CPE would be covered under the accessibility guidelines for the CPE regardless of whether the software which defines the user interface (or portions of it) was present in the CPE when it was purchased, whether it was downloaded to the CPE as it is being used, or whether it is being run at a remote location - as long as it appears to the user to be part of the interface that the user experiences when using their CPE for telecommunications. The responsibility for the accessibility of the interface created by the software would be with the company that manufactures or provides the software to the CPE.

In effect what is being proposed here is

1) the CPE consists of the CPE hardware, AND the software that determines how the hardware behaves and what it does.

2) that that portion of the software which determines how the CPE interface behaves or operates (when the CPE is being used

for telecommunication) be covered under the guidelines for having CPE be accessible whenever readily achievable, REGARDLESS of when the software is loaded onto the CPE.

3) that the user interface software is also covered even when it is actually run on remote computers, if the interface is part of the interface the user experiences while running their CPE (for telecom).

4) that responsibility for accessibility of the user interface software rest with the manufacturer or provider of the software (or the software component).

So, by downloading software which defines or redefines the behavior of the CPE's interface, a service provider becomes a vendor or manufacturer of part of the CPE. A very important part in fact. The part (or a part) which defines it's user interface.

It is important to note that this applies ONLY to software that affects the interface of the CPE when it is used for telecommunication functions ("the transmission, between or among points specified by the user, of information".) It would NOT apply to game (or any other) software for example that was downloaded onto a persons computer and did not involve the transmission of information over telecommunication channels when it was running.

This concept (the CPE user interface being something that may be acquired separately from the CPE hardware) is very important, since we are now to the point where the interface that we experience on our telecommunication systems will often not be defined (or not be completely defined) when we purchase the device, but will be acquired on the fly, as we use the device. This has profound implications for accessibility which can be pro or con depending on how it is implemented.

It is also important to note, that this downloading of the user interface software may not be something that the user will chose to do consciously, have a choice of, or even necessarily be aware of when it happens. Already we have java applets, and a host of telecommunication service providers that automatically download software, and update software, that forms the user interface used to access the service provider's communication services - or communication services in general when they are accessed through that vendor.

The first thin client devices and network computers are already beginning to appear commercially. Several press announcements will occur immediately after the due date for these comments. In addition companies are showing videotapes of their views on very-thin clients. [Note, the above phenomenon of downloaded software which defines some or all of the user interface is not restricted to thin clients or network pc's. This

strategy is already being used today on ordinary personal computers - especially around telecommunication and teletransaction activities.]

An Example

With this direction (toward thin clients and components of interface software run a remote sites), the following scenario is very possible.

> The year is 2000. Bob and Lea are sitting in a room at a table. Each of them has a telecommunication device which they are using to talk with their home office, access information off the Internet, and order a gift for their respective spouses' birthdays. In both cases, they are using systems which are compatible with the systems used by their employers. (a charge-back scheme is used to allow them to transfer personal use charges to their personal accounts). They couldn't use each other's devices due to software and security differences between the two systems used by their respective employers..
>
> The two systems have almost identical user interfaces and functions. However, Bob's device uses a design approach, where the software he runs is stored permanently in memory on his device. This software controls the appearance of the user interface on his device.
>
> Lea's system on the other hand (though it functions almost identically) is using a very thin client system which provides her with the same functions and interface but in a much lighter and more portable system. The user interface on her system is entirely defined by software which comes from the service provider and is downloaded into her system each time she turns it on. In fact most of the software she is running and that she interacts with is actually running on the other end of the wire, at the service provider. What she has in her hand is the equivalent of a touchscreen panel, a speaker, a fold out keyboard, and a microphone.
>
> If one were to define Customer Premise Equipment as being only those physical pieces of hardware and software which were at the customer's premise before they initiated the telecommunication, Bob's device and system would be covered under the Telecommunication Act, but there would be no coverage for Lea's system. If you define any software that affects or defines the user interface of the CPE as being part of the CPE - regardless of when it is provided to the user - and regardless of whether it is run on the user's CPE hardware or at the other end of the wire then both Bob and Lea's systems would be covered.

If not defined this way, then as companies move toward thin client and very thin client architectures, they would actually move out from under any of the requirements for accessibility, since none of the user interface would be part of their product when sold

and delivered to the client (since the user interface would only be delivered to the client when the telecommunication event is initiated). Also, much of the software that defined the interface that the user experienced may not even be running on directly on their CPE as distributed or Network based computing is introduced.

The important point here is that as far as Bob and Lea are concerned, they are using devices which they are holding in their hands and which is behaving in a certain way, and the user interface as they are experiencing it is in their hands. The fact that some of the software is running in one location versus another is completely transparent to them: unless someone told them, they would not know that they had purchased totally different products which were operating along totally different principles.

Implications for accessibility

Now, let us consider Maria who has a disability. Would she be able to get a job with Lea's firm and have an accessible product? Or would the producers of those products not have to worry about accessibility issues? If Maria did want to join Lea's firm, would Lea's company suddenly be faced under the ADA with having to rethink its whole telecommunication structure, and have to go to the older technology in order to use technologies that were covered under the Telecommunications Act? Since this would undoubtedly be found to be an unreasonable burden, it could result in Maria not being able to use the systems at Lea's firm, and perhaps not Bob's, either, as Bob's firm goes to this new approach.

Here today?

Due to transmission efficiencies, and the limited bandwidth of today's telecommunication, current products are not using very thin client architecture. It is more efficient to download some (particularly graphic intensive) functions to the client. However, thin client technologies are already in place, and with the advance of Java and network computers, we are seeing rapid growth in this area. "Just in time" downloading and compiling of software which has it's own user interface is already occurring in telecommunication products.

Although very thin clients (where essentially none of the software resides on the client) may not be common for some time due to network delays, they will be appearing quite soon for some types of telecommunication devices.... much sooner than the FCC will be revisiting this topic for a significant overhaul. It is important that they be addressed therefore at this time. Also, as stated above, these same principles are already being implemented with today's personal computers and need to be addressed.

GENERAL COMMENTS ON COSTS

The Cost to Learn and the Cost to Comply

There are two costs aside from actually making products more accessible which are often cited in conjunction with this area. One is the cost to learn, and the other is the cost to do compliance paperwork.

The cost to learn is basically the additional cost that a company incurs because they need to bring their design team up to speed with regard to the needs and abilities of individuals who have disabilities, as well as the techniques and strategies for creating more accessible products. The cost to learn also includes special design reviews that need to be conducted to identify how their product is or is not usable, and time spent in developing or identifying strategies to address accessibility. Initially, there will be additional costs, since this type of information and training has been neglected not only within the companies' training and apprenticeship activities, but also within the university and design training programs (for the most part). These costs, however, will fade over time. When all of the products are designed to make them accessible wherever it is readily achievable, then the techniques for making products accessible will not only be known, but including them will be reflexive. Special after-the-fact design reviews to check for accessibility would not be necessary beyond the standard testing that is done to make sure that products follow reasonable guidelines and meet usability standards. (It is recognized that including users with disabilities will increase the time that it is necessary to carry out user testing.)

The cost for compliance testing and documentation

It is important that the cost involved in compliance testing and paperwork be minimized, as these activities do not contribute to making the product more accessible. It is important, therefore, that the compliance tests be objective, straightforward, and easy to carry out. Similarly, paperwork should be kept straightforward. It must be remembered that with convergence, these regulations will apply to a very wide variety of products. It is therefore essential that there be little load on the FCC and a minimal load on manufacturers for those individuals and situations where products are in fact being designed in accessible fashion.

Costs Should Be Calculated as Percentage

Because of the large number of products being designed, it is very easy to generate very large numbers with what seem to be simple assumptions. The costs for determining readily achievable, as well as the costs for compliance, should be calculated as a

percentage of the total amount of effort needed to bring a product to market, support it, etc. Because of the sheer volume of products which will be involved in telecommunication, even an increase in cost of one-half or one percent can end up generating very large numbers. These numbers look very large when not taken in context.
Stating these costs as a percentage of the overall cost to do business puts them back into perspective.

In looking at costs it is also important to look at the cost shifting (to the government) that would occur if telecommunication systems which are essential to employment evolve in ways that make them inaccessible and employment less achievable by people with disabilities. There are also tremendous cost savings to be had through the increased ability of people who are older to live independently in their homes for longer periods before having to move into nursing homes.

RESPONSES BY SECTION

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(8) "We seek comment on whether the term 'provider of telecommunication service' requires further clarification or definition in the context of Section 255."

The paragraph as cited in the NOI seems to imply that telecommunication carrier might be equated with provider of telecommunication service. From the language in other parts of the Act, as well as the fact that the two separate terms are used, it seems clear that "telecommunication services" and "providers of telecommunication services" cover a far greater scope than "telecommunication carriers." Also given the thin client discussion, it is quite important that a broad definition of telecommunication and telecommunication service provider be used.

(9). "...We seek comment regarding treatment of equipment that can be used with telecommunication services and which also can be used for other services that do not fall within the statutory definition of telecommunication services."

Due to convergence, it is likely that there will be a large percentage, if not the majority, of Customer Premise Equipment that will be used for other purposes as well as telecommunication. It is therefore recommended that any equipment which is used for telecommunication should be fully accessible while carrying out the telecommunication activities (where that is readily achievable).

(10). "Telecommunication equipment and CPE are distinct... Should treatment of the two categories of equipment be different?"

Treatment of the two is already different, as specified in the Telecommunication Act. However, the point raised here was whether the ability of individuals to choose between different CPE options should affect the accessibility regulations. This is a tricky question. On the one hand, it would seem that if a user can choose between many different equivalent products, some of which are accessible and some of which are not, that there would not be a requirement that they all be accessible. There are several issues, however, that arise around this, including:

1. Does the feature set on the accessible version match that on the non-accessible version?

2. Is the cost of the accessible version equal to the cost of the least expensive of the non-accessible versions?

3. Does the accessible version appear in every catalog and on every store shelf along with the non-accessible version?

4. When the devices are available installed in rental cars or available from rental agencies, will accessible versions always be available?

5. What would be the real difference in cost if the accessibility features were built into every one of the products and incorporated into the design from the beginning?

(11) "...We note that all equipment marketed or sold in the United States must meet all applicable technical and operational requirements, but we question whether the same approach should be adopted for accessibility standards, especially in light of different accommodations that may be necessary for specific disabilities."

Much of the accommodation for people who have disabilities is low or no cost and much benefits all users. If accommodating individuals with a wide range of abilities is easy to do and has little cost, I would think that the different provisions and technical requirements should all be met - as with other types of requirements. If any of the accommodations or requirements would not be readily achievable, then that accommodation should not be required, according to the legislation. There are already

hundreds of factors that are taken into account in designing products. Adding accessibility considerations does not need to be oppressive, especially over the long run, where the accommodations are known and just be incorporated in the design from the beginning. This, of course, does not apply to those techniques which are not readily achievable.

(11b) "We also ask commenter's to consider the effect of differing national equipment accessibility standards on how manufacturers' ability to design, develop, and fabricate accessibility equipment should be weighted when evaluating complaints."

Government and industry have worked in a number of areas including telecommunication to harmonize international standards. The Commission should encourage US government agencies to seek international harmonization of access requirements. However, the presence of multiple standards and requirements should in no way thwart the intent of Congress to bring about access to telecommunications technology for Americans with disabilities through the enactment of Section 255.

(12.) "If several companies are involved in the design and manufacturer of a single piece of equipment, how should responsibility be apportioned?"

Any components or subassemblies which are designed and/or marketed for use specifically in telecommunications equipment should be required to comply with the standards to the extent readily achievable. That is, the components or sub-assemblies should not be designed in such a way that they would compromise or reduce the ability of products which incorporate the component or sub-assembly to meet the accessibility standards. This is important so that manufacturers are not left without the ability to create accessible products because they must use components or sub-assemblies which they do not themselves have the ability to fabricate. When this arises, the manufacturers of the components or sub-assemblies need to be involved in the resolution process.

(12b). ***"...To the extent that some manufacturers design, develop, and fabricate equipment but then license their equipment to other manufacturers for production, how should Section 255 apply to secondary manufacturers or resellers?"***

There is a continuum which exists between people who simply resell other people's equipment, to people who resell other people's equipment with the name tag changed, to people who resell other people's equipment with the name tag changed and some small value added, etc., on down to people who buy components and assemble products from scratch. Finding a clear delineation in this chain is difficult today, and will only be more difficult with coming systems. Section 255 should be able to applied from the reseller on

down. In fact, one of the best ways for passing the pressure upstream is this ability to pass accountability backward. This would also have the effect of rewarding manufacturers of accessible products by increasing the probability that their products would be selected and featured by resellers. This important market pressure may in fact be as effective or more effective than the threat of FCC direct action. (That is, manufacturers might be more motivated by the fear that resellers might avoid their product in deference to more accessible products in order to avoid exposure than they would by the likelihood that in the future they might be involved with the FCC in a complaint situation.)

(16) "We seek comment on the factors that we should consider attempting to apply the components of the ADA definition of 'readily achievable' to telecommunications equipment and services."

The NOI very appropriately highlights the shifting nature of "readily achievable." Things that are not readily achievable today will be readily achievable in the future. It is important to recognize this and apply the "readily achievable" standard based on current technologies and not what was and was not readily achievable in the past.

On the other hand, it is also true that there is a product development cycle, and one cannot look at what technologies are available today and use that to judge whether a product being announced today should have incorporated accessibility. If the concept or technique was not known while the product was being developed, it would not be reasonable to assume or require that it be incorporated into a product.

It is therefore recommended that there be a period of grace after a technique is introduced and made generally known (say, for instance, through posting in a national registry of some sort) before the technology would be used in judging whether companies had ignored readily achievable strategies or techniques in the design of their products.

It should also be noted that there are many types of costs involved in the development of a product. There are costs associated with:

- design
- development
- parts
- manufacture
- testing
- packaging
- documentation
- support
- maintenance

to name some.

In determining whether it is readily achievable, there are two types of costs which should not be considered in determining whether something is readily achievable. The first of these is the cost to learn. It should not be a defense that a company was unable to make their product accessible because the cost for learning how to make accessible products was too much. This cost can be thought of as an investment, and will be amortized over time. If they said that they did not know how and there was not anyone available to show them how, and therefore the cost to develop techniques to make their products accessible was too great to be done within a certain time span, then an argument may be valid. However, if mechanisms for learning how to create accessible designs are available, then they should be taken advantage of.

There will need to be a ramp-up period of some type at the beginning of enforcement, because it will take industry time to arrange for and get training to learn about the access strategies and to incorporate them into their product lines. However, as has been seen with Microsoft and others, this ramp-up time will vary from about a month for many directly and easily implementable strategies to a year or two for tougher areas.

(17) "Costs and Financial Resources"

As stated previously in the cost section, a steady state cost should be used. The cost experience for many companies is temporarily inflated, since they have just begun and are in a learning curve. Also, as new standards and rules are promulgated there will be higher costs initially as they look into them and get up to speed. These costs are real costs, and some provision should be made in the enforcement of the rules initially to give companies a chance to ramp up. However, the determination of whether something is readily achievable should be based upon whether it would be readily achievable if the company were practicing accessible design on a regular basis, and not based upon the fact that they have just begun learning recently or have not paid attention to the topic in the past.

Cost as a Percentage

Also as stated in a previous section, I think it is very important that people state costs as a percentage of their overall costs of doing business, and that they talk about steady-state costs as a percentage of the overall costs of doing business.

Performance Versus Process Standards

I have a real concern over the discussion of performance versus process standards. Process standards do not provide much assurance that things will in fact happen. However, I do think that it is a good idea to do something like shifting the burden of proof to recognize the efforts of companies who have put processes in place.

(21) "...We seek comment on these issues (accessible to and "usable by").

I would concur that equipment manufacturers and service providers are subject to the Commission's authority only for those aspects which they have control over. If they design a piece of equipment which is in itself accessible and they provide instructions with the equipment as to how it should be positioned or mounted, etc., in order to maintain its accessibility (as well as making good faith efforts to see that they are followed) , then, if someone else does not follow those directions, the company would not be held accountable.

(22). "We seek comment on whether a manufacturer or service provider must ensure that each of its telecommunication equipment, CPE, or service offerings is accessible to persons with various types of disabilities."

Where readily achievable, all products in their product line should be accessible. The concern here is that unless this is done, the product that the person with a disability encounters may not be accessible, even though there might be other products which are not available to them which are accessible. For example:

- A person goes to rent a car that has a built-in phone.

- A person goes to rent a phone, but none of them are the accessible type.

- An individual uses a system as prescribed by a company, but the system used by the company is not the accessible system even though a different system by the company is.

- A person buys a house, and the systems built into the house are not the accessible version.

- A person checks into a hotel room, and the devices in the hotel room are not the accessible versions.

- A person wants to buy a phone, but the accessible versions do not have the same features and/or do not have the same costs.

There are bona fide reasons for there to be exceptions to this rule. First, of course, a company may have accessible versions of a product but they then introduce a new product which has a form factor which precludes them from using their previous accessibility standards. In addition, it precludes them from using any known accessibility standards (or anything that is technically and fiscally reasonable -- readily achievable). In that case, they would not need to make it accessible. However, the reason they would not

have to make it accessible would be because it wasn't readily achievable, not because they had another product that was accessible.

(23) "We request commentors to provide an assessment on the extent to which accessible telecommunication services, telecommunication equipment, and CPE are currently available. Specifically, we request commentors to address the kinds of services and equipment that are currently on the market and in the design and development stages, ..."

One example of the extent to which products can be made accessible is the touchscreen kiosk which is currently being deployed. By the time you read this, it is expected that the first such kiosk will have been deployed at the Mall of America in Minneapolis, with others following. In addition, later this year it is expected that the same techniques will be implemented in a state information system by a major Fortune 500 company. These kiosks are touchscreen kiosks; it is estimated that less than 1% was added to the cost of the kiosks to provide accessibility. These touchscreen kiosks are directly accessible (without assistive technologies) to individuals with reading impairments or who cannot read, individuals with low vision, individuals who cannot see, individuals with hearing impairment, individuals who cannot hear, and individuals with severe physical disabilities. Via infrared link, they will also be usable by individuals who are deaf-blind and individuals with complete paralysis with the use of their own personal assistive devices. These same techniques can be applied to most any touchscreen-based appliance, including hand-held or pen-operated systems. Additional techniques are being developed to allow access to an even broader range of systems.

Microsoft has incorporated a very wide range of accessibility features, including features for individuals with low vision, blindness, hearing impairment, deafness, and physical disabilities, directly into their operating systems. These include a wide range of features to allow direct access to the computer as well as features such as SerialKeys and the hooks for screen readers to allow individuals with physical disabilities and blindness to use assistive technologies in conjunction with their software and operating systems. The costs for manufacture and distribution of these is negligible. The research and development costs on some of these (particularly the features for physical disabilities and hearing impairment) were negligible to Microsoft, as the research and development was carried out under funding from the National Institute on Disability and Rehabilitation Research and most of the code was either taken directly or ported directly from code which was also developed in this fashion. Other aspects, such as the restructuring of the operating system to allow it to work better with screen reading software was carried out by Microsoft. There was a fair amount of expense involved in doing this, especially since it was being done for the first time. Carrying this forward in the future, however, should be less expensive; Microsoft can provide more specific information about this.

(24). ***"...Section 255(D) establishes compatibility as the alternative to accessibility for both equipment and services, but only in cases in which accessibility is not readily achievable."***

It should be noted that it will almost always be true that direct accessibility will be possible for some individuals, but other individuals will only have access via compatibility with assistive technology. It is expected that almost every product would need to be addressing the compatibility issues for individuals having more severe or multiple disabilities.

(25). "We ask commentors to address the issue of defining existing peripheral devices and specialized CPE, including specific examples, etc."

For an overview of some commonly used existing peripheral devices, including pictures and descriptions, we refer the readers to the ABLEDATA and TraceBase databases, both of which can be found on the Internet at http://trace.wisc.edu. Look under the "Cooperative Electronic Library" for both the ABLEDATA database and the TraceBase database. Some specific examples of the types of devices that are used to access the CPE include dynamic braille displays (search under "braille"), augmentative communication aids (search under "augmentative"), headsticks and mouthsticks (search for "stick") and telecommunication aids for those who are deaf (search for "TTY or TDD"), hearing aids (not covered in these databases), and computer access aids (search for "computer interfaces").

Attachment A

DOCUMENT OFF-LINE

This page has been substituted for one of the following:

o An oversize page or document (such as a map) which was too large to be scanned into the RIPS system.

o Microfilm, microform, certain photographs or videotape.

o Other materials which, for one reason or another, could not be scanned into the RIPS system.

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