



***Accessibility Forum***

***Quick Reference Guide to Section  
508 Resource Documents***

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***Version 1.0***

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## Executive Summary

This 'Quick Reference' Guide is intended to provide information to assist government in making informed decisions about section 508 related acquisitions.

Section 508, effective June 21, 2001, requires Federal departments and agencies that develop, procure, maintain, or use electronic and information technology to assure that these technologies provide access to information and data for people with disabilities. The Access Board and General Services Administration (GSA) provide technical assistance to the Federal government concerning the section 508 requirements. The Access Board's responsibilities include developing and maintaining accessibility requirements for electronic and information technology, providing technical assistance and training on these guidelines and standards, and enforcing accessibility standards for federally funded facilities. GSA's Office of Governmentwide Policy, Center for IT Accommodation (CITA) is charged with educating Federal employees and building the infrastructure to support section 508 implementation. The Accessibility Forum is a program within CITA that fosters ongoing collaboration among stakeholders to assist the government in implementing section 508.

Since its initial meeting in May 2001, the Forum has been a place to network and share ideas among diverse stakeholders. Over 960 individuals from more than 600 companies, associations for people with disabilities, research and standards institutes, and government agencies from throughout the US and Canada have registered interest and contributed in the work of the Forum.

This Quick Reference Guide is a result of the technical activities of the Forum. In January 2003 the Forum published a set of Resource Documents that included background material on technologies and accessibility embodied in the section 508 Standard. This information, as well as the Guide, has been reviewed with the Access Board staff and the Office of Federal Procurement Policy's Section 508 Working Group. Members of the Working Group expressed interest in making the documents easier to use, and this Guide represents an attempt to meet this request. It is GSA's intention to issue updated versions from time to time to incorporate comments or other changes as necessary.

Additional sources of information about section 508 include:

- **Access Board** (<http://www.access-board.gov/508.htm>)
- **Federal Acquisition Regulations** (<http://www.arnet.gov/far>)
- **CITA Section 508.gov** (<http://www.section508.gov>)
- **Accessibility Forum** (<http://accessibilityforum.org>)
- **Information Technology Technical Assistance and Training Center** (<http://www.ittatc.org>)

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## **General Questions about E&IT Acquisition and Section 508**

### ***What is E&IT?***

E&IT is Electronic and Information Technology. It includes information technology and any equipment or interconnected system or subsystem of equipment that is used in the creation, conversion or duplication of data or information.

Information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources. Electronic and information technology includes, but is not limited to, telecommunications products (such as telephones), information kiosks and transaction machines, World Wide Web sites, multimedia, and office equipment such as copiers and fax machines.

### ***When does acquisition of E&IT result in a general section 508 exception?***

#### **National Security System?**

Section 508 does not apply to E&IT being acquired by a Federal agency where the function, operation, or use involves intelligence activities, crypto logic activities related to national security, command and control of military forces, equipment that is an integral part of a weapon or weapons system, or systems which are critical to the direct fulfillment of military or intelligence missions. This exception does not apply to a system that is to be used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications).

#### **Acquired Incidental To The Contract?**

Section 508 does not apply to E&IT that is acquired by a contractor incidental to a contract.

#### **Micro-purchase – less than \$2,500?**

The micro-purchase exception does not exempt all products that cost under \$2,500. The exception is for a one-time purchase that totals \$2,500 or less, made on the open market rather than under an existing contract. A software package that costs \$1,800 is not a micro-purchase if it is part of a total purchase costing more than \$2,500. Note that this exception is a temporary one. Based on current plans, the micro-purchase exception will not be available after October 1, 2004.

**‘Back Office’ Exception?**

The local interfaces on E&IT located in spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment are not required to comply with section 508. Interfaces and content of such E&IT that can be operated remotely are covered and do not qualify for this exception.

***When does acquisition of an E&IT product result in an exception for a specific section 508 requirement?***

**Fundamental alteration of the nature of product or service?**

Section 508 shall not be construed to require a fundamental alteration in the nature of a product or its components.

**Undue burden?**

When acquiring a product, if an agency determines that compliance with any provision of this part imposes an undue burden, the documentation by the agency supporting the acquisition shall explain why, and to what extent, compliance with each such provision creates an undue burden. If compliance is deemed to impose an undue burden, agencies shall provide information and data to individuals with disabilities by an alternative means of access that allows those individuals comparable use of these information and data.

**Commercial non-availability?**

When acquiring a product, each agency shall acquire products that comply with applicable section 508 provisions when such products are available in the commercial marketplace or when such products are developed in response to a Government solicitation. Agencies cannot claim a product is not commercially available by stating no product in the marketplace meets all the standards. If products that meet some, but not all, relevant provisions are commercially available, the agency must procure the product that best meets the standards.



## Overview of the ‘Quick Reference’ Guides

The specific technical requirements of Section 508 Standards are grouped into 6 sections corresponding to 6 broad product categories:

- **Software applications and operating systems**
- **Web based information and applications**
- **Telecommunications products**
- **Video and multimedia products**
- **Self contained, closed products**
- **Desktop and portable computers**

Any E&IT product or service being acquired that has functionality or characteristics in the above areas must comply with the provisions in those sections. In addition, all E&IT product and services must also comply with:

- 1194.31 Functional performance criteria
- 1194.41 Information, documentation and support

### ***Technical Section Summary Page***

This ‘Quick Reference’ Guide has 6 technical sections. Each technical section begins with a summary that provides general information about the E&IT the section applies to, including examples to help users understand the types of E&IT products and services included. The section summaries also provide general information about accessibility as related to E&IT included in the section category, as well as discussing issues of interoperability between the E&IT and related Assistive Technologies.

Each of the 6 technical sections of Subpart B of the Section 508 Standard is composed of a set of individual technical provisions, each one specifying particular technical requirements for accessibility of the E&IT product or service.

Information regarding Subpart C (Functional Performance Criteria), and Subpart D (Information, Documentation and Support) is provided in this Guide.<sup>1</sup> Readers are referred to the previously mentioned resource sites for information on subparts D and C.

### ***Specific Requirement Reference Page***

The ‘Quick Reference’ Guide presents a reference page for each individual technical provision of each technical Section of the Section 508 Standards. Each reference page provides useful information designed to help clarify the particular requirement and make it more operational.

Each reference page follows a consistent format containing three distinct sections:

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<sup>1</sup> The Forum membership chose not to address subparts C and D at this time.

- ***What does this requirement mean?***  
Provides definitions for terms used in the requirement, makes explicit any assumptions inherent in the requirement, and clarifies typical questions about the wording or interpretation of the requirement.
  
- ***How can I tell if this requirement is met?***  
Identifies information that must be known prior to data collection or measurement, and some tips and suggestions on methods or techniques that may be appropriate to measure or collect data useful for assessment of E&IT based on the requirement. **NOTE this is not a comprehensive or complete testing method, nor does it necessarily constitute an adequate test for compliance to the requirement.**
  
- ***Where can I get additional information?***  
Links to other resources, technical assistance material, and other standards or guidelines related to the requirement.

## 1194.21 Software applications and operating systems

These Section 508 technical requirements apply to purchased operating systems and application software programs. These requirements also apply to E&IT products that contain software as an integral part of their functionality. Such application software is bundled or sold with the product, and typically executes on an attached network connected personal computer or server. Examples include digital copiers, scanners, smart card readers, printers, handhelds, fax machines, and telecommunications devices (wired, analog and digital wireless, and Internet). In addition, these requirements apply to telecommunications PBX with Telephone Application Programming Interface (TAPI) software that allows access to phone system functions from a computer workstation.

Interoperability as it applies to accessible software is rules that are established to allow two software programs (applications) to talk to each other. These rules define how one software program asks another software program for information and how the second software program will respond.

Operating systems by their nature are intended both to provide services to applications and to keep one application from interfering with others. If applications need to share data, there is often a defined set of application programming interfaces (APIs) that allow the interaction.

Current operating systems and operating system environments offer a variety of conventional accessible application programming interfaces (APIs) and open sources to support application programs and assistive technology. These include:

- GNOME Accessibility Framework (<http://developer.gnome.org/projects/gap/>)  
A free, open source, graphical desktop for UNIX and GNU/Linux systems. GNOME 2 will be the future desktop of the Solaris™ Operating Environment.
- Java™ Accessibility (<http://www.sun.com/access/index.html>, <http://www-3.ibm.com/able/accessjava.html>). A free, cross platform, toolkit-independent API designed to give assistive technologies direct access to the information in user interface objects. Java-based applications run on a wide variety of host operating systems, many of which already have assistive technologies available for them (for example, Macintosh, OS/2, Windows). For these existing assistive technologies to provide access to programs written in the Java language, they need a bridge between their native environment and the accessibility support built into the Java platform.
- Linux Accessibility (<http://www.tracecenter.org/linux/>). GNU/Linux lets the assistive technology or software developer make changes to the actual operating system in order to provide its users with the desired information.
- Macintosh Accessibility (<http://www.apple.com/disability/easyaccess.html>).
- Microsoft Active Accessibility (<http://msdn.microsoft.com/library/default.asp?url=/nhp/Default.asp?contentid>

[=28000544](#)). MSAA is included in the Windows operating system. It was designed to provide a standard interface for assistive technology as well as a standard interface for applications built on the Windows operating system.

- World Wide Web Consortium (W3C) Document Object Model (<http://www.w3.org/2002/07/26-dom-article.html>). An API that can be implemented on various operating systems and in many programming languages that provides programmatic access to hypertext markup language (HTML) and extensible markup language (XML)-based content.

Many currently available software applications and assistive technology programs, however, were written prior to the development of APIs. Assistive technology programmers created ingenious, but unique applications, and complementary features and functions that allow users with disabilities to use mainstream software applications successfully. This does not mean that applications and assistive technology cannot and do not work together. It does mean that when they do work together it may be a matter of contrived or accidental compatibility.

Until operating systems and software applications, including assistive technology are able to communicate 100% via open source or accessible APIs, interoperability problems will remain.

Problems in assistive technology and E&IT interoperability can exist even with current APIs. There are many causes for these problems, including (but not limited to):

- Lack of a \*complete\* accessibility API (that is, not all information needed by assistive technology is available via standard and accessibility APIs).
- Lack of conformance to, use of, or implementation of the API by assistive technologies, operating systems, or applications.
- Bugs in implementing an accessibility API (or in the basic code) assistive technologies, operating systems, or applications.
- Mismatch between the version of the accessibility API that are implemented by assistive technologies, operating system, or application.

**1194.21 (a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.**

**What does this requirement mean?**

**Terms and Definitions**

**discerned textually** - able to be represented with words without a lengthy description.

**Assumptions**

Assume navigation functions not typically labeled with text or available in a menu or toolbar but which could be identified with an explicit or pop up label are also required to have a keyboard equivalent. Some examples include scroll, move through choices in a dialogue box, move between sections (or panes) of an application window, move to and select menus and menu items, and move to and operate controls.

**Questions and Clarifications**

1. Is the order in which the Tab key moves the keyboard focus from one control or item to the next within a dialog box a function that can be discerned textually?

No. Correspondence between the Tab order for navigation between items in application windows and the 'logical' relationship between those items is not a requirement of this provision. The logic of the relationship between interface elements is subjective and cannot be assumed as standard. Although certain conventions may exist they are not relevant to or assumed by all users.

This provision requires that functions be accessible from the keyboard. A logical correspondence between the Tab order and interface elements may be an important usability characteristic for some users; it is not an accessibility requirement.

2. Concerning applicability, does the exclusion of maintenance and setup functions apply beyond operable controls and the back office exception - e.g. to 'product functions' of software?

No – All product functions of software available to users should be available via the keyboard. Setup and simple maintenance type of functions typically done by users are NOT exempt from Section 508 requirements. The definition of operable controls states: “A component of

a product that requires physical contact for normal operation.” The back office exception states: “Products located in spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment are not required to comply with this part.”

#### ***How can I tell if this requirement is met?***

Identify the product functions to be assessed. Methods for determining the full set of functions for a product include review of the product interface and the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Unplug/disable all input devices except the keyboard, then attempt to execute the identified set of product functions using only the keyboard.
  - a. Can the function be executed via the keyboard?
  - b. Is the result of performing the function via the keyboard as expected or advertised?
2. Inspect the program documentation. Note that the identified set of functions can be invoked from the keyboard. For applications that have a graphical user interface (GUI), identify any menu commands that cannot be executed from the keyboard.
  - a. Are there documented functions that have no documented keyboard equivalent in the OS or Application?
  - b. Are there commands that require pointing or visual analysis of the screen contents?

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software applications and operating systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(a))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.1 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-device-independent-ui>
3. IBM Software Accessibility Checklist Checkpoint 1.1, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.**

**What does this requirement mean?**

**Terms and Definitions**

**accessibility feature** – a built-in feature of a product that is labeled as an accessibility feature and is documented according to relevant industry documentation standards.

**application programming interface** – a set of subprograms that applications may use to request and carry out lower-level services performed by an operating system.

**disrupt** – to disturb normal appearance or behavior in a perceptible way.

**Questions and Clarifications**

1. What are the relevant industry standards that define the set of possible accessibility features of software applications?

These are not actually published non-proprietary cross-manufacturer standards for documenting features – rather this refers to the commonly accepted ways that are used by software developers to document the programmatic interface of an application. These documentation conventions constitute de-facto standards for providing information about the programmatic interface of an application. An accessibility feature that is appropriately documented with information about its programmatic interface should be included in the set of features that shall not be disrupted or disabled.

**How can I tell if this requirement is met?**

Identify the application accessibility features defined by the relevant industry standards according to which other products develop and document accessibility features. Identify the operating system accessibility features defined by the application programming interfaces of the relevant operating systems.

Methods for determining the full sets of application and operating system accessibility features include review of the system interface and review of the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions of the product are included in the complete set of functions that should work without disrupting or disabling accessibility features. There may be multiple product mechanisms that provide user access to the same function.

**Note:** Exhaustive testing is not always feasible; statistically valid sampling may therefore be required and appropriate.

1. Inspect the application.
  - a. For each application accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.
  - b. For each operating system accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.

**Note:** Satisfying this requirement supports interoperability with virtually all types of assistive technology that provide alternative input or output.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(b))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.2 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-default-input-sensible>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-os-conventions>
4. IBM Software Accessibility Checklist Checkpoint 1.2, <http://www-3.ibm.com/able/accesssoftware.html>
5. ANSI/HFES 200, "Software User Interfaces" Section 200.2, Human Factors and Ergonomics Society (in balloting)



**1194.21 (c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.**

**What does this requirement mean?**

**Terms and Definitions**

**assistive technology** - Any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities.

**current focus** – the interactive interface element within a user interface that is currently active.

**Assumptions**

Assume the visually exposed focus is synchronous with the programmatically exposed focus.

**Questions and Clarifications**

1. Clarify what it means for an on-screen indication to be a well-defined – does this mean visible to a typical user?

Yes – easily visible for a user that does not have a visual disability.

2. Clarify the method(s) by which the input focus shall be programmatically exposed to assistive technology – is this done via a standard set of APIs?

Yes, this should be done via an application programming interface that has been documented and made available by the manufacturer of the operating system.

**How can I tell if this requirement is met?**

Identify the interactive interface elements that could have the current focus. Methods for determining the full set of interactive interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application.
  - a. Inspect the interface display for a well defined on-screen indication of the current focus. Note a clear indication of focus will not tell if the information is programmatically exposed to assistive technology (AT).
  - b. Issue API call to identify the location of the input focus. Note any discrepancy between the actual input focus and the reported location of the input focus.
  - c. Navigate through the software, especially menus, dialogs, forms and property boxes. Verify the visual focus is clearly visible and easy to identify when you tab or arrow to the next object.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, word prediction, and screen keyboard programs.

***Where can I get additional information?***

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2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-ui-access-api>
3. IBM Software Accessibility Checklist Checkpoint 2.1, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.**

**What does this requirement mean?**

**Terms and Definitions**

**user interface element** – any component of an application user interface intended to allow the user to access information or perform an action.

**Assumptions**

Assume that text labels (visible or invisible) that are available to AT and provide the identity, operation and state of a user interface element constitute “sufficient information” as required by this provision.

**Questions and Clarifications**

1. Clarify the method(s) by which the text information shall be made available to assistive technology – is it programmatically exposed via a standard set of APIs?

Yes, it is programmatically exposed through an API. For example, information about the identity, operation, and state of a user interface element might be made available to assistive technology by providing that information as text labels associated with the interface element. These text labels are typically associated as a property of the interface element.

**How can I tell if this requirement is met?**

Identify the product user interface elements that must be assessed. Methods for determining the full set of application user interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational elements are included in the complete set of elements covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Requires a software utility that retrieves and displays information about user interface elements. If such a utility is available, load it and then:
  - a. Exercise all user interface elements for the application.

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## 1194.21 Software applications and operating systems

These Section 508 technical requirements apply to purchased operating systems and application software programs. These requirements also apply to E&IT products that contain software as an integral part of their functionality. Such application software is bundled or sold with the product, and typically executes on an attached network connected personal computer or server. Examples include digital copiers, scanners, smart card readers, printers, handhelds, fax machines, and telecommunications devices (wired, analog and digital wireless, and Internet). In addition, these requirements apply to telecommunications PBX with Telephone Application Programming Interface (TAPI) software that allows access to phone system functions from a computer workstation.

Interoperability as it applies to accessible software is rules that are established to allow two software programs (applications) to talk to each other. These rules define how one software program asks another software program for information and how the second software program will respond.

Operating systems by their nature are intended both to provide services to applications and to keep one application from interfering with others. If applications need to share data, there is often a defined set of application programming interfaces (APIs) that allow the interaction.

Current operating systems and operating system environments offer a variety of conventional accessible application programming interfaces (APIs) and open sources to support application programs and assistive technology. These include:

- GNOME Accessibility Framework (<http://developer.gnome.org/projects/gap/>)  
A free, open source, graphical desktop for UNIX and GNU/Linux systems. GNOME 2 will be the future desktop of the Solaris™ Operating Environment.
- Java™ Accessibility (<http://www.sun.com/access/index.html>, <http://www-3.ibm.com/able/accessjava.html>). A free, cross platform, toolkit-independent API designed to give assistive technologies direct access to the information in user interface objects. Java-based applications run on a wide variety of host operating systems, many of which already have assistive technologies available for them (for example, Macintosh, OS/2, Windows). For these existing assistive technologies to provide access to programs written in the Java language, they need a bridge between their native environment and the accessibility support built into the Java platform.
- Linux Accessibility (<http://www.tracecenter.org/linux/>). GNU/Linux lets the assistive technology or software developer make changes to the actual operating system in order to provide its users with the desired information.
- Macintosh Accessibility (<http://www.apple.com/disability/easyaccess.html>).
- Microsoft Active Accessibility (<http://msdn.microsoft.com/library/default.asp?url=/nhp/Default.asp?contentid>

[=28000544](#)). MSAA is included in the Windows operating system. It was designed to provide a standard interface for assistive technology as well as a standard interface for applications built on the Windows operating system.

- World Wide Web Consortium (W3C) Document Object Model (<http://www.w3.org/2002/07/26-dom-article.html>). An API that can be implemented on various operating systems and in many programming languages that provides programmatic access to hypertext markup language (HTML) and extensible markup language (XML)-based content.

Many currently available software applications and assistive technology programs, however, were written prior to the development of APIs. Assistive technology programmers created ingenious, but unique applications, and complementary features and functions that allow users with disabilities to use mainstream software applications successfully. This does not mean that applications and assistive technology cannot and do not work together. It does mean that when they do work together it may be a matter of contrived or accidental compatibility.

Until operating systems and software applications, including assistive technology are able to communicate 100% via open source or accessible APIs, interoperability problems will remain.

Problems in assistive technology and E&IT interoperability can exist even with current APIs. There are many causes for these problems, including (but not limited to):

- Lack of a \*complete\* accessibility API (that is, not all information needed by assistive technology is available via standard and accessibility APIs).
- Lack of conformance to, use of, or implementation of the API by assistive technologies, operating systems, or applications.
- Bugs in implementing an accessibility API (or in the basic code) assistive technologies, operating systems, or applications.
- Mismatch between the version of the accessibility API that are implemented by assistive technologies, operating system, or application.

**1194.21 (a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.**

**What does this requirement mean?**

**Terms and Definitions**

***discerned textually*** - able to be represented with words without a lengthy description.

**Assumptions**

Assume navigation functions not typically labeled with text or available in a menu or toolbar but which could be identified with an explicit or pop up label are also required to have a keyboard equivalent. Some examples include scroll, move through choices in a dialogue box, move between sections (or panes) of an application window, move to and select menus and menu items, and move to and operate controls.

**Questions and Clarifications**

1. Is the order in which the Tab key moves the keyboard focus from one control or item to the next within a dialog box a function that can be discerned textually?

No. Correspondence between the Tab order for navigation between items in application windows and the 'logical' relationship between those items is not a requirement of this provision. The logic of the relationship between interface elements is subjective and cannot be assumed as standard. Although certain conventions may exist they are not relevant to or assumed by all users.

This provision requires that functions be accessible from the keyboard. A logical correspondence between the Tab order and interface elements may be an important usability characteristic for some users; it is not an accessibility requirement.

2. Concerning applicability, does the exclusion of maintenance and setup functions apply beyond operable controls and the back office exception - e.g. to 'product functions' of software?

No – All product functions of software available to users should be available via the keyboard. Setup and simple maintenance type of functions typically done by users are NOT exempt from Section 508 requirements. The definition of operable controls states: “A component of

a product that requires physical contact for normal operation.” The back office exception states: “Products located in spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment are not required to comply with this part.”

#### ***How can I tell if this requirement is met?***

Identify the product functions to be assessed. Methods for determining the full set of functions for a product include review of the product interface and the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Unplug/disable all input devices except the keyboard, then attempt to execute the identified set of product functions using only the keyboard.
  - a. Can the function be executed via the keyboard?
  - b. Is the result of performing the function via the keyboard as expected or advertised?
2. Inspect the program documentation. Note that the identified set of functions can be invoked from the keyboard. For applications that have a graphical user interface (GUI), identify any menu commands that cannot be executed from the keyboard.
  - a. Are there documented functions that have no documented keyboard equivalent in the OS or Application?
  - b. Are there commands that require pointing or visual analysis of the screen contents?

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software applications and operating systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(a))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.1 provides further guidance and techniques for this requirement, at  
<http://www.w3.org/TR/UAAG10/guidelines.html#tech-device-independent-ui>
3. IBM Software Accessibility Checklist Checkpoint 1.1,  
<http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.**

**What does this requirement mean?**

**Terms and Definitions**

**accessibility feature** – a built-in feature of a product that is labeled as an accessibility feature and is documented according to relevant industry documentation standards.

**application programming interface** – a set of subprograms that applications may use to request and carry out lower-level services performed by an operating system.

**disrupt** – to disturb normal appearance or behavior in a perceptible way.

**Questions and Clarifications**

1. What are the relevant industry standards that define the set of possible accessibility features of software applications?

These are not actually published non-proprietary cross-manufacturer standards for documenting features – rather this refers to the commonly accepted ways that are used by software developers to document the programmatic interface of an application. These documentation conventions constitute de-facto standards for providing information about the programmatic interface of an application. An accessibility feature that is appropriately documented with information about its programmatic interface should be included in the set of features that shall not be disrupted or disabled.

**How can I tell if this requirement is met?**

Identify the application accessibility features defined by the relevant industry standards according to which other products develop and document accessibility features. Identify the operating system accessibility features defined by the application programming interfaces of the relevant operating systems.

Methods for determining the full sets of application and operating system accessibility features include review of the system interface and review of the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions of the product are included in the complete set of functions that should work without disrupting or disabling accessibility features. There may be multiple product mechanisms that provide user access to the same function.

**Note:** Exhaustive testing is not always feasible; statistically valid sampling may therefore be required and appropriate.

1. Inspect the application.
  - a. For each application accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.
  - b. For each operating system accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.

**Note:** Satisfying this requirement supports interoperability with virtually all types of assistive technology that provide alternative input or output.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(b))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.2 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-default-input-sensible>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-os-conventions>
4. IBM Software Accessibility Checklist Checkpoint 1.2, <http://www-3.ibm.com/able/accesssoftware.html>
5. ANSI/HFES 200, "Software User Interfaces" Section 200.2, Human Factors and Ergonomics Society (in balloting)

**1194.21 (c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.**

### **What does this requirement mean?**

#### **Terms and Definitions**

**assistive technology** - Any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities.

**current focus** – the interactive interface element within a user interface that is currently active.

#### **Assumptions**

Assume the visually exposed focus is synchronous with the programmatically exposed focus.

#### **Questions and Clarifications**

1. Clarify what it means for an on-screen indication to be a well-defined – does this mean visible to a typical user?

Yes – easily visible for a user that does not have a visual disability.

2. Clarify the method(s) by which the input focus shall be programmatically exposed to assistive technology – is this done via a standard set of APIs?

Yes, this should be done via an application programming interface that has been documented and made available by the manufacturer of the operating system.

### **How can I tell if this requirement is met?**

Identify the interactive interface elements that could have the current focus. Methods for determining the full set of interactive interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application.
  - a. Inspect the interface display for a well defined on-screen indication of the current focus. Note a clear indication of focus will not tell if the information is programmatically exposed to assistive technology (AT).
  - b. Issue API call to identify the location of the input focus. Note any discrepancy between the actual input focus and the reported location of the input focus.
  - c. Navigate through the software, especially menus, dialogs, forms and property boxes. Verify the visual focus is clearly visible and easy to identify when you tab or arrow to the next object.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, word prediction, and screen keyboard programs.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(c))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-ui-access-api>
3. IBM Software Accessibility Checklist Checkpoint 2.1, <http://www-3.ibm.com/able/accesssoftware.html>



**1194.21 (d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.**

**What does this requirement mean?**

**Terms and Definitions**

**user interface element** – any component of an application user interface intended to allow the user to access information or perform an action.

**Assumptions**

Assume that text labels (visible or invisible) that are available to AT and provide the identity, operation and state of a user interface element constitute “sufficient information” as required by this provision.

**Questions and Clarifications**

1. Clarify the method(s) by which the text information shall be made available to assistive technology – is it programmatically exposed via a standard set of APIs?

Yes, it is programmatically exposed through an API. For example, information about the identity, operation, and state of a user interface element might be made available to assistive technology by providing that information as text labels associated with the interface element. These text labels are typically associated as a property of the interface element.

**How can I tell if this requirement is met?**

Identify the product user interface elements that must be assessed. Methods for determining the full set of application user interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational elements are included in the complete set of elements covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Requires a software utility that retrieves and displays information about user interface elements. If such a utility is available, load it and then:
  - a. Exercise all user interface elements for the application.

- b. Inspect the information available for each interface element. Note any interface elements not identified by the utility (i.e. information not available) or that have inaccurate information.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, voice input, and sip and puff devices.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(d))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.2 provides further guidance and techniques for this requirement, at  
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<http://www.w3.org/TR/UAAG10/guidelines.html#tech-rendering-access-api>
4. IBM Software Accessibility Checklist Checkpoint 2.2,  
<http://www-3.ibm.com/able/accesssoftware.html>
5. IBM Software Accessibility Checklist Checkpoint 2.3,  
<http://www-3.ibm.com/able/accesssoftware.html>

## Overview of the ‘Quick Reference’ Guides

The specific technical requirements of Section 508 Standards are grouped into 6 sections corresponding to 6 broad product categories:

- **Software applications and operating systems**
- **Web based information and applications**
- **Telecommunications products**
- **Video and multimedia products**
- **Self contained, closed products**
- **Desktop and portable computers**

Any E&IT product or service being acquired that has functionality or characteristics in the above areas must comply with the provisions in those sections. In addition, all E&IT product and services must also comply with:

- 1194.31 Functional performance criteria
- 1194.41 Information, documentation and support

### ***Technical Section Summary Page***

This ‘Quick Reference’ Guide has 6 technical sections. Each technical section begins with a summary that provides general information about the E&IT the section applies to, including examples to help users understand the types of E&IT products and services included. The section summaries also provide general information about accessibility as related to E&IT included in the section category, as well as discussing issues of interoperability between the E&IT and related Assistive Technologies.

Each of the 6 technical sections of Subpart B of the Section 508 Standard is composed of a set of individual technical provisions, each one specifying particular technical requirements for accessibility of the E&IT product or service.

Information regarding Subpart C (Functional Performance Criteria), and Subpart D (Information, Documentation and Support) is provided in this Guide.<sup>1</sup> Readers are referred to the previously mentioned resource sites for information on subparts D and C.

### ***Specific Requirement Reference Page***

The ‘Quick Reference’ Guide presents a reference page for each individual technical provision of each technical Section of the Section 508 Standards. Each reference page provides useful information designed to help clarify the particular requirement and make it more operational.

Each reference page follows a consistent format containing three distinct sections:

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<sup>1</sup> The Forum membership chose not to address subparts C and D at this time.

## 1194.21 Software applications and operating systems

These Section 508 technical requirements apply to purchased operating systems and application software programs. These requirements also apply to E&IT products that contain software as an integral part of their functionality. Such application software is bundled or sold with the product, and typically executes on an attached network connected personal computer or server. Examples include digital copiers, scanners, smart card readers, printers, handhelds, fax machines, and telecommunications devices (wired, analog and digital wireless, and Internet). In addition, these requirements apply to telecommunications PBX with Telephone Application Programming Interface (TAPI) software that allows access to phone system functions from a computer workstation.

Interoperability as it applies to accessible software is rules that are established to allow two software programs (applications) to talk to each other. These rules define how one software program asks another software program for information and how the second software program will respond.

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A free, open source, graphical desktop for UNIX and GNU/Linux systems. GNOME 2 will be the future desktop of the Solaris™ Operating Environment.
- Java™ Accessibility (<http://www.sun.com/access/index.html>, <http://www-3.ibm.com/able/accessjava.html>). A free, cross platform, toolkit-independent API designed to give assistive technologies direct access to the information in user interface objects. Java-based applications run on a wide variety of host operating systems, many of which already have assistive technologies available for them (for example, Macintosh, OS/2, Windows). For these existing assistive technologies to provide access to programs written in the Java language, they need a bridge between their native environment and the accessibility support built into the Java platform.
- Linux Accessibility (<http://www.tracecenter.org/linux/>). GNU/Linux lets the assistive technology or software developer make changes to the actual operating system in order to provide its users with the desired information.
- Macintosh Accessibility (<http://www.apple.com/disability/easyaccess.html>).
- Microsoft Active Accessibility (<http://msdn.microsoft.com/library/default.asp?url=/nhp/Default.asp?contentid>

[=28000544](#)). MSAA is included in the Windows operating system. It was designed to provide a standard interface for assistive technology as well as a standard interface for applications built on the Windows operating system.

- World Wide Web Consortium (W3C) Document Object Model (<http://www.w3.org/2002/07/26-dom-article.html>). An API that can be implemented on various operating systems and in many programming languages that provides programmatic access to hypertext markup language (HTML) and extensible markup language (XML)-based content.

Many currently available software applications and assistive technology programs, however, were written prior to the development of APIs. Assistive technology programmers created ingenious, but unique applications, and complementary features and functions that allow users with disabilities to use mainstream software applications successfully. This does not mean that applications and assistive technology cannot and do not work together. It does mean that when they do work together it may be a matter of contrived or accidental compatibility.

Until operating systems and software applications, including assistive technology are able to communicate 100% via open source or accessible APIs, interoperability problems will remain.

Problems in assistive technology and E&IT interoperability can exist even with current APIs. There are many causes for these problems, including (but not limited to):

- Lack of a \*complete\* accessibility API (that is, not all information needed by assistive technology is available via standard and accessibility APIs).
- Lack of conformance to, use of, or implementation of the API by assistive technologies, operating systems, or applications.
- Bugs in implementing an accessibility API (or in the basic code) assistive technologies, operating systems, or applications.
- Mismatch between the version of the accessibility API that are implemented by assistive technologies, operating system, or application.

**1194.21 (a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.**

**What does this requirement mean?**

**Terms and Definitions**

***discerned textually*** - able to be represented with words without a lengthy description.

**Assumptions**

Assume navigation functions not typically labeled with text or available in a menu or toolbar but which could be identified with an explicit or pop up label are also required to have a keyboard equivalent. Some examples include scroll, move through choices in a dialogue box, move between sections (or panes) of an application window, move to and select menus and menu items, and move to and operate controls.

**Questions and Clarifications**

1. Is the order in which the Tab key moves the keyboard focus from one control or item to the next within a dialog box a function that can be discerned textually?

No. Correspondence between the Tab order for navigation between items in application windows and the 'logical' relationship between those items is not a requirement of this provision. The logic of the relationship between interface elements is subjective and cannot be assumed as standard. Although certain conventions may exist they are not relevant to or assumed by all users.

This provision requires that functions be accessible from the keyboard. A logical correspondence between the Tab order and interface elements may be an important usability characteristic for some users; it is not an accessibility requirement.

2. Concerning applicability, does the exclusion of maintenance and setup functions apply beyond operable controls and the back office exception - e.g. to 'product functions' of software?

No – All product functions of software available to users should be available via the keyboard. Setup and simple maintenance type of functions typically done by users are NOT exempt from Section 508 requirements. The definition of operable controls states: “A component of

a product that requires physical contact for normal operation.” The back office exception states: “Products located in spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment are not required to comply with this part.”

#### ***How can I tell if this requirement is met?***

Identify the product functions to be assessed. Methods for determining the full set of functions for a product include review of the product interface and the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Unplug/disable all input devices except the keyboard, then attempt to execute the identified set of product functions using only the keyboard.
  - a. Can the function be executed via the keyboard?
  - b. Is the result of performing the function via the keyboard as expected or advertised?
2. Inspect the program documentation. Note that the identified set of functions can be invoked from the keyboard. For applications that have a graphical user interface (GUI), identify any menu commands that cannot be executed from the keyboard.
  - a. Are there documented functions that have no documented keyboard equivalent in the OS or Application?
  - b. Are there commands that require pointing or visual analysis of the screen contents?

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software applications and operating systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(a))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.1 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-device-independent-ui>
3. IBM Software Accessibility Checklist Checkpoint 1.1, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.**

**What does this requirement mean?**

**Terms and Definitions**

**accessibility feature** – a built-in feature of a product that is labeled as an accessibility feature and is documented according to relevant industry documentation standards.

**application programming interface** – a set of subprograms that applications may use to request and carry out lower-level services performed by an operating system.

**disrupt** – to disturb normal appearance or behavior in a perceptible way.

**Questions and Clarifications**

1. What are the relevant industry standards that define the set of possible accessibility features of software applications?

These are not actually published non-proprietary cross-manufacturer standards for documenting features – rather this refers to the commonly accepted ways that are used by software developers to document the programmatic interface of an application. These documentation conventions constitute de-facto standards for providing information about the programmatic interface of an application. An accessibility feature that is appropriately documented with information about its programmatic interface should be included in the set of features that shall not be disrupted or disabled.

**How can I tell if this requirement is met?**

Identify the application accessibility features defined by the relevant industry standards according to which other products develop and document accessibility features. Identify the operating system accessibility features defined by the application programming interfaces of the relevant operating systems.



Methods for determining the full sets of application and operating system accessibility features include review of the system interface and review of the product user documentation (e.g. user manuals plus on-line help files, etc.)

**Note:** All operational functions of the product are included in the complete set of functions that should work without disrupting or disabling accessibility features. There may be multiple product mechanisms that provide user access to the same function.

**Note:** Exhaustive testing is not always feasible; statistically valid sampling may therefore be required and appropriate.

1. Inspect the application.
  - a. For each application accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.
  - b. For each operating system accessibility feature:
    - Turn on the accessibility feature.
    - Exercise all application functions that might affect accessibility features;
    - Note any function that disables or changes the accessibility feature.

**Note:** Satisfying this requirement supports interoperability with virtually all types of assistive technology that provide alternative input or output.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(b))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.2 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-default-input-sensible>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-os-conventions>
4. IBM Software Accessibility Checklist Checkpoint 1.2, <http://www-3.ibm.com/able/accesssoftware.html>
5. ANSI/HFES 200, "Software User Interfaces" Section 200.2, Human Factors and Ergonomics Society (in balloting)

**1194.21 (c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.**

### **What does this requirement mean?**

#### **Terms and Definitions**

**assistive technology** - Any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities.

**current focus** – the interactive interface element within a user interface that is currently active.

#### **Assumptions**

Assume the visually exposed focus is synchronous with the programmatically exposed focus.

#### **Questions and Clarifications**

1. Clarify what it means for an on-screen indication to be a well-defined – does this mean visible to a typical user?

Yes – easily visible for a user that does not have a visual disability.

2. Clarify the method(s) by which the input focus shall be programmatically exposed to assistive technology – is this done via a standard set of APIs?

Yes, this should be done via an application programming interface that has been documented and made available by the manufacturer of the operating system.

### **How can I tell if this requirement is met?**

Identify the interactive interface elements that could have the current focus. Methods for determining the full set of interactive interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational functions are included in the complete set of functions covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application.
  - a. Inspect the interface display for a well defined on-screen indication of the current focus. Note a clear indication of focus will not tell if the information is programmatically exposed to assistive technology (AT).
  - b. Issue API call to identify the location of the input focus. Note any discrepancy between the actual input focus and the reported location of the input focus.
  - c. Navigate through the software, especially menus, dialogs, forms and property boxes. Verify the visual focus is clearly visible and easy to identify when you tab or arrow to the next object.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, word prediction, and screen keyboard programs.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(c))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 7.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-ui-access-api>
3. IBM Software Accessibility Checklist Checkpoint 2.1, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.**

**What does this requirement mean?**

**Terms and Definitions**

**user interface element** – any component of an application user interface intended to allow the user to access information or perform an action.

**Assumptions**

Assume that text labels (visible or invisible) that are available to AT and provide the identity, operation and state of a user interface element constitute “sufficient information” as required by this provision.

**Questions and Clarifications**

1. Clarify the method(s) by which the text information shall be made available to assistive technology – is it programmatically exposed via a standard set of APIs?

Yes, it is programmatically exposed through an API. For example, information about the identity, operation, and state of a user interface element might be made available to assistive technology by providing that information as text labels associated with the interface element. These text labels are typically associated as a property of the interface element.

**How can I tell if this requirement is met?**

Identify the product user interface elements that must be assessed. Methods for determining the full set of application user interface elements that could have the input focus include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All operational elements are included in the complete set of elements covered by 1194. There may be multiple product mechanisms that provide user access to the same function.

1. Inspect the application. Requires a software utility that retrieves and displays information about user interface elements. If such a utility is available, load it and then:
  - a. Exercise all user interface elements for the application.

- b. Inspect the information available for each interface element. Note any interface elements not identified by the utility (i.e. information not available) or that have inaccurate information.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, voice input, and sip and puff devices.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(d))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.2 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-device-independent-handlers>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 6.4 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-rendering-access-api>
4. IBM Software Accessibility Checklist Checkpoint 2.2, <http://www-3.ibm.com/able/accesssoftware.html>
5. IBM Software Accessibility Checklist Checkpoint 2.3, <http://www-3.ibm.com/able/accesssoftware.html>

- b. Inspect the information available for each interface element. Note any interface elements not identified by the utility (i.e. information not available) or that have inaccurate information.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen readers, screen magnifiers, voice input, and sip and puff devices.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(d))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 1.2 provides further guidance and techniques for this requirement, at  
<http://www.w3.org/TR/UAAG10/guidelines.html#tech-device-independent-handlers>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 6.4 provides further guidance and techniques for this requirement, at  
<http://www.w3.org/TR/UAAG10/guidelines.html#tech-rendering-access-api>
4. IBM Software Accessibility Checklist Checkpoint 2.2,  
<http://www-3.ibm.com/able/accesssoftware.html>
5. IBM Software Accessibility Checklist Checkpoint 2.3,  
<http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (e) When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.**

**What does this requirement mean?**

**Terms and Definitions**

**bitmap** – a graphic image indicating the presence of an interface element. Note that bitmap in this standard does not imply any particular graphics file format.

**Questions and Clarifications**

1. If a bitmap image is moved, scaled up or down, rotated, or has its display otherwise altered, is it still required to be associated with a consistent action?

Some alterations to a bitmap do not change the basic underlying meaning of the image, and so should not result in a change in the programmatic element identified with the image. If a bitmap is altered in a way that changes the meaning of the image, then the programmatic element that is identified by the bitmap need not remain the same. The programmatic element identified by a bitmap should consistently change if the meaning of the bitmap image changes.

2. Confirm or correct the following statement: "In this standard, the term 'bitmap' refers to a broad number of image formats, e.g. .bmp, .gif, .jpeg, .tif, and .svg".

Yes – The statement is true. The preamble to the Final rule states: "Paragraph (e) requires that when bitmap images are used by a program to identify programmatic features, such as controls, the meaning of that image shall not change during the operation of a program. "Bitmap images" refer to a type of computer image commonly used in "icons" (e.g., a small picture of a printer to activate the print command)."

**How can I tell if this requirement is met?**

Identify the bitmap images used to identify controls, status indicators, or other programmatic elements. Methods for determining the full set of bitmap images include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** Bitmap refers to a broad number of image formats, e.g. .bmp, .gif, .jpeg, .tif, and .svg. A summary of the most common graphics file formats may be found at: [http://www.wikipedia.org/wiki/Graphics\\_file\\_format](http://www.wikipedia.org/wiki/Graphics_file_format)

1. Inspect the application. Requires a check that the function assigned to a bitmap image remains consistent. For each application module:
  - a. List all bitmapped images used to indicate an action, and identify the associated action.
  - b. Exercise the application module through its functionality, and identify where the same bitmap image appears in different phases of the operation.
  - c. For all duplicate bitmapped images, note any differences in function. Maybe use a software tool/application to compare bitmaps and identify duplicates.

**Note:** Satisfying this requirement may involve interoperability with assistive technology. Screen readers attach meaning to icons. If the meaning associated with an icon is changed by an application, screen readers may not recognize the change.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(e\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(e))
2. IBM Software Accessibility Checklist Checkpoint 2.3,  
<http://www-3.ibm.com/able/accesssoftware.html>



**1194.21 (f) Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.**

**What does this requirement mean?**

**Terms and Definitions**

**textual information** – Any information presented using words and characters. Note that an image of text is considered textual information.

**Assumptions**

Assume that textual information can be provided via other mechanisms (e.g. images of text) as long as it is also provided through operating system functions for displaying text.

**How can I tell if this requirement is met?**

Identify the operating systems that the product must be assessed with. For each operating system identify the operating system functions for displaying text.

1. Inspect the application. Requires a utility that retrieves the text information around the caret and displays the text content, text input caret location, and text attributes (e.g. MSDN Inspect Objects). Load such a utility, then:
  - a. Run a test suite for the application that exercises all input functions and moves focus to all edit fields.
  - b. Note any textual information that differs from the description shown by the utility.
2. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology, such as screen readers, screen magnifiers and voice input devices. Some assistive technologies access the text information through the operating system functions.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(f\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(f))
2. IBM Software Accessibility Checklist Checkpoint 4.1,  
<http://www-3.ibm.com/able/accesssoftware.html>
3. MSDN Home > MSDN Library > User Interface Design and Development > Accessibility > Microsoft Active Accessibility > C/C++ Developer's Guide > Active Accessibility User Interface Services > Testing Tools > Inspect Objects; <http://msdn.microsoft.com/library/default.asp>

**1194.21 (g) Applications shall not override user selected contrast and color selections and other individual display attributes.**

**What does this requirement mean?**

**Terms and Definitions**

**individual display attribute** – a visual display characteristic that has a user selectable setting.

**Questions and Clarifications**

1. Are other user selectable operating system attributes beyond display attributes included in the requirements of this provision?

No. This requirement pertains to video display settings.

**How can I tell if this requirement is met?**

Identify the set of individual display attributes.

1. Inspect the application.
  - a. Access the operating system preferences and select values for various individual display attributes e.g., large fonts, non-standard foreground, background, window element colors and high contrast.
  - b. Run a test suite for the application that uses all application screens and modules to verify the settings are maintained in the display.
  - c. Note any application function that disables or changes the display attributes.
  - d. If a magnification/zoom function is supported, try all settings and verify that the display is not seriously adversely affected by changing the magnification/zoom setting.

**Note:** Satisfying this requirement will support interoperability with assistive technology such as screen magnifiers and alternative user interfaces. Assistive technologies may allow the user to control contrast and color selections or other individual display attributes.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(g\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(g))
2. IBM Software Accessibility Checklist Checkpoint 4.3, <http://www-3.ibm.com/able/accesssoftware.html>
3. IBM Software Accessibility Checklist Checkpoint 4.5, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (h) When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.**

**What does this requirement mean?**

**Terms and Definitions**

**animation** – automated visual movement created by and under the control of the software application that is displayed on a user interface. Note this definition does not include video, which is the result of differences in the images within individual video frames, and is not created by the display application.

**Assumptions**

Assume that self-scrolling and moving text are considered animation.

**Questions and Clarifications**

1. Does this requirement pertain to animated user interface elements only, or does it also apply to more complex multimedia animations?

This requirement pertains to animated user interface elements under the control of the software application. This requirement does not pertain to multimedia content. Video, the visual portion of multimedia, is automated visual movement displayed on the screen – however that visual effect is external to the control of the software application. This requirement pertains to animation that results from internal control by a software application.

For example, a video player software application must provide a non-animated presentation mode for any animated display of its user interface elements. However, the video content that is being displayed is external to the software application and therefore need not have a mode where the information provided by the video is displayed in non-animated form.

2. Is this requirement met by presenting animated and non-animated modes simultaneously without a user option?

No. The requirement is to provide the ability to turn off all animation. The very existence of animation on the screen is an accessibility problem.

**How can I tell if this requirement is met?**

Identify the set of occurrences where animation is displayed by the product. Methods for determining the full set of controls that display animation include

review of the product interface and the product documentation (e.g. user manuals plus online help).

1. Inspect the application.
  - a. Check for option turning on redundant information for animated presentations.
  - b. Check for a method of turning off animation in the display. If available, inactivate animation. For each animated element verify animation is not displayed and alternate information is provided.

**Note:** Satisfying this requirement may involve interoperability with assistive technology, such as screen readers. The non-animated presentation mode must be accessible to assistive technology. Moving text and animation is a particular problem for screen magnification AT and other technologies.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(h\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(h))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 3.2 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-configure-multimedia>
3. IBM Software Accessibility Checklist Checkpoint 4.6, <http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (i) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.**

**What does this requirement mean?**

**Assumptions**

Assume that more than one person would reliably determine that the information provided by other means (besides color coding) conveys equivalent information to that of the color coding.

**How can I tell if this requirement is met?**

Identify all uses of color coding to convey information, indicate an action, prompt a response, or distinguish a visual element. Methods for determining all the places color coding is used to convey information include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All uses of color coding for operation (which excludes maintenance and setup) are included in the complete set of functions covered by this requirement.

1. Inspect the application. For each module of the application:
  - a. Enumerate functions or items encoded using color, including error messages. For each use of color coding, verify that equivalent information is conveyed without color.
  - b. If a black and white setting is available, turn it on and verify that all information is still conveyed
2. To quickly check if the requirement is being met, if possible print the information without color on a black and white printer or adjust the display to monochrome, and verify that all information is still conveyed.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. The alternative to color coding must be accessible with and without assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(i\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(i))
2. IBM Software Accessibility Checklist Checkpoint 4.2, <http://www-3.ibm.com/able/accesssoftware.html>

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**1194.21 (j) When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.**

**What does this requirement mean?**

**Assumptions**

Assume the required variety of color settings is that which is necessary to produce an adequate range of contrast by distinguishing foreground or element color from background color.

**Questions and Clarifications**

1. Is there guidance on an adequate variety of color selections or range of contrast levels?

Adequate contrast is an accessibility issue that applies beyond E&IT, and so has been examined by the Access Board for other ADA requirements. There are open issues on what constitutes an adequate range of contrast.

**How can I tell if this requirement is met?**

Identify if a product permits a user to adjust color or contrast settings.

1. Inspect the application. If the program allows color adjustment to foreground, background, or other elements note how many color options are available.
  - a. For each application module, check preferences for color controls; note how many colors are available.
  - b. Test the application color selections to ensure that a range of contrast levels can be obtained.

**Note:** There should be a combination that will provide a soft background, low contrast color scheme as well as combinations that provide a high contrast color scheme.

2. Investigate empirical data on contrast ranges and requirements.
  - a. Avoid reds and greens together. White on black, black on white, and yellow on black are examples of high contrast settings.
  - b. Lighthouse International provides guidelines for effective color contrast on their web site at [www.lighthouse.org/color\\_contrast.htm](http://www.lighthouse.org/color_contrast.htm).

**Note:** Primary colors are different for pigment than for light. Color combinations should be based on video display not printed material.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.



***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(j))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 4.3 provides further guidance and techniques for this requirement, at  
<http://www.w3.org/TR/UAAG10/guidelines.html#tech-configure-text-color>
3. IBM Software Accessibility Checklist Checkpoint 4.4,  
<http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (k) Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.**

**What does this requirement mean?**

**Terms and Definitions**

**flashing element** - an interface element that has an intentional cyclic variation in display.

**Assumptions**

Assume “other elements” are any interface element with a flashing or blinking display, including turning graphics on and off or repeatedly changing between different images on the screen.

**Questions and Clarifications**

1. Does this requirement apply to other blinking elements beyond a display screen, such as LED’s, illuminated buttons, and flashing words?

LED’s and illuminated buttons are not covered by this requirement. Flashing words are typically elements on a display screen, and so typically are included as screen elements that could cause harmful screen flicker. In contrast to a display screen, items that are small in size and typically have a low illumination such as LED’s and illuminated buttons may easily be looked away from and generally do not have a negative affect on users.

**How can I tell if this requirement is met?**

Identify all flashing or blinking interface elements. Methods for finding all of the flashing elements include review of the product interface and the product documentation (e.g. user manuals plus online help), or inspection of the source code for commands that provide flashing or blinking displays.

1. Inspect the application and time the frequency of each flashing element.

**Note:** If there are multiple items that are flashing simultaneously in the same visual space, the cumulative effect should be considered.

**Note:** This should be measured on wide range of processor speed. Processor speed and graphics card can affect this measurement.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001,  
[http://www.access-board.gov/sec508/guide/1194.21.htm#\(k\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(k))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 3.3 provides further guidance and techniques for this requirement, at  
<http://www.w3.org/TR/UAAG10/guidelines.html#tech-on-off-blinking-text>
3. BM Software Accessibility Checklist Checkpoint 5.2,  
<http://www-3.ibm.com/able/accesssoftware.html>

**1194.21 (l) When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.**

**What does this requirement mean?**

**Questions and Clarifications**

1. A collection of individual user interface elements makes up an electronic form. Does meeting the requirements of 1194.21 (d) satisfy this provision? Are there additional requirements beyond 1194.21 (d) enforced by this provision?

No, the requirement of 1194.21 (d) alone is not sufficient to satisfy this provision. Yes, there are additional requirements: The requirements of all of the other provisions of 1194.21 are generally necessary in order to provide an accessible electronic form. In addition, there are some requirements specific to software forms, including the availability of non-editable text that is not in a form field, the proximity of identifying labels and their associated form fields, and the location of instructions relative to the form.

**How can I tell if this requirement is met?**

Identify all uses of electronic forms.

1. Inspect the application. Requires a utility that allows inspection of the text information around the edit field containing the caret. For each electronic form:
  - a. Exercise all input functions and move focus to all form fields.
  - b. Use the inspection utility to note any text that differs from the description shown.
2. Complete the form using only the keyboard.

**Note:** When focus is moved among fields, a carat should be put in the field that has the focus for input. On first entering the form, the carat should be in the first data entry field of the form.

3. Apply assistive technology. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot

predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture.

**Note:** Satisfying this requirement will support interoperability with assistive technology, such as for screen readers. Electronic forms must provide accurate prompts for assistive technology. If labels are not associated programmatically with form elements, assistive technology must use proximity to determine the label for a control or object. Proximity is not an accurate way to determine object labels.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Software Applications and Operating Systems (1194.21), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.21.htm#\(l\)](http://www.access-board.gov/sec508/guide/1194.21.htm#(l))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 2.1 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-doc-content-access>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 5.5 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-info-form-submit>
4. IBM Software Accessibility Checklist Checkpoint 2.4, <http://www-3.ibm.com/able/accesssoftware.html>

## 1194.22 Web based intranet and Internet information and applications

These Section 508 technical requirements apply to purchased or contracted websites, including the information content as well as any associated applications and plug-ins. These requirements also apply to web-based interfaces to other E&IT products or systems, such as web-based interfaces to digital copiers or telecommunications devices (wired, analog and digital wireless, and Internet).

Web based information is content provided via Web pages. A Web based application is any application embedded in a Web page that is necessary to fully deliver the content of the page to the user. Web based applications are also any aspect of a Web page with which the user must interact in order to operate the given function of a Web page. For example, a streaming audio player delivers the content of a page to the user and, therefore, must be accessible to the user.

Most Web interoperability issues deal with the design of Web pages and how effectively they work with assistive technology (such as screen readers, screen magnifiers, Braille readers, alternate input devices). Assistive technology cannot be employed effectively to convey equivalent information to a user with disabilities if these provisions are not met.

Assistive technology products interact with Web-based applications in a variety of ways, depending in great part on the operating system and the language in which the Web-based application is written. For example,

- In the Microsoft Windows environment, some Web-based applications support Microsoft Active Accessibility (<http://msdn.microsoft.com/library/>) assistive technology products.
- Some Web-based applications written in Java are compatible with the Java Access Bridge (<http://java.sun.com/products/accessbridge/>) for Windows. Assistive technology also using the Java Access Bridge can link to Windows applications.
- If the Web-based application is, in fact, a set of markup content that is coded following accessible markup language (<http://www.w3.org/TR/xag.html>), assistive technology products will be able to deliver the information to their users.
- Some Web-based applications were designed specifically to interact with a single assistive technology product. These applications will require that the specific assistive technology product be present to be accessible.
- Some Web-based applications provide text-only versions of their products. These are most commonly used in the Linux environment, where the assistive technology products take information from text-based streams and organize the data in a manner that intends to fill the needs of their users.
- If no other methods are available to assistive technology products, they must fall back to rendering the information directly from the screen.

**1194.22 (a) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).**

**What does this requirement mean?**

**Terms and Definitions**

**text equivalent** – words added as (electronically readable) text to represent the purpose of a non-text element.

**non-text element** – any element that is not presented in electronically readable text and that conveys meaning that is required for comprehension of content or to facilitate navigation. (e.g., an image, image of text, graphic, audio clip, or other element).

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the alternative text is actually equivalent in meaning and/or function of the non-text element, and whether the text equivalents are accurate.

**Questions and Clarifications**

1. Is [a text version of the] audio description required as text equivalent for video in a multimedia web page?

No. Essentially this is ‘doubling up’ accessibility for usability – it suggests providing an alternate form (text) for the alternate form (audio description) of the original information content (video).

2. Is a mathematical equation considered a non-text element?

No. If the mathematical equation is represented numerically or with some appropriate markup (e.g. MathML), then this provision does not require a text equivalent. However, if the mathematical equation is presented by a graphic image, then as with all graphic images a text equivalent is required.

**How can I tell if this requirement is met?**

Identify the non-text elements that require text alternatives.

1. Some tips for inspection of HTML to help identify non-text elements and their text equivalents.
  - a. Search the HTML source for “IMG” tags. For each IMG, note if there is an “alt” or “longdesc” attribute. The “alt” attribute should always be present (although for spacer and other non-content images, the value

of “alt” should be ALT=“”). The “longdesc” attribute is optional, and should be used when the text needed to describe the function of the graphic is too long for an alt text. The longdesc can also optionally be used to describe visual information not critical to page comprehension or use. Note if adequate alternative text is contained within the element content.

- b. Search the HTML source for image maps (image with an “ismap” or “usemap” attribute). For each map, note if there is an “alt” text equivalent provided for all active links. Note if adequate alternative text is contained within the element content.
- c. Search the HTML source for <APPLET> or <OBJECT> or <EMBED> tags. For each <applet> element, note if there is an “alt” attribute or nested content which provides the text equivalent. For each <object> element, note if there is nested content which provides the text equivalent. For each <embed> element, note if there is an “alt” attribute.

**Note:** There are authoring tools that can help to identify and prevent potential accessibility problems with a resulting Web page. It may be a good suggestion to explore the availability of such tools when issuing RFPs.

2. Apply AT to verify that all images have appropriate text equivalent. **Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note:** Satisfying this requirement will support interoperability between user agents, such as Web browsers, media players and plug ins, and assistive technology such as screen readers and magnifiers

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(a))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 1.1 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/WCAG10/#tech-text-equivalent>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_a.htm](http://projects.accessibilityforum.org/demos/Rule_a.htm).



**1194.22 (b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.**

**What does this requirement mean?**

**Terms and Definitions**

**equivalent alternatives** – captioning provided for audio information, audio description of visual information, or other alternative presentations of information that fulfills the same function or purpose upon presentation to the user.

**multimedia presentation** – any presentation of more than one type of media, typically both audio and visual information.

**synchronized** - having common timing and coordination of execution.

**Assumptions**

Assume multimedia rendering software applications are required to display synchronized equivalent alternatives, and that informed humans can reasonably consistently judge whether the equivalent alternatives are synchronized with the presentation within an acceptable time window.

**How can I tell if this requirement is met?**

Identify all uses of multimedia presentation.

1. Check each multimedia presentation for the synchronization of captioning and audio description.
  - a. Inspect to find synchronized text tracks in SMIL or Quicktime files.
  - b. Open captioning might be embedded into video stream, requiring human verification.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(b))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 1.4 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-synchronize-equivalents>

## Quick Reference Guide to Section 508 Resource Documents

3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_b.htm](http://projects.accessibilityforum.org/demos/Rule_b.htm).

**1194.22 (c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.**

***What does this requirement mean?***

**Assumptions**

Assume that informed humans can reasonably consistently judge whether color is being used to convey information, and whether that information is adequately available without color.

***How can I tell if this requirement is met?***

Identify all cases where information is conveyed with color, for example, "Fields in red are required to be filled out".

1. A simple but not comprehensive way to identify problems would be:
  - a. View the page on a black and white monitor.
  - b. Print the page out on a black and white printer
  - c. Is all information still discernable?

**Note:** Sometimes color combinations that are readable become unreadable when mapped to black-and-white in printing which could yield a different result than viewing with the eye, color-blind or not. Printing operations will render shades of gray by dithering, in an attempt to match the luminance of the color original; a person viewing the result might incorrectly conclude that a page lacks color-dependence. Gray-scale and monochrome monitors have become a tiny fraction of the overall market, and some mechanisms that attempt to support them on modern video hardware do so in ways that lead to incorrect conclusions about the software being viewed. In particular, some systems support gray-scale monitors by connecting only the output of the green signal to the monitor's input, effectively discarding the red and blue portions of the signal. This incorrectly maps the luminance information because the discarded colors account for 40% of the total. (In contrast, a black-and-white television will correctly display the picture because the luminance of the gray-scale output is a weighted average of all three colors.)

2. Insure that links are not distinguished by color alone. Note a common practice of removing underlines for links creates this problem.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(c))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 2.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-color-convey>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_c.htm](http://projects.accessibilityforum.org/demos/Rule_c.htm).

**1194.22 (d) Documents shall be organized so they are readable without requiring an associated style sheet.**

**What does this requirement mean?**

**Terms and Definitions**

**documents** – named, structured units of text, images, or other elements; web pages.

**style sheet** – A collection of formatting instructions stored in a file that determines how the layout of the documents to which it is attached are presented (e.g. displayed on screens, printed, or pronounced).

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the document is adequately readable in the absence of presentational features from style sheets.

Assume this requirement relates only to the page as delivered to the user and not as stored on a server or transmitted over a network.

**Questions and Clarifications**

1. Is compatibility with user defined style sheets required by the existing 508 standards?

No. Although user defined style sheets are important for many users to allow personalized the presentation of web pages to suite particular user requirements, there is no requirement in the Section 508 standard requiring use defined style sheet compatibility.

2. How does this provision relate to the use of XML? More specifically, for XML data is the following acceptable: “Have an available XSL transform on the server that generates XHTML which meets the requirements of these provisions, with any XML data not related to the XSL flowing to a user application that meets the requirements of 1194.”?

Yes. The specific statement is acceptable. The Section 508 requirements apply to the display of information as it is presented to the user, regardless of the particular language or format used to represent, transport, and store the information.

***How can I tell if this requirement is met?***

Identify if any style sheets are used, (e.g. by looking for the <link> or <style> elements, or the attribute “style=” in any element).

1. View the pages using a browser with style sheets turned off or inactive and determine if the content is adequately readable.

**Note:** Information on how to turn style sheets on and off is typically available from the help pages of Internet browsers.

**Note:** One method, but not the only one, for how XML documents can comply with this requirement is to have an available XSL transform on the server that generates XHTML which meets the requirements of these provisions, with any XML data not related to the XSL flowing to a user application that meets the accessibility requirements of 1194.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. Interference between web pages and user-defined style sheets may be a problem for accessibility but is not specified in the requirements of this or any other technical provision of 1194.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(d))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 6.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-order-style-sheets>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. W3C Web Style Sheet homepage, <http://www.w3c.org/Style>
5. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_d.htm](http://projects.accessibilityforum.org/demos/Rule_d.htm).

**1194.22 (e) Redundant text links shall be provided for each active region of a server-side image map.**

**What does this requirement mean?**

**Terms and Definitions**

**redundant text link** – A link that points to the same location as the active image region, or to another location that is equivalent to that referenced by the active image region.

**Assumptions**

Assume that when the image map contains an impractical number of regions (e.g. equal to the number of pixels in the screen region), some other means for achieving the function of the image map could be provided instead.

**How can I tell if this requirement is met?**

Identify all active regions of all server-side image maps. All regions of all image maps (which excludes maintenance and setup features) are included in the complete set of elements to be assessed.

1. Inspect web content source to identify server-side image maps and identify the presence of appropriate redundant text links for each active region of all server-side image maps.

**Note:** The two methods to indicate server-side image maps are:

- the presence of an ismap attribute in the <img> image element
- the presence of “input type = image” within a form.

**Note:** That redundant text links are most effective if they are positioned before or at least adjacent to the image map so that a user can know what is going on before getting to a non-readable image map.

**Note:** Satisfying this requirement supports interoperability with assistive technology, such as screen readers. Web pages must use redundant text links so that screen readers can provide choices to people who cannot see the choices presented on the image.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(e\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(e))

## Quick Reference Guide to Section 508 Resource Documents

2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 1.2 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-redundant-server-links>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_e.htm](http://projects.accessibilityforum.org/demos/Rule_e.htm).



**1194.22 (f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.**

**What does this requirement mean?**

**Assumptions**

Assume that active regions of client-side image maps have alternative text as required under 1194.22 (a).

**How can I tell if this requirement is met?**

Identify all server-side image maps.

1. Inspect web content source to help identify server-side image maps that could have been represented by client-side image maps. Examine the map - could the map region have been defined with an available geometric shape?

**Note:** The two methods to indicate server-side image maps are:

- the presence of an ismap attribute in the <img> image element
- the presence of “input type = image” within a form.

**Note:** Access to a server-side map file is not in the client HTML and so not typically available over HTTP with most Web servers.

**Note:** Satisfying this requirement supports interoperability with assistive technology, such as screen readers. Using a client-side map allows assistive technology, such screen readers and alternative input devices, to navigate links embedded in the map.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(f\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(f))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 9.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-client-side-maps>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_f.htm](http://projects.accessibilityforum.org/demos/Rule_f.htm).

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**1194.22 (g) Row and column headers shall be identified for data tables.**

**What does this requirement mean?**

**Terms and Definitions**

**data tables** – tables used to represent tabular information.

**Assumptions**

Assume this requirement does not apply to tables used strictly for layout purposes, and assume that informed humans can reasonably consistently judge whether a table is used strictly for layout.

**How can I tell if this requirement is met?**

Identify all uses of a data table. Establish that the table is a data table which needs column and / or row headers for understanding its contents.

1. Inspect web content source to help identify appropriate data table headers. Some tips for inspection of HTML to help identify appropriate identification of data table headers:
  - a. Column headers: the first data row of the table is composed of <th> elements instead of <td> elements.
  - b. Row headers: the first cell of each data row is a <th> element instead of a <td> element.

**Note:** Tables that are used strictly for layout should avoid this markup.

2. Apply AT to make sure row and column headers are identified. **Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note:** Satisfying this requirement supports interoperability with assistive technology, such as screen readers and magnifiers, which must be able to interpret data tables.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(g\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(g))

## Quick Reference Guide to Section 508 Resource Documents

2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 5.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-table-headers>
3. W3C WAI User Agent Accessibility Guidelines 1.0 techniques for browsers, etc. to handle HTML tables: <http://www.w3.org/TR/UAAG10-TECHS/topics.html#table-techniques>
4. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
5. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_g.htm](http://projects.accessibilityforum.org/demos/Rule_g.htm).

**1194.22 (h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.**

**What does this requirement mean?**

**Terms and Definitions**

**data tables** – tables used to represent tabular information.

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the markup adequately reflects the table row and column headers.

**How can I tell if this requirement is met?**

Identify all uses of a data table that have two or more logical levels.

1. Inspect web content source to help identify appropriate multi-level data table headers. Are row and column headers associated with each data cell?
  - c. Inspect the HTML find appropriate identification of multi-level data table headers by looking for various combinations of the <thead>, <col>, <colgroup>, and <th> elements, and “axis”, “id”, “scope”, and “headers” attributes.

**Note:** Tables that are used strictly for layout should avoid this markup.

2. Apply AT to make sure row and column headers are identified. **Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc

**Note:** Satisfying this requirement supports interoperability with assistive technology, such as screen readers and magnifiers, which must be able to interpret data tables.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(h\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(h))

## Quick Reference Guide to Section 508 Resource Documents

2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 5.2 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-table-structure>
3. W3C WAI User Agent Accessibility Guidelines 1.0 techniques for browsers, etc. to handle HTML tables:  
<http://www.w3.org/TR/UAAG10-TECHS/topics.html#table-techniques>
4. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
5. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_h.htm](http://projects.accessibilityforum.org/demos/Rule_h.htm).

**1194.22 (i) Frames shall be titled with text that facilitates frame identification and navigation.**

**What does this requirement mean?**

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the frame text title is appropriate to facilitate frame identification and navigation. Frames should not be titled "top", "left" or "right" or "bottom". Frame names should be indicative of the contents of the frame, e.g. 'navigation bar', 'table of contents', 'page header', or 'main content'.

Assume that the "name" attribute does not identify a frame for purposes of this provision. The "name" attribute may identify frames for scripting, but not for the requirement of this provision.

**How can I tell if this requirement is met?**

Identify all uses of frames.

1. Inspect web content source to help identify frames and frame identification. Some tips for inspection of HTML to help identify appropriate identification of frames. For each frame check if either of the following cases is true:
  - a. Is the frame clearly identified through the "title" attribute of the <frame> or <iframe> element? e.g. <frame src="nav.html" title="Navigational Links">
  - b. Is the frame clearly identified by including text within the body of each frame that clearly identifies the frame?

**Note:** When including text within the body of a frame for identification, the text should be at the beginning of the frame contents to facilitate quick identification of the frame contents beyond the title attribute.

**Note:** Satisfying this requirement supports interoperability with assistive technology, such as screen readers and magnifiers, which must be able to identify frames and frame content for navigation.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(j))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 12.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-frame-titles>

## Quick Reference Guide to Section 508 Resource Documents

3. The W3C maintains a listing of techniques for dealing with frames, including using the “title” attribute, at <http://www.w3.org/TR/WCAG10-HTML-TECHS/#frames>
4. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
5. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_i.htm](http://projects.accessibilityforum.org/demos/Rule_i.htm).



**1194.22 (j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.**

**What does this requirement mean?**

**Terms and Definitions**

**Hz – hertz** - the international unit of frequency, equal to one cycle per second.

**flicker** - an unintentional and undesirable cyclic variation in display of a screen image.

**Assumptions**

Assume that anything visually present on the page, including interface elements and background, is subject to this requirement.

**How can I tell if this requirement is met?**

Requires the capability to measure screen flicker frequency that might be caused by web pages.

**Note:** Because 2 hz is relatively slow, webmasters are currently using visual observation to determine if flicker is greater than 2 hz.

**Note:** Screen flicker should be measured on wide range of processor speed. Processor speed and graphics card can affect this measurement.

1. Inspection
  - a. Exercise the functionality of the page as would be expected in use.
  - b. Does the page result in a flicker greater than 2 Hz and less than 55 Hz?

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(j))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 7.1 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-avoid-flicker>

## Quick Reference Guide to Section 508 Resource Documents

3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_j.htm](http://projects.accessibilityforum.org/demos/Rule_j.htm).

**1194.22 (k) A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.**

**What does this requirement mean?**

**Assumptions**

Assume that informed humans can reasonably consistently judge whether compliance could not be accomplished in any other way than a text-only page and whether the text-only page is actually equivalent to the primary page.

**How can I tell if this requirement is met?**

Identify all cases where an equivalent text-only page is provided.

1. Compare each text-only page to the corresponding primary page to see if the information is actually equivalent.

**Note:** The link to an alternative text only page should be easily found on the web page and should not require any special technology to be activated.

**Note:** This requirement is important for interoperability with assistive technology and is applied where interoperability cannot be attained through other means.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(k\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(k))
2. The W3C WAI Web Content Accessibility Guidelines 1.0 Checkpoint 11.4 provides further guidance and techniques for this requirement at <http://www.w3.org/TR/WCAG10/#tech-alt-pages>
3. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
4. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_k.htm](http://projects.accessibilityforum.org/demos/Rule_k.htm).

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**1194.22 (I) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.**

**What does this requirement mean?**

**Terms and Definitions**

**functional text** – text that when read conveys an accurate message as to what is being displayed by the script or that describes or what action the script will perform.

**scripting language** - a programming language that is used to manipulate, customize, and automate the facilities of an existing system. Note this provision only refers to the use of scripting languages for creating and displaying dynamic web content.

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the text information is an adequate functional text.

**How can I tell if this requirement is met?**

Identify all uses of scripts to display necessary information or create interface elements. For example, one would identify a script on an HTML document by the presence of:

- The <script> element
  - Event handler attributes, i.e. attributes whose name begins with "on" e.g., "onmouseover"
  - JavaScript URLs, i.e. href attributes that use the javascript protocol e.g., <a href="javascript:dosomething()">text</a>
1. Inspect web content source to help identify presence of functional text for scripts. Some hints on how to determine what part of a script is necessary information vs. decoration:
- a. *Image rollovers* – Scripts that are used to change an image's state when a user moves a mouse over it are an accessibility problem if:
    - i. text or other meaningful information is conveyed in the mouseover image (e.g., the normal state is a blank button, but on mouseover the button shows a title for the item or a recognizable logo);
    - ii. the item changes other content on the page (e.g., mousing over an area on the page causes text or other content to appear in another area, when that content is otherwise invisible). This is an issue for users who are blind or use a keyboard or switch device exclusively.

- b. *interface adjustments* – can be ok, but needs verification
  - c. *form validation* – ok if server-side error reporting is provided
  - d. *form submission* – If the form uses an anchor and JavaScript to submit a form (e.g., `<a href="javascript:document.forms[0].submit()"></a>`), people with JavaScript turned off won't be able to submit the form.
  - e. *dynamic html* – often problem, really needs human judgement
  - f. *redirect/refresh page* – problem (accessible alternatives exist)
  - g. *create popup window and change current window* – Popup windows (`<a href="javascript:window.open('foo')"></a>`) and window focus changes (`<a href="javascript:window.parent.frames[1].focus()"></a>`) confuse users of screen readers by changing the focus on their windows without permission.
  - h. *generate content* – problem
2. Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported.
  3. Apply AT to make sure functional text is available. **Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc.

**Note:** Some screen readers will react to scripts and some will not - testing with a modern screen reader may not find problems for other screen readers still in use.

**Note:** Satisfying this requirement supports interoperability with assistive technology such as screen readers. If information conveyed by scripting languages is not coded properly, it will be at best difficult to read.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(I\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(I))
2. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
3. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_1.htm](http://projects.accessibilityforum.org/demos/Rule_1.htm)

**1194.22 (m) When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).**

### **What does this requirement mean?**

#### **Terms and Definitions**

**applet** – An applet is a program that is part of content, and that the user agent executes.

**plug-in** - A plug-in is a program that runs as part of the user agent and that is not part of content. Users generally choose to include or exclude plug-ins from their user agent. Note these add-on programs or "plug-ins" can be downloaded and installed on the user's computer that makes it possible for their web browsers to display or play the content of the files with proprietary formats when these file(s) is (are) included as a part of the web page.

#### **Assumptions**

Assume each plug-in or applet or application is accessible on multiple platforms.

**Note:** Accessibility across multiple platforms is strongly desired. If an element or plug-in is available on a platform, it is assumed to be accessible on that platform.

#### **Questions and Clarifications**

1. Is the "pluginspage" attribute of the <embed> element, or similar functionality on other elements if it exists, acceptable or is a literal link required?

No, a literal link to an explicit plug-in application is intended. Some AT manufacturers do not currently support the described markup.

### **How can I tell if this requirement is met?**

Identify all cases where an applet, plug-in or other application is required on the client system to interpret page content. Some tips for inspection of HTML to help identify required plug-ins, applets or other applications include:

- Look for the <object>, <applet>, or <embed> elements.
- Look for links to files with extensions other than .html, .htm, .jpeg, .gif and .xhtml, or any proprietary tags that are not directly handled by a browser - some plug-in manufacturers may require these.

## Quick Reference Guide to Section 508 Resource Documents

1. If plug-ins, applets, or other applications are required, then look for links to download the software necessary to render the content from those file types. For pages that use an applet, plug-in, or have a link to a file type that has inaccessible content, verify that the page has a link to an accessible version of the required application or content.
2. Run the plug-in, applet, or other application on the page and test the interface against 1194.21 or otherwise verify that the plug-in actually conforms to §1194.21(a) through (l).

**Note:** The types of other applications that must be supported may include MSWord, Excel and Powerpoint in addition to pdf, shockwave, and flash files.

**Note:** Satisfying this requirement supports interoperability with assistive technology such as screen readers or screen magnifiers. Plug-ins or applets must be available to the user. The interoperability is between the user interface presented by the plug-in or applet and the assistive technology.

### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(m\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(m))
2. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
3. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_m.htm](http://projects.accessibilityforum.org/demos/Rule_m.htm)



**1194.22 (n) When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.**

**What does this requirement mean?**

**Terms and Definitions**

**field element** – a user interface element that appears within an electronic form field.

**Assumptions**

Assume that informed humans can reasonably consistently judge whether the order in which the information is presented in a form is logically correct.

**How can I tell if this requirement is met?**

Identify all information, field elements, and functionality that are required for completion and submission of the form.

1. Inspect web content source to help identify form functionality, for example in HTML look for the element <form>. Verify that the form functionality is accessible. Some examples of accessible approaches to various form element functionality include:
  - a. For selection menus (or drop down boxes), radio buttons and check boxes- to ensure that AT user can ascertain the options being presented by these elements as well as determine/ edit choice marked.
  - b. For edit boxes (text fields and text areas): be able to relate label to entry area and enter / verify text entered.
  - c. For buttons (like reset, submit): be able to determine their purpose and activate them.
  - d. For forms embedded in data tables: be able to associate the column header and row header with a text entry cell in the form.
  - e. For instructions: be able to navigate/access the instructions relevant to the part of the form being filled and return to that part.

**Note:** Some design features of an electronic form generally facilitate access to assistive technology, such as the relationship between control labels and controls or the sequence/ordering of form fields and directions or cues. Look for the attribute named “tabindex” – if used, the sequence of this attribute should be the same as the optimal sequence for a user moving through the form. Note that some browsers cannot tabindex.

**Note:** Labels should be associated with input fields in the HTML using the explicit <label> tag - this association is what is required by assistive technology. If this is done, the placement of the label for display on the page is not relevant for assistive technology.

2. Apply AT to make sure screen readers get information in correct order. **Note the use of AT as a measurement method is limited by the adequacy of algorithms and heuristic methods of the specific AT tool used.** It can be used to identify problems with specific AT-E&IT interoperability but it cannot predict results with other AT or with other versions of the same AT, OS, application or accessibility architecture. AT should include the full range e.g. screen readers, screen magnifiers, alternate input devices, etc.

**Note:** When forms are used together with tables, some screen readers can have a conflict with select boxes, permitting the user to select more than one choice in a list.

**Note:** Satisfying this requirement supports interoperability with assistive technology such as screen readers or screen magnifiers.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(n\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(n))
2. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 2.1 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-doc-content-access>
3. The W3C WAI User Agent Accessibility Guidelines 1.0 Checkpoint 2.3 provides further guidance and techniques for this requirement, at <http://www.w3.org/TR/UAAG10/guidelines.html#tech-conditional-content>
4. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
5. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_n.htm](http://projects.accessibilityforum.org/demos/Rule_n.htm)

**1194.22 (o) A method shall be provided that permits users to skip repetitive navigation links.**

**What does this requirement mean?**

**Terms and Definitions**

**repetitive navigation links** – a set of routine navigation links that appear on the top or the side on a web page.

**Assumptions**

Assume that informed humans can reasonably consistently judge whether there are repetitive navigation links, whether they are adequately identified, and whether the skip ends up in an appropriate location on the page.

**How can I tell if this requirement is met?**

Identify those links that are repetitive navigation links.

1. If a page has repetitive navigation links, is there a mechanism to skip past:
  - a. Does an adequately identified link provide a jump past the repetitive navigation links to the main content area?
  - b. Does this link appear before the repetitive navigation links?

**Note:** Where to skip is not specified. Typical appropriate locations are to the beginning of the following block of links or to the top of the content new to that page.

- a. Jump to content may be a more general way of achieving this and would cover cases in addition to skipping repetitive links.
- b. Jumping straight to the beginning of the content may prevent the user from seeing additional links that are not repetitive.
- c. Navigation links are sometimes hidden because it is thought that only screen reader users need them. People that access web content only using the keyboard also need these links to enable them to bypass repetitive links. Therefore they should not be hidden, but also visually displayed prominently so as to be quickly locatable.

**Note:** When frames are used, grouping all the navigation links within a single frame may be an approach. Provided that:

- a. The frame containing the rep nav links is properly identified as required by 1194.22 (i)
- b. There isn't a set of repetitive links in the content frame
- a. The frameset is static.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology, but supports usability with assistive technology such as screen readers.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(o\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(o))
2. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>
3. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_o.htm](http://projects.accessibilityforum.org/demos/Rule_o.htm)

**1194.22 (p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.**

**What does this requirement mean?**

**Assumptions**

Assume that the alert is provided in an accessible fashion. Assume that along with providing the user the opportunity to request additional time, the product or service is also required to actually provide the additional time.

Assume that informed humans can reasonably consistently judge whether the alert is meaningful, whether the user is clearly told how to indicate more time, and whether the amount of time given to indicate more time is required is sufficient.

Assume that this requirement applies to content is not controlled by real time events (e.g. auction), and that time is not a critical element of the activity. Where the activity is time validated (such as a timed test), assume that a non-time-validated version may be provided.

**How can I tell if this requirement is met?**

1. For timed response alert, determine if the page requires a user response within a time interval. If yes:
  - a. Does the page have features that give the user the ability to indicate that more time is required?
  - b. Does the page provide “sufficient time” for the user to indicate that more time is required?
  - c. Determine if the Alert is given in an accessible fashion
2. For additional time, determine if the page provides adequate timed response alert (method 3 above). If yes:
  - a. Does the page provide additional time as requested?

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Web-based Intranet and Internet Information and Applications (1194.22), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.22.htm#\(p\)](http://www.access-board.gov/sec508/guide/1194.22.htm#(p))
2. The W3C WAI maintains a listing of various tool and services available for evaluation and repair of web pages for web content accessibility, at <http://www.w3.org/WAI/ER/existingtools.html>

## Quick Reference Guide to Section 508 Resource Documents

3. An example web page illustrating typical violations of this provision can be found at [http://projects.accessibilityforum.org/demos/Rule\\_p.htm](http://projects.accessibilityforum.org/demos/Rule_p.htm)

## 1194.23 Telecommunications products

These Section 508 technical requirements apply to purchased telecommunications devices, including wired, analog and digital wireless, and Internet based products. In addition, these requirements also apply to such devices as PBX (in-house electronic exchanger) and telephone answering machines.

- Several of these requirements have been defined to mandate the successful delivery and availability of Teletypewriter (TTY) services. Domestic TTYs are Baudot -based communications devices used by people who are deaf, hard of hearing or speech impaired to communicate over networks designed to carry voice. In other words, if a device can transmit and receive voice over a telecommunications network, then it should be able to support the hookup and successful interoperation of TTY assistive technology.

In the U.S., text telecommunications originally developed from teletypewriter systems donated by the Bell System. These devices, which communicated with a five-bit (Baudot) code, were originally designed to be used on dedicated networks. They were adapted for use on the telephone network through the use of a frequency shift keyed modem.

TTYs are “instant-on” devices in that, unlike most data modems, do not require any “handshaking”. Tones are placed on the communications path in response to depressed keys on the keyboard. Although they are primarily used as two-way text communications devices, they are also used in an alternating text/voice fashion often through the Telecommunications Relay Service.

- These requirements address the interaction between telecommunications products and hearing technologies, such as hearing aids and cochlear implants. Hearing technologies, used by people who are hard-of-hearing in conjunction with the telephone, pose unique interoperability challenges. The term ‘coupling’ refers to the connection between telecommunications products such as telephones and hearing technologies like hearing aids. *Acoustic coupling* is where the hearing aid picks up sounds directly from the telephone. *Inductive coupling* is where the sound of the telephone is turned off, and the hearing aid responds to magnetic signals in the telephone. Acoustic coupling is often ineffective as it is susceptible to noise, poor coupling of the phone earpiece, and acoustic feedback. Today, most landline telephones are, by law, Hearing Aid Compatible (HAC) in that they allow inductive coupling with hearing aids rather than rely on an acoustic coupling method. However, with the advent of digital wireless telecommunications, new challenges have arisen for the hearing aid user in the form of interference from the multiplexer in the digital handset. This problem has not yet been completely resolved.

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**1194.23 (a) Telecommunications products or systems which provide a function allowing voice communication and which do not themselves provide a TTY functionality shall provide a standard non-acoustic connection point for TTYs. Microphones shall be capable of being turned on and off to allow the user to intermix speech with TTY use.**

**What does this requirement mean?**

**Terms and Definitions**

**TTY** – A TTY (Teletypewriter) is a data terminal used for two-way text conversation over a telephone line that sends and receive tones converted to text using ANSI/TIA/EIA 825 and Baudot.

**Note:** Voice Carry Over (VCO) and Hearing Carry Over (HCO) are strategies for using TTYs that are not strictly ‘two-way text conversation’. VCO allows people who are hard of hearing or oral deaf (deaf with intelligible speech) to use a TTY without typing. They only use the TTY for reading during the inbound direction of the call, and talk to their party by speaking into a microphone. Similarly, HCO allows a person with a speech disability to hear a response from their party directly, and use the TTY for sending text in the outbound direction.

**Assumptions**

Assume TTY input and output supports the signal levels required by the associated connection point.

**How can I tell if this requirement is met?**

Identify if product provides a function allowing voice communication.

1. Determine if product itself provides TTY functionality. If not:
  - a. Verify a standard non-acoustic connection point.
  - b. Verify microphone off/on switch “mute”, or similar function.
2. Test the phones ability to allow the user to intermix speech outputs with TTY inputs on the same call to insure that Voice Carry Over (VCO) is functioning properly. (On some phones, when the microphone is muted, the telephone also prevents transmitting TTY through the direct-connect port. This is a problem.)
3. Test the phones ability to allow the user to intermix audio inputs with TTY output on the same call to insure that Hearing Carry Over (HCO) is functioning properly.

**Note:** Although 300 baud ASCII includes a carrier tone signal that causes problems in supporting VCO; TTYs must also support 45.5 baud Baudot which works fine with VCO.

**Note:** Satisfying this requirement will support interoperability with TTY (teletypewriter) assistive technology.

- For traditional “wireline” phones (that is, desk or public phones), an analog, Public Switched Telephone Network (PSTN) compatible RJ-11 port or a 2.5 mm jack with the electrical characteristics of a headset jack will allow connection of a TTY.
- For Integrated Services Digital Network (ISDN) systems, an ISDN Terminal Adapter (RJ-11, analog, PSTN compatible) will provide the TTY connection.
- For Analog Wireless systems, a 2.5 mm headset jack on the handset will allow the connection of a TTY modem or an appropriately configured TTY.
- For Digital Wireless systems, the interface specified in Electronics Industries Association (EIA) TSB-121 provides for the connection of compliant TTYs to digital wireless handsets. This interface, developed specifically to support TTY over wireless networks, also uses the 2.5 mm jack.
- For voice over Internet Protocol (IP), there is no specific connector at this time. However, any one of the above connectors may be appropriate, depending on the implementation of this technology. Research is under way to determine effectiveness of various voice over IP systems in carrying TTY and to determine solutions to problems identified.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.23.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.23.htm#(a))
2. “Tools for field testing TTYs with wireless phones” copyright Gallaudet University, <http://tap.gallaudet.edu/trerc.htm>
3. Text Telephone (TTY) Forum - Alliance for Telecommunications Industry Solutions (ATIS), <http://www.atis.org/atis/ttyforum.htm>
4. TIA/EIA-TSB121 – Cellular Subscriber Unit Interfaces for TDD.

**1194.23 (b) Telecommunications products which include voice communication functionality shall support all commonly used cross-manufacturer non-proprietary standard TTY signal protocols.**

**What does this requirement mean?**

**Assumptions**

Assume this provision requires support for 45.5 baud Baudot code.

**Questions and Clarifications**

1. Is support for 300 baud ASCII code or V.18 required?

Support for 300 baud ASCII code is required. Support for V.18 is sufficient but not required.

2. Must a product also support 300 baud ASCII in addition to 45.5 baud Baudot?

No, 300 baud ASCII code alone is not sufficient to meet the requirements of this provision; 45.5 baud Baudot code is also required.

3. Given that 300 Baud ASCII support is required for this carriage requirement 1194.23(b), but is it also required for IVR systems under provision 1194.23 (c)?

No – Based on the requirement of 1194.23 (b), all TTYs must support the 45.5-baud Baudot protocol. The requirement of 1194.23 (c) states that IVR etc. systems must be ‘usable by TTY users with their TTYs’. Therefore, if an IVR etc. system works with 45.5. baud Baudot, then it should meet the requirement for provision (c).

**How can I tell if this requirement is met?**

Identify the standard TTY signal protocols (45.5 baud Baudot and 300 baud ASCII).

1. Refer to standard methods and tools that exist for TTY signal protocol testing for digital wireless.
  - a. Working with Gallaudet University, the TTY Forum employs a consistent approach to TTY protocol testing that uses standard test case data scripts and automated protocol capture and analysis tools for measuring transmission accuracy.
2. Use overall error performance tests from the TTY Forum’s TTY Technical standards implementation tests suite and additional tests as appropriate.

End-to-end performance tests using Gallaudet test scripts should be technology independent.

**Note:** Use of the TTY Forum test methodology alone is not sufficient for Voice over IP (VoIP) systems. The TTY Forum's tests are oriented toward discovery of codec impairments, such as the ability to capture pure tones cleanly. The IVR Forum is currently investigating other potential problems with TTY and VoIP.

**Note:** Wireless carriers must inform the FCC when their networks are TTY compatible - the largest carriers have said that they are now in compliance. They must also support TTY compatible handsets. Federal agencies need to assure that handsets they purchase are TTY compatible, but should not have to do independent testing of carriers networks.

**Note:** Satisfying this requirement will support interoperability with TTY (teletypewriter) assistive technology.

- In general, the objective is that landline, wireless, and voice over IP phone systems be able to pass TTY signals/protocol without unacceptable character loss or error. At this time, support for the TTY protocol as documented in American National Standards Institute (ANSI) Telecommunications Industry Association (TIA) EIA 825 is required to provide TTY interoperability in the U.S. (Proprietary protocols are also widely used in TTYs but these are not standardized and support is not required although desirable from a user standpoint.)
- Under Federal Communications Mandate (FCC) mandate, the wireless industry has developed and implemented a number of standards to support the protocol found in ANSI/TIA/EIA 825.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.23.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.23.htm#(b))
2. "Tools for field testing TTYs with wireless phones" copyright Gallaudet University, <http://tap.gallaudet.edu/trerc.htm>
3. ANSI/TIA/EIA 825, June 23, 2000
4. Text Telephone (TTY) Forum - Alliance for Telecommunications Industry Solutions (ATIS), <http://www.atis.org/atis/ttyforum.htm>

**1194.23 (c) Voice mail, auto-attendant, and interactive voice response telecommunications systems shall be usable by TTY users with their TTYs.**

**What does this requirement mean?**

**Terms and Definitions**

**DTMF** – Dual-Tone Multi-Frequency (DTMF) tones are those used by touch-tone phones for tone dialing.

**Assumptions**

Assume that this requirement applies both to the systems of the caller (caller is TTY user) and those of the person being called (person called is a TTY user and has a voice mail service).

**Questions and Clarifications**

1. Is a VM/AA/IVR system that is usable by a 'DTMF-enabled TTY configuration' sufficient for the requirements of this provision?

No, this provision does not presume that a TTY can produce DTMF tones. This provision places requirements on VM/AA/IVR systems, including:

- VM/AA/IVR systems should be able to transmit voice data in the 45.5 baud Baudot TTY protocol
- VM/AA/IVR systems should be able to hold TTY encoded messages without corruption.

**Note:** A 'DTMF-enabled TTY configuration' is a TTY that either produce DTMF tones itself, or can work together with a DTMF tone producing system (such as a telephone) to generate DTMF tones.

**How can I tell if this requirement is met?**

Identify the set of voice mail, auto-attendant, and interactive voice response functions that must be assessed. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of elements covered by this requirement.

**Note:** The Alliance for Telecommunications Industry Solutions (ATIS) sponsors the Interactive Voice Response (IVR) Accessibility Forum "to investigate and document potential accessibility and usability solutions for voice-mail and other interactive voice response systems and services"

**Note:** Satisfying this requirement will support interoperability with TTY (teletypewriter) assistive technology. Some current important interoperability issues are:

- Allowing voice mail (VM), auto-attendant (AA), and interactive voice response (IVR) interaction by TTY users, and
- Having voice mail record and playback TTY messages with acceptable loss of data. Generally this means providing control by Dual Tone Multi Frequency (DTMF) or Baudot and communication of information in (Baudot) TTY.

**Note:** Issues related to TTY systems that require the use of DTMF tones include:

- There is currently no way for a “command” from a TTY to be distinguished from “communication” from a TTY. IVR design is very hard if the user is trying to use Baudot numbers for both data entry and flow control. It is hard to know if Baudot-encoded number is intended as “speech” or as a command, unless all commands are provided as DTMF number tones.
- The IVR Forum is still debating this and many issues and manufacturers must follow the FCC direction at the end of that Forum.

**Note:** It is possible to get an IVR or voicemail system to recognize TTY tones in the same way that it recognizes DTMF tones, but it would create complex user interface issues, such as:

- How does the voicemail system know that the user has finished recording a TTY message and now wishes to enter a TTY command? This is not an unsolvable problem, but it does require the voice user interfaces and TTY user interfaces to behave differently which would add to the cost of programming the IVR, creating documentation and training users.
- Given the half-duplex nature of the Baudot protocol, provision of capabilities such as “barge-in” and “dial ahead” (the ability to interrupt the system; the ability to make menu selections or enter commands before the menu is presented) would be difficult to support in a TTY-only interface.

**Note:** Maintaining separate IVR or voicemail systems for voice and TTY users satisfies this requirement, analogous to supporting separate web-sites (primary and text-only) as described in 1194.22 (k).

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.23.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.23.htm#(c))
2. Interactive Voice Response (IVR) Forum - Alliance for Telecommunications Industry Solutions (ATIS), <http://www.atis.org/atis/ivrforum.htm>
3. ISO/IEC IS 13714 (1994). Information technology - Document processing and related communication - User Interface to Telephone-based Services - Voice Messaging Applications.
4. HFES 200.5: Human Factors Engineering of Software User Interfaces – Interactive Voice Response (IVR) and Telephony. Human Factors and Engineering Society (HFES) (in ballot)

**1194.23 (d) Voice mail, messaging, auto-attendant, and interactive voice response telecommunications systems that require a response from a user within a time interval, shall give an alert when the time interval is about to run out, and shall provide sufficient time for the user to indicate more time is required.**

**What does this requirement mean?**

**Assumptions**

Assume that informed humans can reasonably consistently judge the amount of time that is sufficient for a user to indicate that more time is required.

**How can I tell if this requirement is met?**

Identify all cases where the product requires a response within a time interval.

1. For each case of a required response within a time interval:
  - a. Does the product give an alert (which is accessible) when the time interval is about to run out?
  - b. Does the product allow the user to indicate that more time is required?
  - c. Does the product provide sufficient time for the user to indicate that more time is required?
  - d. Does the product provide additional time as requested?

OR

- e. When time has run out, is the option set automatically repeated without losing any user input or key presses already entered?

**Note:** Behavior known as ‘non-destructive time outs’, where the entrance or additional cues are repeated but the user is not thrown out, their input is not erased, and they are returned to the point in the program where they were when the time ran out are acceptable since they do not prevent the user from having the time they need to complete their input.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(d\)](http://www.access-board.gov/sec508/1194.23.htm#(d))
2. Interactive Voice Response (IVR) Forum - Alliance for Telecommunications Industry Solutions (ATIS), <http://www.atis.org/atis/ivrforum.htm>

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**1194.23 (e) Where provided, caller identification and similar telecommunications functions shall also be available for users of TTYs, and for users who cannot see displays.**

**What does this requirement mean?**

**Questions and Clarifications**

1. Clarify the basis for determining which functions are similar to caller identification. Is visual display of information the basis for similarity to caller identification?

Although visual means are often used to display output from such functions, the basis for similarity is that these are functions provided by the telecom service provider.

**Note:** Some telecommunications functions expect the user to rely on either audible or visual information. For example, a feature may provide information to the user via a special dial tone or ring pattern. To many TTY users, this audible information is not available, so they cannot properly use the feature. Alternatively, a feature may provide information to the user via a flashing light or an icon in a display. This visual information is not available to users who cannot see the display, so they cannot properly use the feature. The key to making such features accessible is redundancy in the method of information delivery. This means supplementing the audible information with visual or tactile information, and supplementing visual information with audible or tactile information. Providing such redundancy should let most users access more product features.

**How can I tell if this requirement is met?**

Identify the set of telecommunications functions that must be assessed. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of functions covered by this requirement.

Historically some telecommunication functions that can cause problems for TTYs include:

- Caller-ID (Name and Number Delivery)
  - Message Waiting indication
  - Call Selector (\*61)
1. Customer Premises Equipment (CPE), defined as equipment employed on the premises of a person (other than a carrier) to originate, route, or terminate telecommunications:

- a. Determine if the product provides visual Caller ID. If yes, check for voice output (Talking Caller ID).
  - b. If no, check for the ability to add an external device specifically providing talking caller ID.
  - c. Check for exposure of the Caller ID info to a computer workstation.
2. Telecommunication Equipment, defined as equipment other than customer premise equipment, used by a carrier to provide telecommunications services and includes software integral to such equipment (including upgrades):
- a. Determine how the system provides caller id information to the Customer Premises Equipment (CPE).

**Note:** Satisfying this requirement will support interoperability with TTY (teletypewriter) assistive technology. Some ways in which the necessary interoperability with Caller ID could be achieved include:

- The TTY user could use an external display that provides Caller ID.
- The TTY user could use a telephone that has Caller ID functions built in.
- An ISDN phone with RJ-11 interface could pass through the Caller ID functions for a TTY connected to it.

With regard to access by “users who cannot see displays,” the following Caller ID implementations may provide limited solutions for blind users:

- Integrated or external Caller ID devices that articulate the number.
- Where the phone is only used in a work area that includes a speech output or Braille-based technology, a telephony Application Programming Interface (API) that is compatible with that access technology could provide access to the function.

Sometimes these features are unavailable to TTY users because digital Private Branch Exchange (PBX) information may not be provided through the analog connections and adapters that are needed for direct-connecting TTY to the PBX or other internal telephone system.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(e\)](http://www.access-board.gov/sec508/1194.23.htm#(e))
2. Text Telephone (TTY) Forum - Alliance for Telecommunications Industry Solutions (ATIS), <http://www.atis.org/atis/ttyforum.htm>

**1194.23 (f) For transmitted voice signals, telecommunications products shall provide a gain adjustable up to a minimum of 20 dB. For incremental volume control, at least one intermediate step of 12 dB of gain shall be provided.**

**What does this requirement mean?**

**Terms and Definitions**

**decibel** – unit of relative sound intensity, abbreviated dB.

**Assumptions**

Assume that the frequency response of the receiver is conducive to voice communication.

**Questions and Clarifications**

1. With regard specifically to telephones, may the first part of this standard be interpreted to require a gain adjustable up to a minimum of 20 dB only when the resulting amplitude would not exceed the maximum acoustic pressure permitted by OSHA for audio transducers that are held against the ear?

This provision places requirements on the gain of the input signal that is provided by a telecommunications product. The requirement is not about acoustic pressure or Sound Pressure Level (SPL). We may assume that products will not allow volumes that exceed the maximum SPL, but this is not the requirement of this provision.

**How can I tell if this requirement is met?**

1. Inspect for the presence of volume control:
  - a. If the device provides continuous amplification measure the base output and the maximum gain.
  - b. If the device provides discrete intermediate volume levels, measure the gain at each incremental level.
2. Adopt FCC Part 68 measurement methods, but extend from 18dB to 20dB.

**Note:** Some engineers are concerned that exceeding 18dB will be problematic for FCC acceptance. The FCC maximum gain is 18 dB, but this may be exceeded if an automatic volume reset is provided. Since 1194.23 (g) requires automatic volume reset, the 20 db gain required by this provision does not conflict with the FCC requirements.

Some engineers believe there may be technical problems with meeting other requirements at levels above 18dB. This needs further research. In the United States, none of the commonly accepted standards for digital voice communication between telephones and associated back-office equipment (such as PBX's) has 20 dB of amplitude headroom available, and providing such gain would result in unusable output. Under typical conditions, the maximum additional gain in the output of back-office systems, without introducing unacceptable levels of distortion, is about 12 dB.

Some systems and products cannot provide 20 dB of true gain without exceeding the 125 dB safety criteria.

Additional technical issues may exist with other requirements for VoIP.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(f\)](http://www.access-board.gov/sec508/1194.23.htm#(f))
2. OSHA regulation 1910.95 - Occupational noise exposure., - [http://www.osha-slc.gov/OshDoc/Interp\\_data/I19910401A.html](http://www.osha-slc.gov/OshDoc/Interp_data/I19910401A.html)
3. FCC Part 68.317 (a): "An analog telephone complies with the Commission's volume control requirements if the telephone is equipped with a receive volume control that provides, through the receiver in the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating (ROLR), as defined in paragraph 4.1.2 of ANSI/EIA-470-A-1987 (Telephone Instruments With Loop Signaling)."
4. FCC Part 68.317 (c): "A digital telephone complies with the Commission's volume control requirements if the telephone is equipped with a receive volume control that provides, through the receiver of the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating (ROLR), as defined in paragraph 4.3.2 of ANSI/EIA/TIA-579-1991 (Acoustic-To-Digital and Digital-To-Acoustic Transmission Requirements for ISDN Terminals)."
5. FCC Part 68.317 (f): "The 18 dB of receive gain may be exceeded provided that the amplified receive capability automatically resets to nominal gain when the telephone is caused to pass through a proper on-hook transition in order to minimize the likelihood of damage to individuals with normal hearing."

**1194.23 (g) If the telecommunications product allows a user to adjust the receive volume, a function shall be provided to automatically reset the volume to the default level after every use.**

***What does this requirement mean?***

**Assumptions**

Assume that this standard refers to products which have a handset, headset, earphone, or other transducer near the ear. Assume that the volume default level is safe, clear, and audible for fully able users.

**Questions and Clarifications**

1. In many cases with standard equipment, achieving a >20 dB gain requires two sources of amplification. For example, the maximum gain from many telephones phones is 12 dB, which is also true of many amplified handsets. To achieve 20 dB, both pieces of equipment need to be used. Requiring both to reset adds cost and complexity. Can this be interpreted in a way that allows just one to reset? e.g., define the “default level” as a level not to exceed “neutral” + 12 dB.

No. The ‘default’ level is 0 gain – it is whatever the input signal is. The reset should return to this base input signal level.

2. Confirm the proposed assumption, “Assume that this standard refers to products which have a handset, headset, earphone, or other transducer near the ear.”

Yes. The assumption is reasonable. This Section 508 requirement is intended to be consistent with FCC Part 68.317 (f) Hearing aid compatibility volume control: technical standards. This FCC regulation is specific to transducers intended to be held near the ear.

***How can I tell if this requirement is met?***

Determine if the product allows the user to control the receive volume.

1. Verify that the volume level resets after use with amplification.
  - a. Determine the default volume level, and assess if the receive volume returns to default after use.
  - b. Does the product have a feature to automatically revert to the default output level, or is that behavior a user controlled option?

**Note:** Note that personal communications devices such as cell phones do not typically default at the current time. Users of personal communication devices

might desire a customized setting that does not always default. Note that most phones and phone systems do not currently default to a “0 gain” state.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(g\)](http://www.access-board.gov/sec508/1194.23.htm#(g))

**1194.23 (h) Where a telecommunications product delivers output by an audio transducer which is normally held up to the ear, a means for effective magnetic wireless coupling to hearing technologies shall be provided.**

**What does this requirement mean?**

**Assumptions**

Assume that effective magnetic wireless coupling to hearing aids with a telecoil and cochlear implants is adequate for this requirement.

**How can I tell if this requirement is met?**

1. Measure magnetic field produced by the handset microphone:
  - a. Wireline phones - adopt FCC Part 68 Hearing Aid Compatibility (HAC) testing method.
  - b. Wireless phones - adopt performance levels set forth in a technical standard established by the American National Standards Institute (ANSI) as the applicable technical standard for compatibility of digital wireless phones with hearing aids.

**Note:** The Hearing Aid Compatibility Act of 1988 (the HAC Act) requires all new landline telephones produced or imported after 1989 to be compatible with hearing aids, so current land line phones (including cordless) meet this provision. The technical standards for HAC telephones are specified in ANSI/EIA-504-1989, "Magnetic Field Intensity Criteria for Telephone Compatibility with Hearing Aids," ANSI/TIA/EIA-504-1-1994, "An Addendum to EIA-504," which adds the HAC requirements, and the FCC regulations at 47 CFR 68.317 (a)

**Note:** On July 10, 2003, FCC modified the exemption for wireless phones under the Hearing Aid Compatibility Act of 1988 (HAC Act) and required digital wireless phones be capable of being effectively used with hearing aids. To make digital wireless phones accessible to individuals who use hearing aids, the FCC found that digital wireless phone manufacturers and service providers should be required to take steps to reduce the amount of interference emitted from digital wireless phones and to provide the internal capability for telecoil coupling.

**Note:** Satisfying this requirement supports interoperability with hearing devices, such as hearing aids, cochlear implants, and assistive listening devices.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(h\)](http://www.access-board.gov/sec508/1194.23.htm#(h))
2. Telecommunications Act Accessibility Guidelines (1193), <http://www.access-board.gov/telecomm/html/telfinl2.htm>

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3. FCC Hearing Aid Compatibility Act of 1988  
<http://www.fcc.gov/cgb/consumerfacts/hac.html>, (47 CFR 68.317),  
[http://www.fcc.gov/wcb/iatd/part\\_68.html](http://www.fcc.gov/wcb/iatd/part_68.html)
4. ANSI/EIA-504-1989, "Magnetic Field Intensity Criteria for Telephone Compatibility with Hearing Aids"
5. ANSI/TIA/EIA-504-1-1994, "An Addendum to EIA-504"
6. ANSI C63.19 - 2001, "American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids"



**1194.23 (i) Interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) shall be reduced to the lowest possible level that allows a user of hearing technologies to utilize the telecommunications product.**

**What does this requirement mean?**

**Questions and Clarifications**

1. Does this requirement allow digital wireless products to interfere with hearing aids not specifically designed to work with wireless phones?

No.

2. May digital wireless vendors await an FCC ruling before addressing this provision?

This requirement is not changed, altered, or dependent upon FCC ruling. If all manufacturers wait to address the requirement of this provision, there may be exceptions based on a lack of commercial availability until a product meeting this requirement is available for government procurement.

**How can I tell if this requirement is met?**

**Note:** ANSI/IEEE C63.19 is a standard developed to aid compatibility between wireless phones and hearing technologies. It does not provide an absolute measure of interference across hearing aid types. It may be useful to provide relative measures of interference among telephones with widely differing levels of interference. However, currently neither the handset nor the hearing aid companies are providing ratings for their products using this standard.

**Note:** Satisfying this requirement will support interoperability with hearing devices, such as hearing aids, cochlear implants, and assistive listening devices.

There is presently a problem with the multiplexer in the handsets of digital wireless services generating radio frequency (RF) noise into unshielded assistive hearing devices. Magnetic fields in the handset also generate noise in the telecoil circuitry of hearing aids. Resolution of these problems would require cooperation between hearing aid manufacturers and wireless equipment manufacturers to agree on methods of designing hearing aids that are more immune to interference and handsets that emit less electromagnetic noise.

To achieve the lowest possible level of interference, consider the following:

1. ANSI C63.19-2001 provides procedures to test the interference level produced by handsets;

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2. Code Division Multiple Access (CDMA)–based technologies generally causes less bothersome interference in hearing aids than do Groupe Spéciale Mobile (GSM) technologies, and analog cellular transmission is not bothersome to hearing aids;
3. Handsets that support telecoil-compatible accessories and assistive technology are on the market.

### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(j\)](http://www.access-board.gov/sec508/1194.23.htm#(j))
2. FCC Hearing Aid Compatibility Act of 1988 <http://www.fcc.gov/cgb/consumerfacts/hac.html>, (47 CFR 68.317), [http://www.fcc.gov/wcb/iatd/part\\_68.html](http://www.fcc.gov/wcb/iatd/part_68.html)
3. ANSI Standard C63.19, American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids

**1194.23 (j) Products that transmit or conduct information or communication, shall pass through cross-manufacturer, non-proprietary, industry-standard codes, translation protocols, formats or other information necessary to provide the information or communication in a usable format. Technologies which use encoding, signal compression, format transformation, or similar techniques shall not remove information needed for access or shall restore it upon delivery.**

**What does this requirement mean?**

**Assumptions**

Assume that this requirement applies only to accessibility-related coded information. The requirement is relevant to any technologies involved with the transmission of information, such as analog or digital video transmission products and voice transmission systems.

The issue applies to retention of closed captioning and audio description information in the reformatting and transmission processes. This requirement prohibits products from stripping out such information or requires the information, including timing information to synchronize it with the audio and video, to be restored at the end.

This requirement also applies to intact transmission of standard TTY signals over voice telecommunications systems, including those that are Internet Protocol (IP)-based. The requirement was written broadly to ensure that it would apply to evolving technologies, including digital television, video over IP, and videoconferencing systems. This also ensures that it will apply during the evolution of non-proprietary assistive technology, such as TTY, audio description, and closed captions.

**Questions and Clarifications**

1. Does this requirement apply to products that duplicate information or communication, in addition to those that 'transmit or conduct information or communication'?

No. This does not apply to copy machines.

**How can I tell if this requirement is met?**

1. For systems that transmit bi-directional voice, insure that cross-manufacturer, non-proprietary, industry-standard codes for TTY are passed through in a usable format.

Some example cross-manufacturer, non-proprietary, industry-standard codes, translation protocols, and formats. **Note:** This list is not comprehensive.

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- a. NTSC Video with closed captions.
  - b. NTSC Video with descriptive audio in the alternate audio channel.
  - c. Digital Video with closed captions.
  - d. Digital Video with descriptive audio.
  - e. Telephone data stream between 2 TTYs
2. Test media transmission with a suite of analog and digital media that includes the relevant disability access information. Verify the information is passed through in a usable format.

**Note:** Satisfying this requirement will support interoperability with assistive technologies, such as TTY (teletypewriter), audio descriptions and closed captioning.

Analog television caption technology is standardized under EIA-608, and advanced (digital) television caption technology is standardized under EIA-708. Note that EIA-608 captions are frequently used in some digital environments, such as Digital Versatile Disc (DVD), because subtitles generated for international markets do not include accessibility information, such as description of background sounds. Audio description is currently carried using the second audio programming (SAP) channel.

### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(j\)](http://www.access-board.gov/sec508/1194.23.htm#(j))
2. "Tools for field testing TTYs with wireless phones" copyright Gallaudet University, <http://tap.gallaudet.edu/trerc.htm>

**1194.23 (k)(1) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be tactilely discernible without activating the controls or keys.**

**What does this requirement mean?**

**Terms and Definitions**

**tactilely discernible** – can be located and distinguished from adjacent objects by touch.

**How can I tell if this requirement is met?**

Identify all mechanically operated controls and keys. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of controls and keys covered by this requirement.

1. To test for ability to search for keys without activation, have someone who does not know the device close their eyes and tactilely count all the buttons on the device without looking. Did they trigger any of them?

**Note:** This would not fully test for tactile discernability which also requires a key is *locatable* via tactile landmarks.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(k\)](http://www.access-board.gov/sec508/1194.23.htm#(k))
2. ETSI ES 201 381 (December 1998) Telecommunication keypads and keyboards: Tactile identifiers, <http://www.etsi.org/>

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**1194.23 (k)(2) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.**

**What does this requirement mean?**

**Terms and Definitions**

**pinch** - Use of two digits, usually thumb and forefinger, to apply pressure to opposite sides of an object.

**newton (N)** – a unit of force, 22 N = 5 lbs.

**Assumptions**

Assume that requiring a user to twist their wrist and/or pinch in order to use a product is prohibited. Assume that knobs are not specifically prohibited if they could be operated without tight grasp, pinching, or twisting of the wrist, e.g. with the side of the hand or with a headstick.

**Questions and Clarifications**

1. Define tight grasp. How tight is tight? Does the 5 lb. force maximum apply?

No definite measure of tight is given.

2. Does the 5 lb. force maximum apply to pinching, or is pinching prohibited?

At least one mode of operation that does not require pinching must be provided.

3. Does the 5 lb. force apply to twisting of the wrist as a torque maximum, or is twisting of the wrist prohibited?

At least one mode of operation that does not require twisting of the wrist must be provided.

**How can I tell if this requirement is met?**

Identify all mechanically operated controls and keys. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of controls and keys covered by this requirement.

1. For each control and key:

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- a. Note if two hands are required to operate the control.
- b. Note if a tight grasp is needed (how tight is tight?).
- c. Note if pinching or twisting of the wrist is need to operate the control.
- d. Measure the force needed to activate the control
  - i. Measuring a quantitative value (5 lbs.) for simple push-button control operation is relatively straightforward.
  - ii. Objectively measuring the activating force is more complicated. Equally important are the effects of knob diameter, toggle configuration, surface textures, surrounding surfaces, etc.

**Note:** It is problematic to measure the force required by non push-button controls such as pull-type, rotary, slide, thumb wheels, and toggles.

**Note:** 1194.31 (f) prohibits simultaneous actions and applies to all products. Therefore, even if simultaneous actions could be done with one hand (and therefore, permitted under strict interpretation of the wording of this provision), they are prevented under 1194.31. When reviewing items for this requirement, it is therefore useful to make sure no simultaneous actions required.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(k\)](http://www.access-board.gov/sec508/1194.23.htm#(k))
2. Section 4.27.4 of the ADA Accessibility Guidelines, codified as the ADA Standards for Accessible Design as part of the Department of Justice's regulation implementing title III of the ADA at 28 C.F.R. pt. 36, Appendix A, <http://www.usdoj.gov/crt/ada/reg3a.html>



**1194.23 (k)(3) Products which have mechanically operated controls or keys, shall comply with the following: If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.**

***What does this requirement mean?***

**Note:** Some systems do not support key repeat. However, where key repeat is provided, this provision requires the repeat to be adjustable. Specifically, the delay must be adjustable for a length of time that is no less than 2 seconds between repeats.

***How can I tell if this requirement is met?***

Identify all mechanically operated controls and keys. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of controls and keys covered by this requirement.

1. Check for Key Repeat function:
  - a. Find key repeat feature and turn it on, then check key repeat start up delay and key repeat rate.
  - b. If key repeat feature cannot be found, hold down key for 10 seconds.
    - i. If no key repeat behavior is observed, then no key repeat function exists and requirement does not apply.
    - ii. If key repeat behavior is observed, then check key repeat start up delay and key repeat rate.
2. Key repeat start up delay
  - a. Set key repeat start up delay to maximum value.
  - b. Hold down key and note when first repeat occurs
    - i. Confirm that first repeat occurs after more than 2 seconds
3. Key repeat rate
  - a. Set repeat rate to minimum value
  - b. Press and hold key until it has repeated at least 4 times
  - c. Measure the time between the fifth and sixth repeat occurs
    - i. Confirm that the repeat rate is greater than 2 seconds

**Note:** Some systems have a key repeat acceleration feature. For such systems, the measurement should be taken when the key repeat rate stabilizes. If the acceleration feature can be turned off, measurements should be done with this acceleration feature disabled.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(k\)](http://www.access-board.gov/sec508/1194.23.htm#(k))

**1194.23 (k)(4) Products which have mechanically operated controls or keys, shall comply with the following: The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound.**

***What does this requirement mean?***

**Assumptions**

Assume that more than one person would reliably determine:

- a. The type and severity of low vision to which a control or key must be discernible,
- b. The level of sound that is adequate to discern the status of locking or toggle controls, and
- c. The amount of force required for the status of a control or key to be tactilely discernible without activating.

***How can I tell if this requirement is met?***

Identify all locking or toggle controls and keys. All of the operational functions (which excludes maintenance and setup features) are included in the complete set of controls and keys covered by this requirement.

1. For each locking or toggle control or key:
  - a. Check that the status of the control or key is visually discernible.
  - b. Check for either an audible or tactile indicator for the status of the control or key.

**Note:** Discernible by sound may be difficult to assess due to ambient noise.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Telecommunications Products (1194.23), [http://www.access-board.gov/sec508/1194.23.htm#\(k\)](http://www.access-board.gov/sec508/1194.23.htm#(k))

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## 1194.24 Video and multimedia products

These Section 508 requirements stipulate that accessible alternative representations must be included, decoded, and presented correctly in video and multimedia presentations. These requirements apply to A/V equipment, including both legacy analog type systems as well as newer digital systems. These requirements also apply to personal computers (desktop, notebook, portable, including displays) that contain a television tuner/receiver.

Traditional video and multimedia products have been associated with analog tape and network broadcast formats. Solutions surrounding accessibility issues for these formats are well known, documented, and can be found on the WGBH Media Access Group Web Site (<http://access.wgbh.org>). Audible content is translated into text and converted into closed captioning that is encoded on scan line 21 of the video frame of National Television System Committee (NTSC) broadcast signals. Audio description of important video content is provided through the secondary audio programming (SAP) channel within a standard analog video broadcast signal.

With the advent of faster and more powerful computers, current video and multimedia products have evolved with digital technology. This technology allows the video products to be more portable, and it allows more delivery mechanisms. Digital technology can play video and multimedia content locally on a personal computer (PC), but it can also be implemented across an intranet or the Internet.

Some solutions for digital multimedia accessibility are well known and documented; others are still evolving. Information is available from the WGBH media access web site, as well as from the World Wide Web Consortium (W3C) (<http://www.w3c.org>).

For video and multimedia, technology already exists which can help federal agencies meet these accessibility requirements. Agencies can use the tools listed below to make their own multimedia presentations accessible, or can hire a service. Additional information is available from the Information Technology Technical Assistance and Training Center (ITTATC) at the Georgia Institute of Technology (<http://www.ITTATC.org/>).

- To add captions and audio descriptions to digital multimedia, authors may use various available free tools. Such tools add these accessibility enhancements to media playable in the QuickTime, Real Player, and Windows Media Player formats.
- Players also exist for playing back accessible multimedia. A couple of players support captions and audio descriptions through SMIL (Synchronized

Multimedia Integration Language; <http://www.w3.org/audiovideo>). Another type of player supports embedding captions and audio descriptions as discrete tracks in the media file itself. Yet another type of player supports closed captions through a proprietary format, but does not openly support audio descriptions (however, they can be provided post production).

All three types of media players work to some extent with assistive technology such as screen readers and alternate keyboards. For example, users can control most playback, display, and option functions using menu choices or keyboard shortcuts. In most cases, users can toggle captions and descriptions on and off via a preferences setting or a menu.

However, problems still exist for people with disabilities. Some players do not give users full keyboard or menu access to player controls, making it difficult to completely rewind a multimedia presentation or to move in small increments. Some main menus and dialog boxes are not labeled in such a manner that assistive technology, such as screen readers, can properly convey information about objects or functions.

- Analog video may be captioned by any number of captioning agencies. On completing a job for hire, a captioning agency can supply federal agencies with the necessary closed- or open-captioned master videotape that can be used for duplication or broadcast. Those agencies wishing to write and encode closed or open analog captions themselves may purchase the necessary software and hardware from a number of vendors.

Care must be taken when making copies of a master videotape so that captioning information is not inadvertently stripped out (and forgotten) in the process. The captioning information must usually be re-entered (encoded) into each copy.

Analog video may also be described, but only a professional can do this. No dedicated software currently exists on the commercial market for consumers or federal agencies to record closed analog audio descriptions, but standard scripting and analog recording and sound-mixing technologies can handle the job.

**1194.24 (a) All analog television displays 13 inches and larger, and computer equipment that includes analog television receiver or display circuitry, shall be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. As soon as practicable, but not later than July 1, 2002, widescreen digital television (DTV) displays measuring at least 7.8 inches vertically, DTV sets with conventional displays measuring at least 13 inches vertically, and stand-alone DTV tuners, whether or not they are marketed with display screens, and computer equipment that includes DTV receiver or display circuitry, shall be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals.**

**What does this requirement mean?**

**Terms and Definitions**

**analog television display** – any device that displays analog television signals or other signals such as those originating from DVD or video tape. In addition to standard television displays, these display devices also include projectors that have analog video input and include analog TV display circuitry, and computers that display analog television signals.

**(open, closed) captions** – visual display of spoken dialogue and other important audio information as printed words. Open captions are displayed automatically; closed captions are displayed only when selected by the user.

**Assumptions**

Assume that television displays include a variety of display technologies including but not limited to CRT, plasma, LCD, and rear and front projection technologies.

**Questions and Clarifications**

1. This provision refers to ‘conventional displays measuring at least 13 inches vertically’, while the Television Decoder Circuitry Act of 1990 applies to displays measuring 13 inches diagonally. Is this an intentional difference?

No. The intent was to be consistent with the Television Decoder Circuitry Act of 1990. The requirement of this provision is effectively the same as that of the Television Decoder Circuitry Act of 1990. Any product capable of displaying analog digital signals must comply with the provision.

Conventional television displays are typically measured diagonally. A screen size measuring 13 inches vertically will in general be larger than one measuring 13 inches diagonally. Since manufacturers of conventional television displays must meet the requirement of both standards, the result is that the smaller of the two measures (i.e. 13 inches diagonally) is effectively the measurement for which this requirement to include caption decoder circuitry applies. This is the intent of this provision.

2. To be fully consistent with the Television Decoder Act, this provision would only apply to displays with receiver/tuner circuitry. Does this provision apply to displays (including projectors) that have analog video input and can be used to display closed captioned videotapes but have no receiver/tuner?

No. This provision does not apply to television displays that do not include receiver/tuner circuitry.

#### ***How can I tell if this requirement is met?***

Identify the standard caption protocols for both analog and digital signals.

1. Inspect system specifications and user manual for support of closed captions. Note whether manuals have instructions on how to activate closed captions.
2. Turn on closed captions and play a video known to have closed captions, and verify the captions are available.

**Note:** The Television Decoder Circuitry Act of 1990 and the FCC requires such decoders in analog and DTV sets that have built-in receivers/tuners. Neither rule makes such a requirement on displays that do not have built-in receivers/tuners. Therefore, displays without receivers that meet this provision may not initially be commercially available.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Video and multimedia products (1194.24), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.24.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.24.htm#(a))
2. CPB/WGBH National Center for Accessible Media, <http://ncam.wgbh.org/>
3. CPB/WGBH Caption Center Online: <http://main.wgbh.org/wgbh/pages/captioncenter/index.html>
4. World Wide Web Consortium (W3C) Audio-Video Information, <http://www.w3.org/audiovideo>



**1194.24 (b) Television tuners, including tuner cards for use in computers, shall be equipped with secondary audio program playback circuitry.**

**What does this requirement mean?**

**Terms and Definitions**

**secondary audio program** – an auxiliary sound channel that can be transmitted in addition to a television station's main audio channel.

**tuner card** – a circuit board that enables a computer to receive television broadcasts.

**Assumptions**

Assume the provision requires all tuners to be stereo tuners, since only stereo tuners can decode SAP. Assume that SAP information comes in standard protocol with appropriate signal levels.

**Questions and Clarifications**

1. Confirm or correct the following: "Assume this provision applies to stereo digital television tuners as well as stereo analog tuners. Mono devices cannot decode SAP. The encoding method requires stereo."

Yes. This assumption may be true due to technology capability today. However, this is irrelevant from the perspective of the Standard. The requirement is to provide SAP playback circuitry with television tuners.

2. If a television tuner is procured without integrated SAP circuitry, and with no stand-alone SAP circuitry directly included in that procurement, but stand-alone SAP circuitry is available in the installation into which it will be placed, is the requirement of these provisions met?

Yes. The requirement for accessibility is on the agency/program that is acquiring E&IT. It is the system that should be assessed. Elements of the system that are needed to make the system accessible must already be in place as a part of the existing technical environment, or they must be acquired as a part of the procurement.

**How can I tell if this requirement is met?**

1. Inspect system specifications and user manual for support of secondary audio. Note whether manuals have instructions on how to activate secondary audio.

2. Turn on secondary audio and tune in a channel with known SAP content, and verify the SAP content is available.

**Note:** Stand-alone SAP receivers are also available, though most TVs and VCRs purchased within the past eight years are equipped with SAP capability.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. Secondary audio program playback circuitry should be built in to television tuners, including tuner cards for use in computers.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Video and multimedia products (1194.24), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.24.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.24.htm#(b))
2. CPB/WGBH National Center for Accessible Media, <http://ncam.wgbh.org/>
3. World Wide Web Consortium (W3C) Audio-Video Information, <http://www.w3.org/audiovideo>

**1194.24 (c) All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain speech or other audio information necessary for the comprehension of the content, shall be open or closed captioned.**

**What does this requirement mean?**

**Terms and Definitions**

**audio information** – electronic sound necessary for the comprehension of the content of a video or multimedia production.

**multimedia production** – productions that present information in more than one sensory channel.

**production** – the end product of the process of producing a video or multimedia presentation. This is distinct from the in-process data (multimedia 'raw footage') acquired in preparation or development of a final production.

**video production** – a multimedia production containing both visual and auditory information delivered on videotape.

**Assumptions**

Assume that more than one person would reliably determine that a production supports the agency mission, contains speech or audio information necessary for the comprehension of the content, and that the captions are adequate.

**Questions and Clarifications**

1. Can we assume this requirement also applies to software applications if they are also multimedia productions?

Yes. Some examples include PowerPoint, and Flash.

**How can I tell if this requirement is met?**

Determine if the training and informational video or multimedia production is in support of the agency's mission.

1. Inspect the production, and verify that captions are adequate.

**Note:** This requirement specifically applies to video and multimedia productions. Audio only is not subject to the requirements of this provision. Typically, captions are used for audio that is presented with visual information.

**Note:** The Media Access Group at WGBH publishes a series of consumer guides to issues related to media access. Media Access Group (or MAG) Guides are publications which contain tools, strategies and helpful hints for consumers. MAG Guide Volume 3 offers guidance to the somewhat complex mandates governing the provision and availability of closed captioning and video description on television.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. Open or closed captioning is built in to the video and multimedia training productions.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Video and multimedia products (1194.24), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.24.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.24.htm#(c))
2. WGBH MAG Guide Vol. 3 - The FCC's rules for closed captioning and video description for TV, [http://main.wgbh.org/wgbh/pages/mag/resources/guides/mag\\_guide\\_vol3.html](http://main.wgbh.org/wgbh/pages/mag/resources/guides/mag_guide_vol3.html)
3. CPB/WGBH National Center for Accessible Media, <http://ncam.wgbh.org/>
4. World Wide Web Consortium (W3C) Audio-Video Information, <http://www.w3.org/audiovideo>

**1194.24 (d) All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain visual information necessary for the comprehension of the content, shall be audio described.**

#### **What does this requirement mean?**

##### **Terms and Definitions**

**audio description** – an audible description of the visual content of a presentation, synchronized with the existing soundtrack. Same as video description.

**visual information** – key visual elements necessary for comprehension of the content of a video or multimedia production.

##### **Assumptions**

Assume that more than one person would reliably determine that a production supports the agency mission, that audio description is necessary for the comprehension of the content, and that the audio description is adequate.

#### **How can I tell if this requirement is met?**

Determine if the training and informational video or multimedia production is in support of the agency's mission.

1. Inspect the production, and verify that audio description is adequate.

**Note:** The Media Access Group at WGBH publishes a series of consumer guides to issues related to media access. Media Access Group (or MAG) Guides are publications which contain tools, strategies and helpful hints for consumers. MAG Guide Volume 4 is a simple guide to activating video description through the Second Audio Program (or SAP channel) of stereo-equipped televisions or VCRs.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. Audio description is built in to the video and multimedia training productions.

#### **Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Video and multimedia products (1194.24), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.24.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.24.htm#(c))
2. WGBH MAG Guide Vol. 4 - How to Access Description on Your Television, [http://main.wgbh.org/wgbh/pages/mag/resources/guides/mag\\_guide\\_vol4.html](http://main.wgbh.org/wgbh/pages/mag/resources/guides/mag_guide_vol4.html)

## Quick Reference Guide to Section 508 Resource Documents

3. CPB/WGBH National Center for Accessible Media, <http://ncam.wgbh.org/>
4. World Wide Web Consortium (W3C) Audio-Video Information, <http://www.w3.org/audiovideo>

**1194.24 (e) Display or presentation of alternate text presentation or audio descriptions shall be user-selectable unless permanent.**

***What does this requirement mean?***

**Assumptions**

Assume controls for selection of audio descriptions are audible or otherwise readily selectable, so that people who are blind or visually impaired can independently select and gain access to those audio descriptions.

**Clarifications**

Note that the phrase ‘unless permanent’ was appended to this provision with the intended meaning ‘unless a permanent part of the production’. In the case that alternate text or audio description is a permanent part of the multimedia production, display or presentation of this information will not be user selectable, regardless of whether the E&IT equipment provides user controls for their presentation.

***How can I tell if this requirement is met?***

Determine if controls for alternate text or audio description are available. Acquire a sample video/multimedia production that has alternate text and captioning.

1. Inspect system specifications and user manual for support of closed captions and descriptive audio. Note whether manuals have instructions on how to activate these features.
2. View the sample production for captioning:
  - a. If open captioning – no problem since open captioning are always permanent.
  - b. If closed captioning – determine if the caption display is user selectable. Turn on closed captions and view content with known captions.
3. View the sample production for audio description:
  - c. Determine if the audio description is permanent or user selectable. Turn on any audio description feature and view content with known audio description.

**Note:** DVD content and menus should be designed to independently turn the audio description on and off. This is often not the case today; currently most audio description requires vision to turn it on/off.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. Open or closed captioning and audio descriptions are built in to the video and multimedia productions.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Video and multimedia products (1194.24), Updated: June 21, 2001, [http://www.access-board.gov/sec508/guide/1194.24.htm#\(e\)](http://www.access-board.gov/sec508/guide/1194.24.htm#(e))
2. CPB/WGBH National Center for Accessible Media, <http://ncam.wgbh.org/>
3. World Wide Web Consortium (W3C) Audio-Video Information, <http://www.w3.org/audiovideo>



## **1194.25 Self contained, closed products**

These Section 508 technical requirements apply to products that generally have embedded software and are commonly designed in such a fashion that a user cannot easily attach or install assistive technology. These products include, but are not limited to, information kiosks and information transaction machines, copiers, printers, calculators, fax machines, and other similar types of products.

By definition, a self-contained, closed product is a device unto itself. It is expected to provide all required accessibility as a standalone unit without the support of external assistive technology. Therefore, if a product claims to fall into this category, no interoperability capabilities are mandated for it. However, there are some specific requirements that have implications for assistive technology.

Interoperability that goes on internally, between the components of a self-contained closed product, is outside the scope of Section 508.

In the commentary on subpart B of section 1194, it is stated in the introductory paragraph that printers (as well as several other devices) are self-contained, closed products. As an un-integrated device, this is true. But if the printer is to be integrated with an external computer and driver software, the software interfaces to the printer and its drivers would be considered subject to the provisions of 1194.21, Software applications and operating systems.

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**1194.25 (a) Self contained products shall be usable by people with disabilities without requiring an end-user to attach assistive technology to the product. Personal headsets for private listening are not assistive technology.**

**What does this requirement mean?**

**Terms and Definitions**

**Self Contained, Closed Products** – Products that generally have embedded software and are commonly designed or used in such a fashion that a user cannot easily attach or install assistive technology or will not be permitted to.

**Assumptions**

Assume that this provision makes explicit that unlike other technical sections of this Standard, interoperability with assistive technology alone may not be used to satisfy the requirements of the technical provisions of 1194.25, but this does not preclude providing interoperability with Assistive Technology in addition to accessibility without Assistive Technology.

Assume that “usable by people with disabilities” is demonstrated by compliance with provisions (b) – (j)(4) of 1194.25, plus any other technical provisions that apply, plus the functional performance provisions of 1194.31.

**Questions and Clarifications**

1. A company would like to make its copier as accessible as possible. They will add voice output for blind users. They would like to also provide an industry standard connection so that deaf/blind individuals could use a Braille notetakers as an interface to the copier. Does this violate 25a or is it equivalent facilitation?

Providing an industry standard connection point to allow assistive technologies to interface with an otherwise self contained product does not result in a violation of 1194.25 (a), neither is it a case for equivalent facilitation.

2. Verify the following assumption: “Assume that if a product is being purchased for an application where the user cannot install or attach adaptive technology, it is considered a self-contained, closed product. When a product is being purchased as a part of a package of products, the package of products (the system) is the thing that needs to be assessed.”

Yes. The intended use of the E&IT is an important factor in determining the applicability of the standard. It is the responsibility of the agency

program to determine the relevant requirements based on product functional characteristics as they are expressed in the use of the system within the technical environment. It is the system that should be assessed. Elements of the system that are needed to make the system accessible must already be in place as a part of the existing technical environment, or they must be acquired as a part of the procurement.

3. Is the following statement true? “If a self-contained closed product is being employed as a computer peripheral or connected to a network, other portions of the Section 508 standards may apply”.

Yes. The intended use of the E&IT is an important factor in determining the applicability of the standard. It is the responsibility of the agency program to determine the relevant requirements based on product functional characteristics as they are expressed in the use of the system within the technical environment.

#### ***How can I tell if this requirement is met?***

Determine if the E&IT is a self-contained or closed product.

**Note:** If a product is being purchased for an application where the user cannot install or attach adaptive technology, it is considered a self-contained, closed product.

**Note:** A personal digital assistant (PDA) is not necessarily a self contained, closed product. Non-closed products are increasingly being used as PDAs.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(a))

**1194.25 (b) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.**

**What does this requirement mean?**

**Assumptions**

Assume that informed humans can reasonably consistently judge the amount of time that is sufficient for a user to indicate that more time is required

**How can I tell if this requirement is met?**

Identify all cases where the product requires a response within a time interval.

1. For each case of a required response within a time interval:
  - a. Does the product give an alert (which is accessible) when the time interval is about to run out?
  - b. Does the product allow the user to indicate that more time is required?
  - c. Does the product provide sufficient time for the user to indicate that more time is required?
  - d. Does the product provide additional time as requested?

OR

- e. When time has run out, is the option set automatically repeated without losing any user input or key presses already entered?

**Note:** Behavior known as ‘non-destructive time outs’, where the entrance or additional cues are repeated but the user is not thrown out, their input is not erased, and they are returned to the point in the program where they were when the time ran out are acceptable since they do not prevent the user from having the time they need to complete their input.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(b))

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**1194.25 (c) Where a product utilizes touchscreens or contact-sensitive controls, an input method shall be provided that complies with §1194.23 (k) (1) through (4).**

**What does this requirement mean?**

**Terms and Definitions**

**contact-sensitive controls** - controls which operate through sensing a person's touch.

**Assumptions**

Assume this requirement applies to touchscreens or contact-sensitive controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

**Questions and Clarifications**

1. Does this provision apply only to controls operated by human touch, or is a control that is operable by touching an area on the surface of the product with a pencil or other object?

The terms touchscreen and contact-sensitive control do not necessarily imply touch by the human body – contact with objects such a mouthstick, stylus, or pencil are also included.

2. The standard explicitly excludes 'maintenance and setup' from the requirements for operable controls. Does this imply that product functions for maintenance and setup are excluded, and that all product functions for normal daily operation are included, independent of the methods to access the function (i.e. various controls)?

No. All product functions typically available to users through touchscreens or contact sensitive controls should be available via an input method that complies with §1194.23 (k) (1) through (4). Setup and maintenance functions typically done for normal operation are NOT exempt from Section 508 requirements. The definition of operable controls states: “A

component of a product that requires physical contact for normal operation.” Note that it is the responsibility of the agency program to determine what constitutes ‘normal operation’ for E&IT use within their technical environment.

#### ***How can I tell if this requirement is met?***

Determine if the product uses touchscreens or contact-sensitive controls. Determine if the control is related to a function of normal daily operation (including daily settings) or if it is maintenance or setup.

**Note:** All operable controls (which excludes maintenance and setup) are included in the complete set of functions covered by this requirement.

1. Determine if the product provides a redundant set of controls for the touchscreen or contact-sensitive control that complies with §1194.23 (k) (1) through (4).

**Note:** Satisfying this requirement supports interoperability with certain assistive technology, such as artificial limbs or head sticks.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(c))
- ***1194.23 (k)(1) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be tactilely discernible without activating the controls or keys.***
  - ***1194.23 (k)(2) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.***
  - ***1194.23 (k)(3) Products which have mechanically operated controls or keys, shall comply with the following: If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.***
  - ***1194.23 (k)(4) Products which have mechanically operated controls or keys, shall comply with the following: The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound.***



**1194.25 (d) When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, shall also be provided.**

**What does this requirement mean?**

**Terms and Definitions**

**biometric controls** - controls that are activated by a particular biological feature or physical characteristic.

**Assumptions**

Assume that providing a password capability is an acceptable alternative to a biometric form of user id or control.

Assume that the alternative control is a non-biometric choice that complies with the applicable requirements of §1194.

**Questions and Clarifications**

1. Verify the assumption “Assume that an alternative control is either another biometric choice or else complies with §1194” to make sure the alternative of another biometric choice is ok and that the alternative doesn’t have to be non-biometric.

No. A non-biometric alternative must be provided. Note that the intended use of the E&IT is an important factor in determining the applicability of the standard. It is the responsibility of the agency program to determine the relevant requirements based on product functional characteristics as they are expressed in the use of the system within the technical environment.

Elements of the system that are needed to make the system accessible must already be in place as a part of the existing technical environment, or they must be acquired as a part of the procurement. An individual E&IT product may only provide a biometric form of user identification if the system overall provides a non-biometric alternative.

**How can I tell if this requirement is met?**

Determine if the product uses biometric controls.

1. Determine if the product provides an alternative to the biometric control.

**Note:** Someone with an artificial limb or eyes would not be able to pass biometric tests, which are dependent on fingerprints or retinas respectively.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(d))
2. National Institute for Standards and Technology Biometrics Resource Center: <http://www.itl.nist.gov/div895/biometrics>

**1194.25 (e) When products provide auditory output, the audio signal shall be provided at a standard signal level through an industry standard connector that will allow for private listening. The product must provide the ability to interrupt, pause, and restart the audio at anytime.**

**What does this requirement mean?**

**Terms and Definitions**

**auditory output** - in the context of this requirement, auditory output is voice output.

**Assumptions**

Assume that a headset connection point and interrupt, pause, and restart functionality is not required if the product has only audible tones (e.g. beeps and tones) and does not have audio voice output.

Assume the controls for interrupt, pause, and restart functionality meet the requirements of §1194.

**How can I tell if this requirement is met?**

Determine if the product provides voice auditory output.

1. Inspect the product:
  - a. Check for a standard audio connection point and signal levels.
  - b. Check for controls for audio interrupt, pause, and restart functionality.

**Note:** Industry standard audio connection points are 2.5 mm or 3.5 mm jacks. The larger 3.5 mm jack is the connection point typically used by persons with visual disabilities.

**Note:** Industry standard signal levels for digital wireless phones are specified in Electronics Industries Association (EIA) TSB-121.

**Note:** Satisfying this requirement supports interoperability with assistive technology by allowing the use of hearing aids, cochlear implants, and assistive listening devices.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(e\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(e))
2. TIA/EIA-TSB121 – Cellular Subscriber Unit Interfaces for TDD.

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**1194.25 (f) When products deliver voice output in a public area, incremental volume control shall be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level shall be user selectable. A function shall be provided to automatically reset the volume to the default level after every use.**

#### **What does this requirement mean?**

##### **Terms and Definitions**

**ambient noise** - the background sound of an environment in relation to which all foreground sounds are heard. Ambient noise level is a measure of the ambient noise of an environment over a given period of time in Decibels.

**incremental volume control** - volume control that allows more than one step between minimum and maximum levels. The size of the increment may be small enough to effectively provide a continuous, or variable, volume control.

##### **Assumptions**

Assume that the ambient noise level is determined as a maximum that may occur for some significant period of time within the environment, not a mean or mode noise level. Emergency alarms and other signals related to urgent safety in the environment are not included in the determination of ambient noise level.

**Note:** Daily variation in the background sound of an environment should be considered when determining the ambient noise level.

##### **Questions and Clarifications**

1. Incremental volume control only – no continuous amplification/volume control allowed?

The size of the increment may be infinitesimally small, so a ‘continuous’ amplification/volume control is allowed. Rather than continuous, a suggested term is ‘variable’ volume control. The term ‘incremental’ is to distinguish from controls that only go directly to the maximum level. Thus, while the increment may be infinitesimally small, it should not be a single increment the size of the entire range of volume.

2. Is there any upper limit that may be specified for volume level, or do we assume that products will not allow volumes that exceed a safe maximum Sound Pressure Level (SPL) although this is not the requirement of this provision?

No upper limit is specified by this requirement. It may be assumed that manufacturers will not develop products that exceed a safe maximum SPL.

***How can I tell if this requirement is met?***

Determine if the device is in a public area.

Determine the ambient noise level of the environment prior to specifying the procurement needs. The location of the product is an important consideration for this requirement. If two units are located next to each other in an otherwise quiet room, their 65 dB output will raise the ambient noise level to over 45 dB.

1. If the ambient noise level is less than or equal to 45 dB, verify that the product provides incremental volume control up to at least 65 dB.
2. If the ambient noise level is greater than 45 dB, verify that the product provides incremental volume control with gain of at least 20 dB above ambient level unless this exceeds maximum safe SPL.
  - a. Is this gain above ambient level user selectable?
3. Determine if the product automatically resets the volume to the default level after every use.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(f\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(f))
2. Voting Systems Standards, April 30, 2002, Federal Election Commission (FEC). <http://www.fec.gov/pages/vssfinal/vss.html>

**1194.25 (g) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.**

**What does this requirement mean?**

**Assumptions**

Assume that informed humans can reasonably consistently judge that the information provided by other means (besides color coding) conveys equivalent information to that of the color coding.

**How can I tell if this requirement is met?**

Identify all uses of color coding to convey information, indicate an action, prompt a response, or distinguish a visual element. Methods for determining all the places color coding is used to convey information include review of the product interface and the product documentation (e.g. user manuals plus online help).

**Note:** All uses of color coding for operation (which excludes maintenance and setup) are included in the complete set of functions covered by this requirement.

1. Inspect the application. For each module of the application:
  - a. Enumerate functions or items encoded using color, including error messages. For each use of color coding, verify that equivalent information is conveyed without color.
  - b. If a black and white setting is available, turn it on and verify that all information is still conveyed
2. To quickly check if the requirement is being met, if possible print the information without color on a black and white printer or adjust the display to monochrome, and verify that all information is still conveyed.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology. The alternative to color coding must be accessible with and without assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(g\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(g))

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**1194.25 (h) When a product permits a user to adjust color and contrast settings, a range of color selections capable of producing a variety of contrast levels shall be provided.**

**What does this requirement mean?**

**Assumptions**

Assume this requirement applies to products with color display screens.

**Questions and Clarifications**

1. Is there guidance on an adequate variety of color selections or range of contrast levels?

Adequate contrast is an accessibility issue that applies beyond E&IT, and so has been examined by the Access Board for other ADA requirements. There are open issues on what constitutes an adequate range of contrast.

**How can I tell if this requirement is met?**

Identify if a product permits a user to adjust color or contrast settings.

1. Inspect the product. If it allows color adjustment to foreground, background, or other elements note how many color options are available.
  - a. Check preferences for color controls; note how many colors are available.
  - b. Test the color selections to ensure that a range of contrast levels can be obtained.

**Note:** There should be a combination that will provide a soft background, low contrast color scheme as well as combinations that provide a high contrast color scheme.

2. Investigate empirical data on contrast ranges and requirements.
  - a. Avoid reds and greens together. White on black, black on white, and yellow on black are examples of high contrast settings.
  - b. Lighthouse International provides guidelines for effective color contrast on their web site, [www.lighthouse.org/color\\_contrast.htm](http://www.lighthouse.org/color_contrast.htm)

**Note:** Primary colors are different for pigment than for light. Color combinations should be based on video display not printed material.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(h\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(h))

**1194.25 (i) Products shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.**

**What does this requirement mean?**

**Terms and Definitions**

**hertz** - a unit of frequency equal to one cycle per second -- abbreviation Hz.

**flicker** - an unintentional and undesirable cyclic variation in display of a screen image.

**Questions and Clarifications**

1. Does this requirement apply to other blinking elements beyond a display screen, such as LED's, illuminated buttons, and flashing words?

LED's and illuminated buttons are not covered by this requirement. Flashing words are typically elements on a display screen, and so typically are included as screen elements that could cause harmful screen flicker. In contrast to a display screen, items that are small in size and typically have a low illumination such as LED's and illuminated buttons may easily be looked away from and generally do not have a negative affect on users.

**How can I tell if this requirement is met?**

Identify all application modules and their associated series of display screen images. Methods for finding all of the display screen images include review of the product interface and the product documentation (e.g. user manuals plus online help).

1. Inspect the product and determine if the screen flicker at a frequency greater than 2 Hz and lower than 55 Hz.

**Note:** This should be measured on wide range of processor speed. Processor speed and graphics card can affect this measurement.

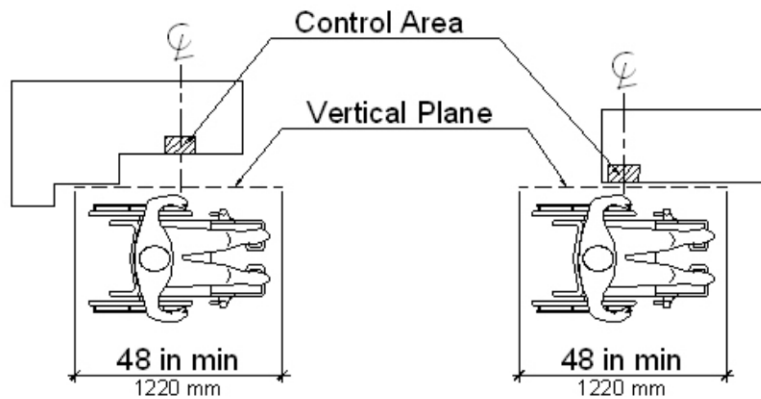
**Note:** Because 2 hz is relatively slow, it is possible to use visual observation to determine if flicker is greater than 2 hz.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(i\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(i))

**1194.25 (j)(1) Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls shall comply with the following: The position of any operable control shall be determined with respect to a vertical plane, which is 48 inches in length, centered on the operable control, and at the maximum protrusion of the product within the 48 inch length (see Figure 1 of this part).**



Vertical Plane Relative to the Operable Control

Figure 1

**What does this requirement mean?**

**Terms and Definitions**

**operable control** - A component of a product that requires physical contact for normal operation. Operable controls include, but are not limited to, mechanically operated controls, input and output trays, card slots, keyboards, or keypads.

**Assumptions**

Assume this is not a specific requirement on self contained, closed products, rather it serves to establish a reference plane used for the requirements of 1194.25 (j) (2) – (4) to determine the permitted positions of operable controls.

**Note:** A product may have controls in more than one vertical location resulting in more than one reference plane.

Assume this requirement applies to controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

***How can I tell if this requirement is met?***

N/A

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(j))
2. Americans with Disabilities Act Accessibility Guidelines - ADAAG 4.2 Space Allowance and Reach Ranges, <http://www.access-board.gov/adaag/html/adaag.htm#4.2>

**1194.25 (j)(2) Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls shall comply with the following: Where any operable control is 10 inches or less behind the reference plane, the height shall be 54 inches maximum and 15 inches minimum above the floor.**

### **What does this requirement mean?**

#### **Terms and Definitions**

**operable control** - A component of a product that requires physical contact for normal operation. Operable controls include, but are not limited to, mechanically operated controls, input and output trays, card slots, keyboards, or keypads.

#### **Assumptions**

Assume this requirement applies to controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

#### **Questions and Clarifications**

1. Does the requirement automatically drop exactly to the 46-inch max height after the 10-inch (depth) limit has been reached?

Yes, according to 1194.25 the requirement is written as a step function. It is recognized that other international regulations that require a linear progression of the maximum height of controls between 54 inches and 46 inches.

Note that a manufacturer may attempt to make a case for equivalent facilitation if the height of a control is decreased according to a range or linear progression over the control depth, rather than making a quantum step to decrease the depth of the control.

***How can I tell if this requirement is met?***

Determine if the product is freestanding, non-portable, and intended to be used in one location and has operable controls related to normal daily operation. Establish the reference plane for each operable control - see 1194.25 (j)(1).

1. Identify the operable controls that are 10 inches or less behind their reference plane. For each relevant operable control, verify that the height of the control at least 15 inches and not more than 54 inches above the floor.

**Note:** All operable controls (which excludes maintenance and setup) are included in the complete set of elements covered by this requirement.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(j))
2. Americans with Disabilities Act Accessibility Guidelines - ADAAG 4.2 Space Allowance and Reach Ranges, <http://www.access-board.gov/adaag/html/adaag.htm#4.2>



**1194.25 (j)(3) Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls shall comply with the following: Where any operable control is more than 10 inches and not more than 24 inches behind the reference plane, the height shall be 46 inches maximum and 15 inches minimum above the floor.**

**What does this requirement mean?**

**Terms and Definitions**

**operable control** - A component of a product that requires physical contact for normal operation. Operable controls include, but are not limited to, mechanically operated controls, input and output trays, card slots, keyboards, or keypads.

**Assumptions**

Assume this requirement applies to controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

**How can I tell if this requirement is met?**

Determine if the product is freestanding, non-portable, and intended to be used in one location and has operable controls related to normal daily operation. Establish the reference plane for each operable control - see 1194.25 (j)(1).

1. Identify the operable controls that are more than 10 inches and not more than 24 inches behind their reference plane. For each relevant operable control, verify that the height of the control at least 15 inches and not more than 46 inches above the floor.

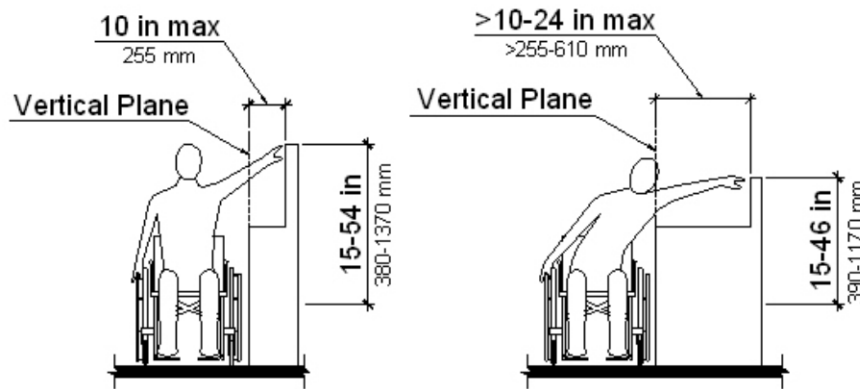
**Note:** All operable controls (which excludes maintenance and setup) are included in the complete set of elements covered by this requirement.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(j))
2. Americans with Disabilities Act Accessibility Guidelines - ADAAG 4.2 Space Allowance and Reach Ranges, <http://www.access-board.gov/adaag/html/adaag.htm#4.2>

**1194.25 (j)(4) Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls shall comply with the following: Operable controls shall not be more than 24 inches behind the reference plane (see Figure 2 of this part).**



Height of Operable Control Relative to the Vertical Plane

Figure 2

**What does this requirement mean?**

**Terms and Definitions**

**operable control** - A component of a product that requires physical contact for normal operation. Operable controls include, but are not limited to, mechanically operated controls, input and output trays, card slots, keyboards, or keypads.

**Assumptions**

Assume this requirement applies to controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

***How can I tell if this requirement is met?***

Determine if the product is freestanding, non-portable, and intended to be used in one location and has operable controls related to normal daily operation. Establish the reference plane for each operable control - see 1194.25 (j)(1).

1. Identify the operable controls that are more than 10 inches and not more than 24 inches behind their reference plane. For each relevant operable control, verify that the depth of the control more than 24 inches behind the reference plane.

**Note:** All operable controls (which excludes maintenance and setup) are included in the complete set of elements covered by this requirement.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Self contained, closed products (1194.25), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.25.htm#\(j\)](http://www.access-board.gov/sec508/guide/1194.25.htm#(j))
2. Americans with Disabilities Act Accessibility Guidelines - ADAAG 4.2 Space Allowance and Reach Ranges, <http://www.access-board.gov/adaag/html/adaag.htm#4.2>

## **1194.26 Desktop and portable computers**

These Section 508 technical requirements apply to personal computers (desktop, notebook, portable, including displays). These requirements also apply to handhelds, workstations, and servers.

Desktop and portable computers have become ubiquitous in our society. They perform a wide range of tasks, from information gathering, processing, and retrieval to real-time control of machinery and facilities. Still, developments in technology are leading to a blurring of features between computers and telecommunications, video, multimedia, standalone software, and other technologies. As a result, a computer or computer system may provide telecommunication, multimedia, and Web functionality and would therefore have to comply with or conform to the provisions in those sections as well (in addition to 1194.31, Functional performance criteria).

Standard input and output interfaces are important to all computer users to allow them to connect a variety of software and peripherals to address the wide range of applications. The standard industry interfaces have also been important to people with disabilities by providing a means to link their assistive technology to the computer and software.

The ability of computers to link to other devices via standard ports, connectors, and interfaces provides significant capability and cost benefits. These interconnection points are standard for most desktop and portable computers. Some industry standard interfaces have remained a constant over the past several decades, while others have come and gone. Parallel ports, the standard for printer connection for many years, finally appear to be giving way to Universal Serial Bus (USB) ports. Serial ports are going much the same way as parallel ports.

As the personal computer of choice has evolved from a desktop machine, to a laptop machine, and now in many cases to notebook or hand-held size, the importance of minimizing the number and size of interfaces has grown. It remains to be seen whether one of the current interfaces, such as USB or wireless (radio frequency (RF) and infrared), will be prevalent in the future or whether something new become the de facto interconnection standard.

In general, connectivity aspects of interoperability are greatly facilitated by the existence of interface standards that are followed by both assistive technology and personal computer manufacturers. The recent trend toward the development of interoperability standards (hardware and software) at all levels can have a similar impact on overall assistive technology–information technology interoperability.

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**1194.26 (a) All mechanically operated controls and keys shall comply with §1194.23 (k) (1) through (4).**

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Desktop and Portable Computers (1194.26), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.26.htm#\(a\)](http://www.access-board.gov/sec508/guide/1194.26.htm#(a))

- **1194.23 (k)(1) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be tactilely discernible without activating the controls or keys.**

See Quick Reference for 1194.23 (k)(1)

- **1194.23 (k)(2) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.**

See Quick Reference for 1194.23 (k)(2)

- **1194.23 (k)(3) Products which have mechanically operated controls or keys, shall comply with the following: If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.**

See Quick Reference for 1194.23 (k)(3)

- **1194.23 (k)(4) Products which have mechanically operated controls or keys, shall comply with the following: The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound.**

See Quick Reference for 1194.23 (k)(4)

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**1194.26 (b) If a product utilizes touchscreens or touch-operated controls, an input method shall be provided that complies with §1194.23 (k) (1) through (4).**

***What does this requirement mean?***

**Assumptions**

Assume this requirement applies to touchscreens or touch-operated controls related to normal daily operation, and that informed humans can reasonably consistently judge that a control is related to normal daily operation.

**Note:** Characterization of normal daily operation for a particular E&IT product may in part depend on the intended use for that product. Product vendors typically have a view on the expected normal operation for their products. Documentation in user manuals can be a good indication of user vs. maintenance personnel activities. Note that access to controls required for typical user monitoring functions are considered a part of normal daily operation.

**Questions and Clarifications**

1. Does this provision apply only to controls operated by human touch, or is a control that is operable by touching an area on the surface of the product with a pencil or other object?

The terms touchscreen and contact-sensitive control do not necessarily imply touch by the human body – contact with objects such a mouthstick, stylus, or pencil are also included.

***How can I tell if this requirement is met?***

Determine if the product uses touchscreens or touch-operated controls. Determine if the control is related to a function of normal daily operation (including daily settings) or if it is maintenance or setup.

**Note:** All operable controls (which excludes maintenance and setup) are included in the complete set of functions covered by this requirement.

1. Determine if the product provides a redundant set of controls for the touchscreen or touch-operated control that complies with §1194.23 (k) (1) through (4).

**Note:** Satisfying this requirement supports interoperability with certain assistive technology, such as artificial limbs or head sticks.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Desktop and Portable Computers (1194.26), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.26.htm#\(b\)](http://www.access-board.gov/sec508/guide/1194.26.htm#(b))

- **1194.23 (k)(1) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be tactilely discernible without activating the controls or keys.**

See Quick Reference for 1194.23 (k)(1)

- **1194.23 (k)(2) Products which have mechanically operated controls or keys, shall comply with the following: Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.**

See Quick Reference for 1194.23 (k)(2)

- **1194.23 (k)(3) Products which have mechanically operated controls or keys, shall comply with the following: If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.**

See Quick Reference for 1194.23 (k)(3)

- **1194.23 (k)(4) Products which have mechanically operated controls or keys, shall comply with the following: The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound.**

See Quick Reference for 1194.23 (k)(4)

**1194.26 (c) When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, shall also be provided.**

**What does this requirement mean?**

**Terms and Definitions**

**biometric controls** - controls that are activated by a particular biological feature or physical characteristic.

**Assumptions**

Assume that providing a password capability is an acceptable alternative to a biometric form of user id or control.

Assume that the alternative control is a non-biometric choice that complies with the applicable requirements of §1194.

**How can I tell if this requirement is met?**

Determine if the product uses biometric controls.

1. Determine if the product provides an alternative to the biometric control.

**Note:** Someone with an artificial limb or eyes would not be able to pass biometric tests, which are dependent on fingerprints or retinas respectively.

**Note:** Satisfying this requirement does not involve interoperability with assistive technology.

**Where can I get additional information?**

1. Guide to the Section 508 Standards for Electronic and Information Technology, Desktop and Portable Computers (1194.26), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.26.htm#\(c\)](http://www.access-board.gov/sec508/guide/1194.26.htm#(c))
2. National Institute for Standards and Technology Biometrics Resource Center: <http://www.itl.nist.gov/div895/biometrics>

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**1194.26 (d) Where provided, at least one of each type of expansion slots, ports and connectors shall comply with publicly available industry standards.**

***What does this requirement mean?***

**Questions and Clarifications**

1. What are the publicly available industry standards?

An industry standard is one that is published and made available by the manufacturer, so that third party and cross-manufacturer developers may build compatible connections. Some examples are listed in the 508 technical assistance material.

This requirement essentially implies that a manufacturer cannot have all connection ports that are proprietary where standard ports are available.

***How can I tell if this requirement is met?***

Inventory the expansion slots, ports and connectors. Wireless connectors are included as a type of connection subject to this requirement.

1. Determine if at least one of each type (slot, port or connector) conforms to a publicly available industry standard.

**Note:** Products may provide more than one connection point of each type that is standard.

**Note:** Docking stations, PDA cradles, and modular component 'bays' are examples of connections for which no publicly available industry standards currently exist.

**Note:** Satisfying this requirement supports interoperability with assistive technology that uses standard expansion slots, ports and connectors, such as alternative input and output devices.

Some connection technologies used by assistive technology include:

- Parallel ports, PS 2 mouse and keyboard connectors, Computer expansion slots
- Serial ports  
Serial ports are legacy connectors that have served as a general-purpose lower speed interconnection. Their behavior and characteristics are well known and stable. Older devices, or newer customized ones, are often

equipped with a serial port although the USB and wireless technologies are rapidly making serial ports obsolete.

- PCMCIA (Personal Computer Memory Card International Association)  
PCMCIA slots are an older technology developed for laptop computers. They provide both high-speed connection and the ability to house additional functions directly inside the laptop. The cards that plug into these slots provide disk drive, networking, and modem features. PCMCIA slots and cards are convenient and quick where minimizing the size of add-ons is important. (Note: PCMCIA cards are rapidly giving way to Cardbus PC cards that are physically identical but electrically superior.)
- USB (Universal Serial Bus)  
The USB and its ports were developed to provide a single point-of-connection for the growing number of quick-connect and -disconnect peripheral devices. These include printers, mice, scanners, hard drives, microphones, networks, and almost everything that is connected to a computer.
- Wireless connections  
Wireless (RF and infrared) connections are quickly taking root and provide a particularly convenient connection mechanism or bus for people with physical, visual, and cognitive disabilities. Bluetooth, Wireless USB, 802.11, and other technologies fall in this category. Assistive technology has usually lagged behind other technologies in this area. The advantages may change this in the near future.

#### ***Where can I get additional information?***

1. Guide to the Section 508 Standards for Electronic and Information Technology, Desktop and Portable Computers (1194.26), Updated: August 1, 2001, [http://www.access-board.gov/sec508/guide/1194.26.htm#\(d\)](http://www.access-board.gov/sec508/guide/1194.26.htm#(d))
2. IEEE Standard 1394b, "High-Performance Serial Bus, 2002, IEEE Standards Association (IEEE-SA) <http://www.ieee.org/products/onlinepubs/stand/standards.html>
3. PCMCIA Standard Release 2.1/JEIDA 4.2 - July 1993, PCMCIA (Personal Computer Memory Card International Association) <http://www.pcmcia.org>
4. Universal Serial Bus Specification, Revision 2.0 April 27, 2000, Compaq Computer Corporation, Hewlett-Packard Company, Intel Corporation, Lucent Technologies Inc., Microsoft Corporation, NEC Corporation, Koninklijke Philips Electronics N.V. [http://www.usb.org/developers/data/usb\\_20.zip](http://www.usb.org/developers/data/usb_20.zip)