



Section 508 Reference Guide

1194.23 Telecommunications Products

Overview

This category addresses communication devices used by people who are deaf, hard of hearing, visually impaired, or speech impaired to communicate over networks designed to carry voice. Whenever a device transmits and receives voice over a telecommunications network, it must then be able to support the hookup and successful interoperation of [TTY AT](#). This category includes telecommunications devices such as digital, analog, wire, wireless, and Internet-based products and devices such as [PBX](#) and telephone answering machines.

Due to the technical nature of the standards in this category, many of the evaluation statements and tests for compliance require specialized tools and expertise in telecommunication products. While this could be daunting, there is an easy solution and that is to contact the manufacturer of the product for information. This should not be a problem since the manufacturer stated that their product was Section 508 compliant.

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."

Telecommunication products (e.g., telephones) or systems that provide voice communication must also have the capability to provide standard non-acoustic connection points for TTY. Microphones must be capable of being turned on and off to allow user to intermix speech with TTY use.

Terms

- [Teletypewriter \(TTY\)](#)
- [Hearing Carry Over \(HCO\)](#)
- [Voice Carry Over \(VCO\)](#)

Determining Compliance

Based on a visual inspection of a product that provides voice communications:

- If the product does not provide TTY functionality built-in, the product should have a standard non-acoustic connection point (e.g., RJ-11 or TSB-121).
- If the product includes a microphone, it must have an off/on and mute switch function.

Notes

- 300 baud [ASCII](#) includes a carrier tone signal that causes problems in supporting VCO. Therefore, TTYs must also support 45.5 baud [Baudot](#), which works fine with VCO.
- For traditional phones (e.g., desk or public phones), an analog, [PSTN](#)-compatible RJ-11 port or a 2.5 mm jack will allow connection of a TTY.
- For [ISDN](#) systems, an ISDN Terminal Adapter (RJ-11, analog, PSTN-compatible) will provide the TTY connection.
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- For wireless analog or digital systems, a 2.5 mm headset jack on the handset will allow the connection of a TTY.

- For [VoIP](#), 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 VoIP systems in carrying TTY and to determine solutions to problems identified.

Vertical SBX IP, MBX IP, Wave IP:

These systems have standard analog telephone ports that can be wired to an RJ11 connector for TTY device compatibility.

The microphone has a MUTE function. The microphone does not have an ON/OFF function.

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

Voice telecommunication products must support commonly used protocols such as 45.5 baud [Baudot](#) and 300 baud [ASCII](#).

Term

- [Teletypewriter \(TTY\)](#)

Determining Compliance

- The quick, non-technical method to determine compliance is to read the user manual or check with the manufacturer.
- A more comprehensive method for determining compliance is to identify the standard TTY signal protocols (e.g., 45.5 baud Baudot and 300 baud ASCII) and use of the standard methods and tools that exist for TTY signal protocol testing for digital wireless.

Notes

- The [ATIS](#) sponsors the [IVR](#) Accessibility Forum "to investigate and document potential accessibility and usability solutions for voice-mail and other interactive voice response systems and services."
- Use of the IVR TTY Forum test methodology alone is not sufficient for [VoIP](#) systems.
- 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 carrier networks.
- Satisfying this requirement will support interoperability with TTY [AT](#).
- In general, the objective is that land-line, wireless, and VoIP phone systems will be able to pass TTY signals/protocol without unacceptable character loss or error. At this time, support for the TTY protocol as documented in [ANSI/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. Support is not required for these protocols, although it is desirable from a user standpoint.)
- Under FCC mandate, the wireless industry has developed and implemented a number of standards to support the protocol found in ANSI/TIA/EIA 825.



Vertical SBX IP, MBX IP, Wave IP:

These systems have standard analog telephone ports that can be wired to an RJ11 connector for TTY device compatibility. These connections support 300 Baud ASCII formats.

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

Automated telecommunication services (e.g. voice mailboxes) must support TTY interaction.

Term

- [Teletypewriter \(TTY\)](#)

Determining Compliance

- A TTY user must be able to leave a message, navigate an automated menu, or otherwise interact with the telecommunication product.

Notes

- Voice mail systems must record and playback TTY messages with acceptable loss of data. Generally this means providing control by [DTMF](#) or [Baudot](#) and communication of information in (Baudot) TTY.
- 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 whether a 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 issue and many others, and manufacturers must follow the [FCC](#) direction at the end of that Forum.
- 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\(k\)](#).

Vertical SBX IP, MBX IP, Wave IP:

These systems provide DTMF navigation of automated menus.

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."

In other words...

The user should be alerted when any time-dependent function is about to [timeout](#). The user must be given enough time to extend the response time.

Note: Assume that informed individuals can reasonably and consistently judge the amount of time they need and indicate that more time is needed.

Determining Compliance

For each product or function that requires a response within a specific amount of time:

- The user must be warned before the response time has elapsed.
- The product must provide sufficient time for the user to indicate that more time is required.
- The user must be able to extend the response time to allow sufficient time for the user to complete the function.

Notes

- If the response time is not limited, this standard is not applicable.
- Although not required, it is good programming practice to use [non-destructive timeouts](#).
- This standard is parallel to standards [1194.22\(p\)](#) for web-based information and applications and [1194.25\(b\)](#) for self-contained, closed products.

Vertical SBX IP, MBX IP, Wave IP:

These systems have programmable timeout parameters to allow the user ample time to make entries.

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."

In other words...

Caller identification and similar functions of a telecommunication device must be accessible to TTY users and those who cannot see the device's display.

Term

- [Teletypewriter \(TTY\)](#)

Determining Compliance

All of the operational functions (which excludes maintenance and setup features) are included in the complete set of functions covered by this requirement. Some telecommunication functions that can cause problems for TTY include: Caller-ID (Name and Number Delivery), Message Waiting indication, and Call Selector (*61).

For equipment on a person's premises (other than a carrier) originating, routing, or terminating telecommunications:

- If the product provides visual Caller ID, it should either:
 - Provide for voice output, or
 - Have a connection method for adding an external Caller ID product with voice output.
- Check for exposure of the Caller ID info to a computer workstation. There should be software or protocols that will make Caller ID and other information available in at least one non-visual mode.

Notes

- 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 allows most users to access more product features.
- Satisfying this requirement will support interoperability with TTY [AT](#). 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, telephony [API](#) that is compatible with that access technology could provide access to the function.
 - Sometimes these features are unavailable to TTY users because digital [PBX](#) information may not be provided through the analog connections. Adapters are needed for direct-connecting TTY to the PBX or other internal telephone system.

Vertical SBX IP, MBX IP, Wave IP:

These systems have a CTI interface to allow CallerID to be gathered on a computer workstation.

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."

In other words...

Telecommunications products that transmit voice communications must have the ability to amplify the volume and have an intermediary setting.

Terms

- [Decibel \(dB\)](#)
- [Gain](#)
- [Incremental volume control](#)

Determining Compliance

If the product transmits voice signals:

- The product must have a volume control.
- The volume must be able to be amplified above the default level.
- Check the user manual to determine the maximum volume in decibels and whether it is equal to or greater than 20.

Notes

- Some engineers are concerned that exceeding 18 dB 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 standard [\(g\)](#) below 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 18 dB. 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) have 20 dB of amplification available, and providing such gain would result in unusable output. Under typical conditions, the maximum 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](#).
- Satisfying this requirement does not involve interoperability with [AT](#).
- This standard is comparable to standard [1194.25\(f\)](#) for self-contained, closed products.

Vertical SBX IP, MBX IP, Wave IP:

Incremental volume control of a 12dB step is supported on handset/headset connections.

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."

In other words...

On telecommunication products that have adjustable volume, there must be an automatic volume reset function that sets the volume back to the default level.

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

Determining Compliance

For telecommunication products with volume adjustments:

- The product must have a feature to automatically revert back to the default output level after every use. This does not mean it must reset every time, but that it is possible to enable the product to reset after each use.

Notes

- 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.
- Satisfying this requirement does not involve interoperability with [AT](#).
- This standard is comparable to standard [1194.25\(f\)](#) for self-contained, closed products.

Vertical Wave IP:

The Wave IP system has a volume reset override function to accomplish this.

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."

In other words...

When using a telecommunication product such as a telephone, there must be a means to effectively use magnetic wireless coupling devices such as hearing aids.

Note: Assume that effective magnetic wireless coupling to hearing aids with a [telecoil](#) and [cochlear](#) implants is applicable to this requirement.

Term

- **Magnetic wireless coupling:** See [Inductive coupling](#)

Determining Compliance

It is difficult to determine compliance with this standard without the use of special testing equipment and expertise in this field. However, the [HAC Act](#) requires all new land-line telephones produced or imported after 1989 to be compatible with hearing aids, so current land-line phones (including cordless) meet this provision.

Notes

- 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).
- On July 10, 2003, the FCC modified the exemption for wireless phones under the HAC Act and required that digital wireless phones be capable of effective use 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.

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

Vertical SBX IP, MBX IP, Wave IP:

All digital and IP endpoints conform to FCC Hearing Aid Compatible requirements.

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."

In other words...

Interference to hearing technologies (e.g., hearing aids, cochlear implants, assistive listening systems) should be reduced to the lowest possible level.

Term

- [Cochlear](#)

Determining Compliance

It is difficult to determine compliance for this standard without the use of special testing equipment and expertise in this field. Consult the manufacturer to ensure they comply with the telecommunications standards in the notes below.

Notes

- To achieve the lowest possible level of interference, consider the following:
 - [ANSI C63.19-2001](#) provides procedures to test the interference level produced by handsets.
 - 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.
 - Handsets that support [telecoil](#)-compatible accessories and [AT](#) are available on the market
- 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 handset nor hearing aid companies are providing ratings for their products using this standard.
- 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.

Vertical SBX IP, MBX IP, Wave IP:

All digital and IP endpoints conform to FCC Hearing Aid Compatible requirements.

94.23(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."

In other words...

Any telecommunication product must have the ability to process information in a usable format. Products shall not remove information required for access.

Note: This requirement applies to the transmission of [TTY](#) signals over voice-based telecommunications systems, including [VoIP](#). The requirement was written broadly to ensure that it would apply to evolving technologies.

Determining Compliance

It is difficult to determine compliance for this standard without the use of special testing equipment and expertise in this field. Contact the manufacturer or consult the user manual to determine whether a product under review removes or does not provide access to usable formats of the information it transmits, conducts, or passes through.

Notes

- Satisfying this requirement will support interoperability with [AT](#), such as TTY, audio descriptions and closed captioning.
- Analog television caption technology is standardized under [EIA-608](#), and digital television captions are standardized under EIA-708. Note that EIA-608 captions are frequently used in DVDs, because subtitles generated for international markets do not include accessibility information, such as description of background sounds.
- Audio descriptions are currently carried using the [SAP](#) channel.

Vertical SBX IP, MBX IP, Wave IP:

These systems have standard analog telephone ports that can be wired to an RJ11 connector for TTY device compatibility. The system will not interfere with the TTY protocol using analog station ports.

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."

In other words...

The controls and keys on a telecommunication product must be designed and manufactured so that a user may locate and identify them by means of touch alone, without activating them.

Terms

- [Tactilely discernible](#)

Determining Compliance

- Keyboards should have navigational bumps on the keys (e.g., the F and J keys on a standard keyboard, or the 5 key on a numeric pad).
- Testers must be able to locate controls or keys with their eyes shut and without activating the functions of the keys.
- The law does not require that similar keys be grouped together, although this may be important for product usability. Examples include arrow keys, numeric keys, and function keys.

Notes

- Satisfying this requirement does not involve interoperability with [AT](#).
- This standard is referenced by standards [1194.25\(c\)](#) for self-contained, closed products and [1194.26\(a\)](#) and [\(b\)](#) for desktop and portable computers.

Vertical SBX IP, MBX IP, Wave IP:

All digital and IP endpoints have a navigational bump on digit 5 of the keypad.

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."

In other words...

Mechanically operated controls must be usable with one hand, without particular motions (twisting of the wrist, tight grasping, pinching) or considerable exertion (more than five pounds of force).

Determining Compliance

Consult the manufacturer or user manual for the amount of force required to operate controls. Also, perform the following:

- Attempt to operate the product with one hand. Pay particular attention to controls such as latches, which must also be compliant.
- Examine the user manual for function keys (e.g., programmable phone buttons) and attempt to use all documented features with one hand.
- No control or key should require tight grasping, pinching, twisting of the wrist (e.g., contrast controls), or more than five pounds of pressure.

If any of the conditions are questionable, then special tools are required to perform a more precise evaluation.

Notes

- It is difficult to measure the forces required by non push-button controls such as pull controls, rotary controls, slide controls, thumb wheels, and toggles. Check the user manual or contact the manufacturer for specific information.
- Functional Performance Criterion [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, ensure that no simultaneous actions are required.
- This standard is referenced by standards [1194.25\(c\)](#) for self-contained, closed products and [1194.26\(a\)](#) and [\(b\)](#) for desktop and portable computers.

Vertical SBX IP, MBX IP, Wave IP:

All digital and IP endpoints meet this requirement.

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."

In other words...

Telecommunications products with key repeat features must allow a two-second delay before repeating a key being held down. Products with key repeat features must also allow up to two seconds between each repetition of a key being held down.

Note: Some systems do not support key repeat. However, on products where key repeat is provided, this provision requires the repeat to be adjustable.

Determining Compliance

It is best to avoid products that require the pressing of the same key in rapid succession. However, if it is required of users:

- Attempt to locate key repeat features by reading the user manual or consulting the manufacturer.
- If the telecommunication product has key repeat functions, it must allow the user to control the key repeat rate.
- If a key repeat feature cannot be found, hold down a key for 10 seconds. If you observe key repeat behavior:
 - The delay between an initial key press and the automatic repeat must be adjustable to at least 2 seconds.
 - The key repeat rate must be adjustable to 2 seconds.

Notes

- 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.
- Satisfying this requirement does not involve interoperability with [AT](#).
- This standard is referenced by standards [1194.25\(c\)](#) for self-contained, closed products and [1194.26\(a\)](#) and [\(b\)](#) for desktop and portable computers.

Vertical SBX IP, MBX IP, Wave IP:

Key repeat is not supported

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."

In other words...

All locking or toggle controls or keys must be discernible visually, and through touch or sound.

Note: Assume that more than one person would reliably determine:

- The type and severity of low vision to which a control or key must be discernible (e.g., a good heuristic is to procure for people with 20/70 vision; meaning what most people see at 70 feet, they would see at 20 feet away).
- The level of sound that is adequate to discern the status of locking or toggle controls (see requirements [\(f\)](#), [\(g\)](#) and [\(h\)](#)).
- The amount of force required for the status of a control or key to be [tactilely discernible](#) without activating a key (e.g., lightly running your fingers over the F and J keys of a standard keyboard to locate the navigational bumps without actually typing the F or J key).

Determining Compliance

Each locking or toggle control or key must:

- Be visually discernible.
- Have either an audible or tactile indicator for status.

Notes

- "Discernible through sound" may be difficult to assess, due to [ambient noise](#).
- Satisfying this requirement does not involve interoperability with [AT](#).
- This standard is referenced by standards [1194.25\(c\)](#) for self-contained, closed products and [1194.26\(a\)](#) and [\(b\)](#) for desktop and portable computers.

Vertical SBX IP, MBX IP, Wave IP:

All digital and IP endpoints meet this requirement.