

**Four Features that could be built into Standard Cell Phones
that would benefit users with hearing impairments or deafness
(and other users)**

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1. One Way Silent Conversation (1WSC) Feature
2. Two Way Silent Communication (2WSC) Feature
3. Personal Portable Interpreter (PPI) Device
4. Captioned 2 Way Voice Phone Call

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One Way Silent Conversation (1WSC) Feature - “Talk/Read”

This feature allows individuals who are deaf - but who can speak - to use standard digital cellular phones to communicate with hearing individuals or relay operators who have a TTY or TTY compatible device (including other digital phones with these features).

The deaf user talks into their phone in the standard manner. The person on the other end of the phone line (or the relay service intermediary) types back using a standard TTY. If the 1WSC feature is implemented, the TTY characters received by the deaf user's phone could be displayed on the phone's display. This would allow people who are deaf (but can speak) to use the wireless phone directly without requiring that they carry a TTY with them.

This is possible if the digital phone implements the Lucent “no-gain” solution which

- (on the phone's sending side) detects TTY tones coming into the phone's audio jack and converts them to character codes which are then transmitted through the wireless network. (where they are converted back to tones later).
- (on the phone's receiving side) receives character codes from the wireless network and converts them into TTY tones and sends them out the audio (headset) jack on the phone.

If the 1-Way Silent Conversation (1WSC) feature is implemented, the deaf mobile phone user would not have to have a TTY with them at all. Whenever their (or any) digital phone received TTY character codes from the wireless network it would display them on the phone's display screen (at the same time as it converted them to tones to send out of the headset jack in case there were a TTY connected). As a result, a deaf user would not need to have a TTY connected to view an incoming TTY message. A deaf person could therefore use any digital phone (with this feature) that was handy to communicate with hearing loved ones, colleagues, companies or anyone with a TTY

They could also talk to anyone without a TTY – by going through a Telephone Relay Service (TRS). When the call is made through a telephone relay operator, the person being called would hear the deaf user talking in their own natural voice. Since there was a TRS operator on the line, the person called could also talk back to the deaf user using speech – making for a very natural two way speech conversation to the person called. And this could be done without requiring the deaf (or hard of hearing) user to carry any special equipment with them (other than their cell std. phone).

The feature works best with phones that display a larger number of characters but would be a very welcome feature for people who were deaf on any phone. Some TTYs for example have only 20 characters on their display.

With our rapidly aging population, we are seeing an increasing number of hard of hearing individuals. Often they do not want to use special equipment for “the disabled”. They can however have great difficulty hearing conversations. This feature would allow people who are hard of hearing to use their standard cell phones, (and the TRS service), to talk to people and see what the other people are saying – without having to buy a “special” device and without having to use something other than their own natural speech to communicate. This could be a significant factor for sales to elders.

(See appendix A for details on implementation of this feature as well as options for implementation)

Two Way Silent Communication (2WSC) Feature - “Type/Read”

This feature is similar to the One way Feature described above except that it also allows the Deaf user to type his messages back – resulting in a two way, pure TTY (fully silent), message.

This feature can therefore be used by people who are both deaf and cannot speak. It can also be used by anyone who is in an environment where they cannot use speech to communicate. This would include:

- very noisy environments (e.g. a factory, heavy equipment work site, etc)
- very quiet environments (e.g. a library)
- a meeting (where talking on a phone would not be tolerated)

This feature will work on any phone with the ability to enter characters and which implements the “Lucent” no gain solution for TTY compatibility. Basically, the user would turn on a TTY OUT feature. Once turned on, any characters entered on the cell phone would be transmitted as TTY characters - just as if they had come into the phone from the phone’s audio jack as TTY tones.

There are several ways that could be used to enter characters to a phone.

1. Using T9 or some other technique for entering characters and words from the standard phone keypad.
2. A keyboard that attaches to the phone
3. A built in keyboard on the phone
4. A touch screen that recognizes written characters (such as Graffiti)

This feature would be very easy to implement with any “Lucent solution” phone that already has a character entry mode for some other purpose (such as SMS or Email or WEB-Browsing)

It can be implemented on other phones by adding a character entry capability and connecting it to the TTY code transmission circuitry.

In addition to being used by people who are deaf, anyone interested in direct silent communication could use it with any other similarly equipped phone or with anyone having access to a TTY or TTY function on their computer.

Implementation Details and option provided in Appendix B

Personal Portable Interpreter (PPI) Device - “Read to Listen”

A phone outfitted with the 1WSC feature can also serve as a Personal Portable Interpreter (PPI) Device when used in conjunction with a Personal Remote Interpreter service.

Basically a person who was Hard-of Hearing or Deaf and who was having trouble understanding speech (or sounds) in their environment, could use the phone to call up a Remote Interpretation Service. By connecting a sensitive (and usually directional) microphone to their phone, they could pick up the sounds in their environment and send them, via the phone, to the remote interpreter. The interpreter would translate the speech (or sounds) into text and send them back using standard TTY. The text would then be displayed on the screen of the phone.

This technique works best if the speech is slow or not sustained since TTY has a maximum throughput of about 60 wpm.

The feature would work better if higher character transmission were also possible – but would be quite functional for short conversations and interactions. The ability to use ANY standard digital cell phone for this service (that used Lucent Solution) would be of great benefit and advantage.

NOTE: The technique even better if the speaker can also see the displayed text. They can then pace their speech better – as well as catching any translation errors - which they can correct by re-speaking the information or spelling it.

NOTE: There are patents owned by UltraTec (#02955393 and #03025433) which may relate to implementations of this approach.

Captioned 2 Way Voice Phone Call -- “Talk/Hear&Read”

Many people can hear – but not well enough to understand clearly what is being said over a phone. The Captioned – 2 Way Voice Call feature allows a person to carry out a two-way phone call via voice. The person using the digital cellular phone however, has the option of having the speech from the person at the other end of the line turned into text and displayed on their phone. Thus they would hear the other person talking AND see what they were saying displayed in text on the phone display.

For this feature to work the phone would have to support EITHER

1. the ability to receive incoming voice and incoming TTY data simultaneously.
2. the ability to receive incoming voice and incoming text on a data channel simultaneously.

The feature also requires a service that would tie into the conversation and render a text version of the persons speech at the other end of the phone call.

NOTE: There are patents owned by UltraTec which may relate to implementations of this approach.

APPENDIX A

Implementation Notes for 1WSC Feature

Display

- the display can be any number of characters. However displays with greater numbers of characters would work better
- the display should fill up a line and then scroll upward.
- The display should not use a Times Square Marching display
- A simple version of the feature would have not display speed control or ability to scroll back
- More advanced versions could allow the user to utilize the up and down scroll buttons (or any up down button – like volume) to move back in the display to read text. Once the person has hit the scroll up button, the display would stay on those lines of text until the individual hit the scroll forward button. It would continue to NOT do automatic vertical scrolling until the user scrolled all the way to the bottom and hit the down scroll button one more time than necessary to see the bottom line. Thus the user could control the speed of reading independently from the rate of incoming text.
- Some mechanism should be provided for line status indication. This could be as simple as providing a dot or icon on the screen that would follow the acoustic information coming into the phone. For example, if the line were ringing – the deaf person would see the indicator turning on and off slowly. If the line were busy – they would see it turning on and off more rapidly. If a person answered, they would see it flickering as they talked. TTY characters incoming of course would show up on the display so no visual indication of this is required. A more sophisticated approach could also be used if desired where the ringing and busy patterns were recognized and displayed in words on the display. This would not be necessary though.

General

In the simplest implementation,

1. any TTY text coming in would be displayed and a simple on screen indicator would be provided for line status indication (as per above).
NOTE: Since most phone users would not receive TTY characters they would not be affected or even aware that such a feature existed. If someone were to send them a TTY message however, instead of being bewildered by the tones (if they were using a headset) they would see the text appearing on their screen simultaneously.
2. TTY tones would not be played out of the regular earpiece (only the headset).

More advanced versions could have a variety of TTY settings including

- Setting so that TTY tones WOULD come out of the regular earpiece (default= No)
- Setting that would determine when TTY tones would come out of headset jack (Default = yes)

APPENDIX B

Implementation Notes for 2WSC Feature

General

- See Appendix A for implementation notes for the receiving portion of the two way silent communication feature
- See Appendix A for Line Status indicator information as well

Sending Text

- If there is already a text sending capability on the phone, then sending TTY messages would be accomplished by having the user turn on the TTY OUT feature. While this feature is on, text typed while on a phone call – would go out at TTY characters on the voice channel.
- If the phone is not capable of sending SMS or other text functions while a phone call is in progress, then a TTY OUT feature may not be necessary – since text typed during a phone call should automatically be assumed to be TTY.