

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the matter of)
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)
Implementation of Section 255 of the)
Telecommunications Act of 1996)
)
Access to Telecommunications Services,)
Telecommunications Equipment, and)
Customer Premises Equipment)
By Persons with Disabilities)
)

WT Docket No. 96-198

Ex parte Comments
Reference Design

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Attached for the Commission's general information is a reference design that we are working on at the Trace Center for a cellular telephone. This design meets all of the specifications in the FCC/Access Board Guidelines. This design is intended to show how a single phone can be designed so that it would be cross-disability accessible as well as usable and attractive to mass market customers.

This design uses only technologies that are already found in today's cell phones (although the software in the telephones today may not currently be written to use these technologies in an accessible fashion). The only exception to this is hearing aid compatibility with digital wireless phones. This design assumes that industry will develop a solution to this problem in conjunction with ANSI C63 and that that solution would be incorporated into this design.

The cost to implement these features is nominal. Basically, it involves the addition of a single button to the key pad on the front of the phone and changing the software instructions that tell the phone how to behave. (A design which does not require the addition of the extra button is also possible.) All of the technologies described and used in this phone are already present in other cell phones today. Most of them are in low cost phones. A couple technologies are currently only found in mid-range phones today, but we expect these technologies to be available in the inexpensive phones shortly (except where there are marketing reasons for companies to reserve some features for higher end phones for product differentiation rather than cost reasons).

You should find the following pages attached:

1. A brief description of the Reference Design 1 cell phone which meets all of the FCC guidelines.
2. Notes as to how the access features on page 1 are actually related to a standard product feature that would be desirable by mass market users.
3. A table listing each of the FCC guidelines, how the guideline is met in the proposed reference design, and a comment about cost of implementation.

You will note, that in almost all the cases, there are already cell phones on the market that either provide the capability or have the technology necessary to provide the capability. All that would be necessary would be to change the software in the phone that governs its behavior.

Additional and related information to this and other reference designs will be at <http://www.trace.wisc.edu/world/telecomm/>

Note: If you have trouble viewing the images on the pages below, you will need to download Acrobat Reader version 4 or above. Visit <http://www.adobe.com/prodindex/acrobat/readstep.html> for more information about upgrading.



ONE phone design that meets all of the FCC proposed access requirements

(Trace Center Reference Design 1)

Volume range

Meets FCC specifications for those who are hard of hearing (also is hearing aid compatible)

Speakerphone function

Facilitates use by people who have difficulty handling the phone

Headset jack

Allows connection of neckloops, silhouettes, Assistive Listening Devices, TTY's and headsets

Easy to feel keys

And a nub on the 5 key makes eyes-free dialing easy. (Because of keypad edges, all keys are tactilely different.) Keys are dishd as well to make it easy to use a mouthstick or other device to dial.

Infrared (IR) Port

Allows wireless connection of computers and assistive technologies

Matrix display

Allows use of graphics and multi-line text messages including TTY conversations

EZ button

The EZ button allows you to have the label for any key read to you - as well as the contents of the display and all menus and features of the phone. (Useful if you cannot see well, are blind, or if you have trouble reading the text on the phone for any reason.) Spoken words are displayed on screen in large type as well.

Connector

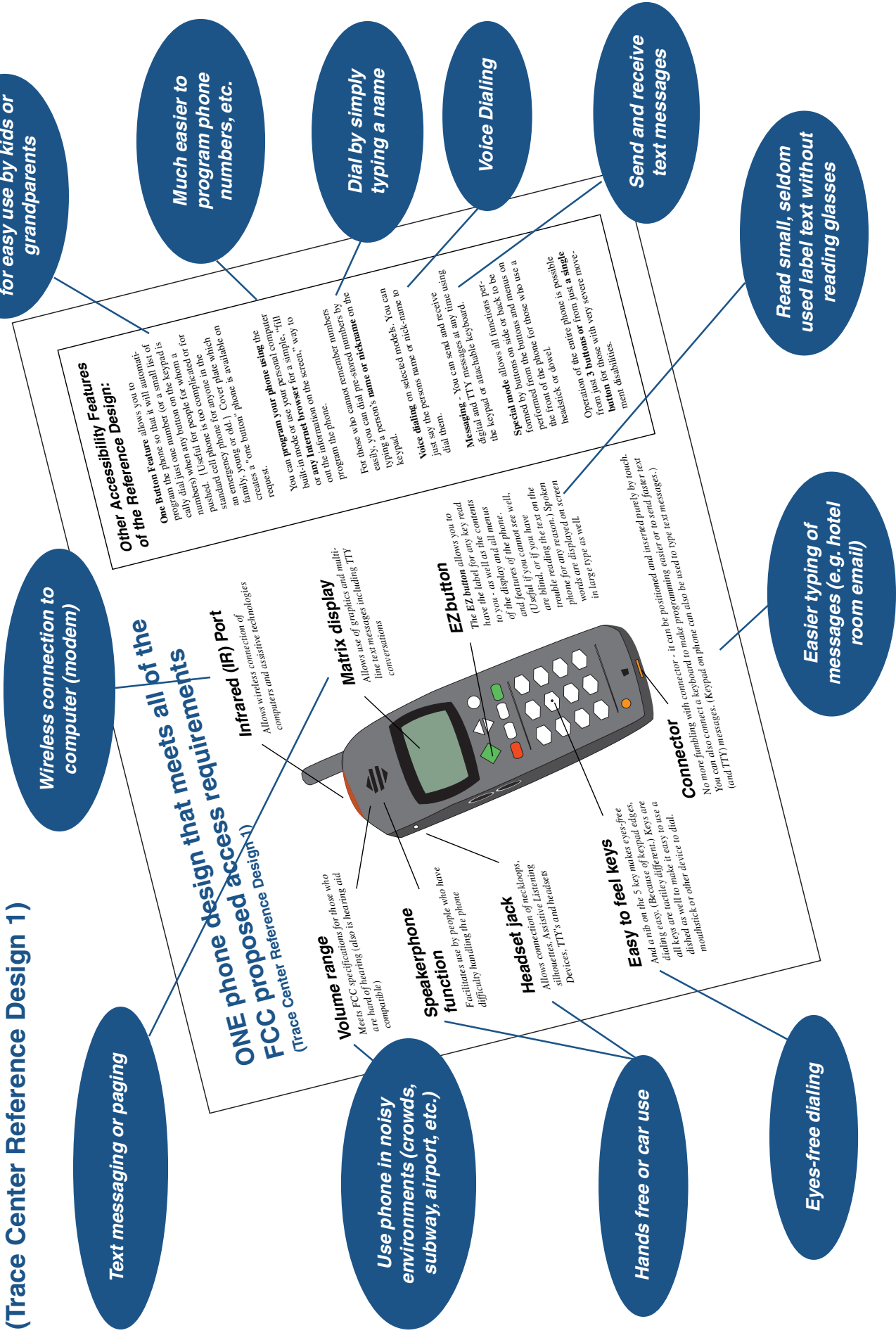
No more fumbling with connector - it can be positioned and inserted purely by touch. You can also connect a keyboard to make programming easier or to send faster text (and TTY) messages. (Keypad on phone can also be used to type text messages.)

Other Accessibility Features of the Reference Design:

- **One Button Feature** allows you to program the phone so that it will automatically dial just one number (or a small list of numbers) when any button on the keypad is pushed. {Useful for people for whom a standard cell phone is too complicated or for an emergency phone for anyone in the family, young or old.} Cover plate which creates a "one button" phone is available on request.
- You can **program your phone** using the built-in mode or use your personal computer or **any Internet browser** for a simple, "fill out the information on the screen," way to program the phone.
- For those who cannot remember numbers easily, you can dial pre-stored numbers by typing a person's **name or nickname** on the keypad.
- **Voice dialing** on selected models. You can just say the persons name or nick-name to dial them.
- **Messaging** - You can send and receive digital and TTY messages at any time using the keypad or attachable keyboard.
- **Special mode** allows all functions performed by buttons on side or back to be performed from the buttons and menus on the front of the phone for those who use a headstick or dowel.
- Operation of the entire phone is possible from just **3 buttons** or from just a **single button** for those with very severe movement disabilities.

How the same features would be useful in the mass market

(Trace Center Reference Design 1)



How Trace Center Reference Design #1 addresses each of the FCC Guidelines

FCC Guideline	Met?	How the requirements are met.	Cost & Ease of Implementation (If a company had been doing this as a matter of course, e.g. does not include cost of acquainting engineers with access.)	
SUBPART C -- REQUIREMENTS FOR ACCESSIBILITY AND USABILITY	Sec. 1193.41 Input, control, and mechanical functions.	(a) Operable without vision.	yes ✓ Tactile keys and landmarks All input and functions accessible via voice output	- All needed electronics for digitized speech already in today's digital phones; Need only small additions to software and sometimes additional memory (~100k) which will cost little in phones tomorrow. Memory is already available today in many phones (used for digital voice recording). - (This reference design uses spelled speech for transmitted text - voice synthesis will be possible in near future but is not quite practical today for inexpensive phones. Voice synthesis using network facilities is practical today - but is not proposed here.) Many newer cell phones already use matrix displays. Many have large print displays as standard or as a user setting. - Not a problem in most phones today. Any use of color just has to also be accompanied with a text label - as is true on all phone keys today.
		(b) Operable with low vision and limited or no hearing.	yes ✓ -Matrix Display - the labels of all buttons can be shown in large print prior to activating them.	
		(c) Operable with little or no color perception.	yes ✓ All color coded buttons and indicator lights distinguishable by other means (shape, label)	
		(d) Operable without hearing.	yes ✓ Vibration ringer alert. Also buttons have tactile feel of activation (i.e. do not rely on auditory beeps). Visual indication of line status.	- Vibrator is standard in many cell phones. (Not in lower cost phones mostly due to marketing rather than cost.) Visual indication of line status is software only.
		(e) Operable with limited manual dexterity.	yes ✓ EZ Access* - buttons can be selected in 2 steps - press desired button then confirm with EZ Button; Dished keys easy to press; Also optional 1-Button mode ; Connection of customized external keyboard.	- Software only for confirm and 1 button access features. (Less than 2k memory.) - Dished keys is no cost, just a different key shape. - Keyboard connection can be via Infra-red or the connector on bottom. (Based on industry standard ANS/ITIA/EIA-688)
		(f) Operable with limited reach and strength.	yes ✓ Buttons easy to press down; One button mode. Optional Speakerphone is easier for people who cannot place phone to ear; Optional Voice Dialing is faster for some.	- Light button pressure is standard on many phones. Optional speakerphone and voice dialing features are increasingly common - and cost for these features is dropping precipitously. (Speakerphone and voice dialing not required for access in this design).
		(g) Operable without time-dependent controls.	yes ✓ Time-outs can be modified via preferences menu	- Menu option. (easily implemented in software)
		(h) Operable without speech.	yes ✓ Speech input of commands not required; Text communication modes available.	- Ability to control phone without requiring speech is standard on most all phones. - Text communication is common on digital phones and will be standard soon.
		(i) Operable with limited cognitive skills.	yes ✓ EZ Access - all functions accessible via speech output; Also one-button / single number dialing with optional cover plate; Infrared port - allows user programming via simplified step-by-step computer interface	- Speech output of all printed text is already covered above (first item). - One button dialing and single number dialing is software only. - Optional cover plate would cost a bit but is not needed for access. - IR port is standard on many cell phones
		(a) Availability of visual information.	yes ✓ EZ Access - all functions and displayed text available via speech	- Cost covered above.
		SUBPART D - COMPATIBILITY	Sec. 1193.43 Output, display, and control functions.	(b) Availability of visual information for low vision users.
(c) Access to moving text.	yes ✓ Arrow buttons - text can be paused or stepped through using arrow buttons - configurable via preferences menu			- Preferences menu option (easily implemented in software)
(d) Availability of auditory information.	yes ✓ Ringing tones, beeps shown on display (and vibrating ringer). TTY messages shown on display. Speech to Text available via relay services. VCO supported. Full FCC volume range.			- Using the Lucent solution strategy (or final standard), TTY codes can be decoded in digital phones using software. A little additional software would allow TTY text to be displayed. - All other sounds made by the phone can be visually displayed as well using existing displays. - Cell phones already exist that meet the FCC specified levels
(e) Availability of auditory information for people who are hard of hearing.	yes ✓ Flashing lights all within acceptable flash frequencies.			- No cost. Not a problem on most phones today.
(f) Prevention of visually-induced seizures.	yes ✓ Headset being placed in jack cuts off the speaker			- Standard industry practice.
(g) Availability of audio cutoff.	yes ✓ Per Standards group ANSI C63			- Already being addressed by industry.
(h) Non-interference with hearing technologies.	yes ✓ Hearing aid I-coil compatibility			- Already common in many phones including world's smallest mass market cell phone.
(i) Hearing aid coupling.	yes ✓ Infrared port allows activation of all features remotely.			- Hardware for this is already common in many cell phones (including Nokia's most popular model). Only software protocol needs to be added.
(a) External electronic access to all information and control mechanisms.	yes ✓ Standard subminiature headset jack connects to external auditory processing devices			- Already used by most cell phone companies for connection of headsets (including world's smallest mass market cell phone. - No cost to use standard signal levels.
(b) Connection point for external audio processing devices.	yes ✓ Keys do not require contact with human body to work. Dished keys make it easier to press keys for people with limited manipulation. Headset jack is a TTY connector			- Not aware of any phones that fail this guideline today (though there probably is one). - Most (non-cell) phones also have dished keys like the old touchtone phones. - Headset jack already used as TTY connector today for some TTYs. (see also next item)
(c) Compatibility of controls with prosthetics.	yes ✓ Phone can send and receive TTY signals.			- One of 3 industry proposed all software solutions is used. (which work with today's phones.)
(d) TTY connectivity.	yes ✓			
(e) TTY signal compatibility.	yes ✓			

* Note: The access packages above can be implemented with or without a separate green diamond "EZ" button. Implementation with the button is preferable. The cost for the extra button is in the cents range if done as part of the overall original keyboard design.