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Apr 13 1998



Building The
Wireless Future™

April 13, 1998

CTIA

Cellular
Telecommunications
Industry Association
1250 Connecticut
Avenue, N.W.
Suite 200
Washington, D.C. 20036
202-785-0081 Telephone
202-785-0721 Fax

Ms. Magalie Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., 2nd Floor
Washington, DC 20554

RECEIVED

**Re: Ex Parte Presentation
CC Docket No. 94-102**

Dear Ms. Salas:

On Monday, April 13, 1998, the Cellular Telecommunications Industry Association ("CTIA") on behalf of the Signatories of the TTY Consensus Agreement¹ sent the attached letter and document to the following:

- The Honorable William E. Kennard, Chairman
- The Honorable Susan Ness, Commissioner
- The Honorable Harold Furchtgott- Roth, Commissioner
- The Honorable Michael K. Powell, Commissioner
- The Honorable Gloria Tristani, Commissioner

- Mr. Ari Fitzgerald, Legal Advisor, Office of the Chairman
- Mr. David Siddall, Legal Advisor, Office of Commissioner Ness
- Mr. Paul Misener, Senior Legal Advisor/Chief of Staff,
Office of Commissioner Furchtgott- Roth
- Mr. Peter Tenhula, Legal Advisor, Office of Commissioner Powell
- Ms. Karen Gulick, Legal Advisor, Office of Commissioner Tristani

Wireless Telecommunications Bureau

- Mr. Daniel Phythyon, Bureau Chief
- Mr. Gerald Vaughan, Deputy Bureau Chief
- Mr. John Cimko, Chief, Policy Division
- Ms. Nancy Boocker, Deputy Chief, Policy Division

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¹ The Signatories of the TTY Consensus Agreement include the Cellular Telecommunications Industry Association, Personal Communications Industry Association, National Association of the Deaf, Telecommunications for the Deaf, Inc., Gallaudet University, and Consumer Action Network.



Mr. Josh Roland, Legal Advisor, Office of the Bureau Chief
Mr. Ron Netro, Senior Electronics Engineer, Policy Division

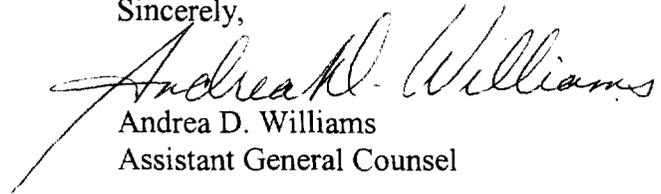
FCC Disabilities Issues Task Force

Meryl Icove, Director

Pam Gregory, Deputy Director

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter and its attachments are being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

A handwritten signature in cursive script that reads "Andrea D. Williams". The signature is written in black ink and is positioned above the printed name and title.

Andrea D. Williams
Assistant General Counsel

Attachments



Building The
Wireless Future

April 13, 1998

CTIA

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1250 Connecticut
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Mr. Daniel Phythyon
Chief, Wireless Telecommunications Bureau
Federal Communications Commission
2025 M Street, NW, Room 5002
Washington, DC 20554

**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

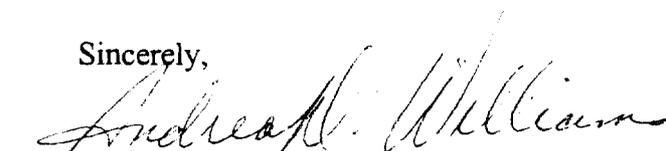
Dear Mr. Phythyon:

The Wireless TTY Forum ("TTY Forum") was established in September 1997 to seek and develop technical solutions that will allow TTY users to access 9-1-1 over digital wireless systems. The TTY Forum is a collaborative effort that includes representation from the four interests groups that have a significant stake in this issue, *i.e.*, the wireless industry, the public safety answering points, TTY manufacturers, and consumers. For your information, attached is the first quarterly status report that provides information on the TTY Forum's efforts and progress.

In accordance with the Commission's rules governing E9-1-1/TTY compatibility with digital wireless systems, the Cellular Telecommunications Industry Association ("CTIA"), on behalf of the Signatories of the TTY Consensus Agreement,¹ filed the report on April 10, 1998 in the above referenced docket.

If you should have any questions or need additional information concerning the TTY Forum's efforts and progress, please contact me at (202) 736-3215.

Sincerely,



Andrea D. Williams
Assistant General Counsel

¹ The Signatories of the TTY Consensus Agreement include the Cellular Telecommunications Industry Association, Personal Communication Industry Association, National Association of the Deaf, Telecommunications for the Deaf, Inc., Gallaudet University, and Consumer Action Network.



Attachment – (1)

cc w/ attachment: Mr. Gerald Vaughan
Mr. John Cimko
Ms. Nancy Boocker
Mr. Josh Roland
Mr. Ron Netro



Building The
Wireless Future

April 13, 1998

The Honorable Gloria Tristani
Commissioner
Federal Communications Commission
1919 M Street, NW, Room 826
Washington, DC 20554

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Cellular
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Washington, D.C. 20036
202-785-0081 Telephone
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**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

Dear Commissioner Tristani:

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Assistant General Counsel

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Attachment – (1)

cc w/ attachment: Ms. Karen Gulick



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April 13, 1998

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The Honorable William E. Kennard
Chairman
Federal Communications Commission
1919 M Street, NW, Room 814
Washington, DC 20554

**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

Dear Mr. Chairman:

The Wireless TTY Forum ("TTY Forum") was established in September 1997 to seek and develop technical solutions that will allow TTY users to access 9-1-1 over digital wireless systems. The TTY Forum is a collaborative effort that includes representation from the four interests groups that have a significant stake in this issue, *i.e.*, the wireless industry, the public safety answering points, TTY manufacturers, and consumers. For your information, attached is the first quarterly status report that provides information on the TTY Forum's efforts and progress.

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Sincerely,

Andrea D. Williams
Assistant General Counsel

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Attachment – (1)

cc w/ attachment: Mr. Ari Fitzgerald



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April 13, 1998

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1250 Connecticut
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The Honorable Susan Ness
Commissioner
Federal Communications Commission
1919 M Street, NW, Room 832
Washington, DC 20554

**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

Dear Commissioner Ness:

The Wireless TTY Forum ("TTY Forum") was established in September 1997 to seek and develop technical solutions that will allow TTY users to access 9-1-1 over digital wireless systems. The TTY Forum is a collaborative effort that includes representation from the four interests groups that have a significant stake in this issue, *i.e.*, the wireless industry, the public safety answering points, TTY manufacturers, and consumers. For your information, attached is the first quarterly status report that provides information on the TTY Forum's efforts and progress.

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Sincerely,

Andrea D. Williams
Assistant General Counsel

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Attachment – (1)

cc w/ attachment: Mr. David Siddall



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April 13, 1998

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The Honorable Harold Furchtgott-Roth
Commissioner
Federal Communications Commission
1919 M Street, NW, Room 802
Washington, DC 20554

**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

Dear Commissioner Furchtgott-Roth:

The Wireless TTY Forum ("TTY Forum") was established in September 1997 to seek and develop technical solutions that will allow TTY users to access 9-1-1 over digital wireless systems. The TTY Forum is a collaborative effort that includes representation from the four interests groups that have a significant stake in this issue, *i.e.*, the wireless industry, the public safety answering points, TTY manufacturers, and consumers. For your information, attached is the first quarterly status report that provides information on the TTY Forum's efforts and progress.

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Sincerely,

Andrea D. Williams
Assistant General Counsel

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Attachment – (1)

cc w/ attachment: Mr. Paul Misener



Building The
Wireless Future

April 13, 1998

The Honorable Michael K. Powell
Commissioner
Federal Communications Commission
1919 M Street, NW, Room 844
Washington, DC 20554

CTIA

Cellular
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**Re: Revision of the Commission's Rules to Ensure
Compatibility with Enhanced 911 Emergency Calling
Systems, CC Docket 94-102**

Dear Commissioner Powell:

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Sincerely,

Andrea D. Williams
Assistant General Counsel

¹ The Signatories of the TTY Consensus Agreement include the Cellular Telecommunications Industry Association, Personal Communications Industry Association, National Association of the Deaf, Telecommunications for the Deaf, Inc., Gallaudet University, and Consumer Action Network.



Attachment – (1)

cc w/ attachment: Mr. Peter Tenhula



Building The
Wireless Future

April 13, 1998

Ms. Meryl Icove
Director, Disabilities Issues Task Force
Federal Communications Commission
2033 M Street, NW, Room 918
Washington, DC 20554

CTIA

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**Re: Revision of the Commission's Rules to Ensure
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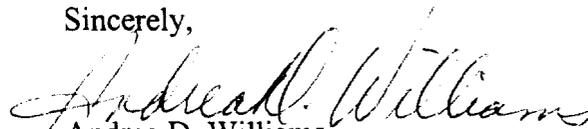
Dear Ms. Icove:

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Attachment – (1)
cc w/ attachment: Ms. Pam Gregory

WIRELESS TTY FORUM

*Seeking Solutions to TTY Through Wireless
Digital Systems*

QUARTERLY STATUS REPORT

Submitted by:

**The Cellular Telecommunications Industry Association (CTIA)
Consumer Action Network (CAN)
Gallaudet University
National Association of the Deaf (NAD)
Personal Communications Industry Association (PCIA)
Telecommunications for the Deaf, Inc. (TDI)**

April 10, 1998

Introduction

The purpose of the TTY Forum is to seek and develop technical solutions to support TTY technology over digital wireless systems. The TTY Forum includes representatives from the four interest groups that have a significant stake in providing TTY users access to 9-1-1 over digital wireless systems: wireless telecommunications industry (wireless carriers and phone manufacturers), manufacturers of TTY equipment, emergency and relay service providers (9-1-1 and TRS), and consumer organizations that represent individuals who are deaf and hard of hearing ("Stakeholders"). The Stakeholders acknowledge that intensive collaborative efforts are necessary in order to support TTY signaling over digital wireless systems, and that carriers, equipment vendors (wireless phones and TTY equipment), emergency and relay service providers, and consumer organizations should participate in these collaborative efforts.¹ The TTY Forum strives for consensus among the Stakeholders regarding the most appropriate technical solutions for providing TTY access to 9-1-1 over digital wireless systems.

The TTY Forum commenced in September 1997 and has held subsequent meetings to continue its efforts to provide viable solutions for TTY access to 9-1-1 over digital wireless systems.² The Forum has reached consensus on several issues that will facilitate progress.³ While the Working Groups have provided several demonstrations, proposed test procedures and presented preliminary test results, much work remains to be done. In an effort to focus research efforts and resources to meet the Federal Communications Commission's ("FCC") October 1, 1998, compliance date, the Forum's immediate focus is to provide an acceptable short-term solution while work continues to develop long-term solutions for TTY users to access 9-1-1 over digital wireless systems. In an effort to assist wireless carriers with the FCC's notification requirements, the TTY Forum has developed notification text and strategy targeted at current and potential subscribers.

¹ The Consumer Organizations formally agreed to support the efforts of the TTY Forum by providing representatives with appropriate technical expertise to the Working Groups. The TTY Forum agreed to coordinate efforts with and receive technical input on user requirements from the Consumer Organizations to achieve TTY Access. See In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Consensus of The Cellular Telecommunications Industry Association, Personal Communications Industry Association, National Association of the Deaf, Telecommunications for the Deaf, Inc., Gallaudet University, Consumer Action Network ("TTY Consensus Agreement"), filed November 20, 1997.

² The TTY Forum Meetings were held on the following dates: September 17-19, 1997; December 11-12, 1997; February 11-12, 1998; and April 1-2, 1998. Subsequent meetings are scheduled for May 20-21, 1998, June 16, 1998 (Signatories, TTY Forum Steering Committee and Working Group Chairpersons), and July 21-22, 1998 (tentative) in Washington, DC. See Appendix F, attached hereto, for TTY Forum Reports.

³ See Appendix A, attached hereto.

This quarterly status report provides the FCC with information on the problems associated with TTY access to 9-1-1 over digital wireless systems, the TTY Forum's proposed technical solutions, steps taken to achieve proposed technical solutions, steps taken to notify current and potential subscribers, and a summary of the TTY Forum's forthcoming workplans. The quarterly status report includes several appendices that provide supporting data on the progress and efforts of the TTY Forum and its Working Groups.

I. Problems Associated With TTY Access to 9-1-1 Over Digital Wireless Systems

(A) Passing TTY signals through the voice channel (vocoder)

The TTY Forum has identified several technical challenges associated with providing reliable TTY access to 9-1-1 over digital wireless systems. Digital wireless systems use vocoders that represent a mathematical model of the human voice tract to efficiently reproduce the speech it produces. Signals or tones other than human speech such as ambient noise, progress tones, and music-on-hold can impact the quality and accuracy of the voice or data transmission. Since TTY signaling tones are not sounds typically produced by the human voice tract, some vocoders do not accurately reproduce such tones into coherent messages.⁴

(B) Technical difficulty of using Baudot due to obsolescence

With respect to connectivity and compatibility, the challenge is developing an interface between new digital wireless technology⁵ and older TTY technology, such as the 45.45 baud Baudot signaling, that will allow the Baudot tones to pass successfully over digital wireless systems. The Baudot signaling is an analog protocol that has virtually remained unchanged for over 30 years. The majority of TTY users, however, still rely on TTY machines equipped with 45.45 baud Baudot signaling as their primary mode of communication. Many technical experts at the TTY Forum consider the Baudot signaling obsolete — vulnerable to error, slow, and incompatible with today's advanced telecommunications technology. They would prefer to provide advanced telecommunications data services to people who currently use TTYs. Until TTY users transition from the embedded base of Baudot TTY machines to more current telecommunications data services, the TTY Forum will focus research efforts and resources on backward compatibility solutions, particularly if carriers are to meet the FCC's October 1, 1998, compliance date.

(C) Possible interference between TTYs and digital wireless phones

TTYs working with some digital wireless phones may experience interference. Problem has not been verified, and no findings have been presented during the TTY Forum.

(D) Connecting a TTY and a digital wireless phone

Digital wireless phones and TTYs do not have a common interface for coupling. Acoustic coupling by physically placing a digital wireless phone on a TTY's cups is not effective due to the size and shape of phones and ambient noise, *i.e.*, noise from the surrounding environment.

⁴ Baudot is a varying transmission. While a vocoder anticipates and predicts the next tones, Baudot signaling is not predictable. Running at full speed the character bits in Baudot can be dropped. Digital vocoders have different error corrections and prediction methods. Thus, the various types of digital vocoders should be tested to determine tolerable error rate.

⁵ For purposes of the TTY Forum, digital wireless technology includes CDMA 800 MHz, CDMA 1900 MHz, PCS 1900 (GSM), TDMA, and iDEN.

E) Developing user requirements

Another challenge is defining appropriate user requirements with respect to coupling, error rate, and portability. With respect to specifying a tolerable error rate, TTY manufacturers should provide the error rate experienced on wireline connections. Human error rate on the part of the TTY user and the 9-1-1 calltaker must also be factored into the equation along with the error rate via transmission over digital wireless systems.

II. Proposed Technical Solutions

The TTY Forum has reached consensus on the need for backward compatibility, and therefore has focused primarily on sending Baudot signals through the voice channel of digital wireless systems for TTY access to 9-1-1. This is not to preclude supporting other types of TTY protocols, but Baudot must be one of them. Possible solutions in support of this approach are referred to as short-term solutions.

The TTY Forum has also discussed the possibility of adding Baudot protocol into the modem pools of digital wireless networks, and bypassing the voice channel, *i.e.*, V.18 standard or equivalent. The user would not use a TTY, but a commercial device such as a personal digital assistant. This approach is referred to as a long-term solution.

A. Short-Term Solutions

(A) Passing TTY signals through the voice channel (vocoder)

While preliminary laboratory tests, demonstrations and informal tests have been provided to the TTY Forum, the extent of the problem has yet to be measured. Several Working Groups have not provided the necessary data in order for the TTY Forum to reach a consensus on appropriate solutions.⁶

(B) Technical difficulty of using Baudot due to obsolescence

The TTY Forum believes there are no short-term solutions to this issue, particularly in view of the October 1, 1998, compliance date. This problem will require long-term solutions, *i.e.*, after October 1, 1998.

(C) Possible interference between TTYs and digital wireless phones

While no findings have been presented during the TTY Forum concerning electromagnetic interference between TTYs and some digital wireless phones, there is an independent research center specifically dedicated to the investigation of issues related to electromagnetic compatibility of electronic equipment with wireless devices, *i.e.*, the Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma ("EMC Center"). The EMC Center already has a program in place whereby TTY and equipment manufacturers may submit their devices to the EMC Center for device interaction testing.

⁶ See infra p. 9.

(D) Connecting a TTY and a digital wireless phone

In order to pass Baudot signal through the voice channel, there must be a direct connection between the digital wireless phone and the TTY. Wireless telephones and TTYs, however, use different types of connectors. The 2.5mm audio jack provided on wireless phone handsets (or via a manufacturer-supplied adapter for hands-free operation) is a logical solution. However, TTYs do not have audio jacks and would need to be changed in design or retrofitted. Conversely, many TTYs have RJ-11 connections, but these are not included in digital wireless telephones. An adapter to interface these two types of connections would render the device less portable and would require a separate power source (battery).

Wireless equipment manufacturers need the cooperation of TTY manufacturers to provide input and output specifications for several types of TTY including other relevant information such as voltage, ring, *etc.*, in order to pass the audio directly to the TTY device. It appears that no technical standard exists to accommodate this coupling solution. Accordingly, the TTY Forum anticipates that this solution will require producing a Standards Requirement Document (SRD) for the 2.5mm jack and submission of the SRD to the appropriate standards-setting body. According to TTY Forum Members who have expertise in the standards-setting process, the TTY Forum can anticipate twelve to eighteen months for this process.

Another proposed solution involves having the user carry a wireline telephone handset, coupled to the digital wireless telephone. The user would then take this handset and place it on the cups of the TTY. It was noted that while this solution may be a "stop gap" measure for coupling, it may be cumbersome for the TTY user.

(E) Developing user requirements

The TTY Forum recommended that the Consumer Organizations provide a list of user requirements. The Consumer Organizations will draft a user requirements document for consideration by the TTY Forum. Discussion and research among the Consumer Organizations are taking place. The document will be an agenda item for discussion at the May 20-21, 1998 Forum Meeting.

(F) One phone model for each digital technology that CMRS provider offers

At the February 1998 Forum Meeting, the wireless industry asked whether the FCC and TTY Forum members, particularly the Consumer Organizations represented at the TTY Forum⁷, would accept as a short-term solution at least one phone model for each digital technology, *i.e.*, CDMA (800 MHz & 1900 MHz), TDMA, PCS-1900, and iDEN, in order to meet the FCC's October 1, 1998, compliance date. The TTY Forum deferred discussion of this issue until the April 1998 Forum Meeting in order to seek guidance from the FCC and to provide Consumer Organizations with an opportunity to discuss privately their position on this issue. In preparation of the April 1998 Forum Meeting, CTIA, on behalf of the TTY Forum, met with Dan Phythyon,

⁷ The following consumer advocacy groups are actively participating in the TTY Forum: Consumer Action Network, Gallaudet University, National Association of the Deaf, Telecommunications for the Deaf, Inc., Self Help for the Hard-of-Hearing ("Consumer Organizations").

Chief, Wireless Telecommunications Bureau, FCC, and his staff to discuss the progress of the TTY Forum Working Groups, and their need for FCC guidance on several issues.

Specifically, CTIA asked if the FCC would accept, as a short-term solution, CMRS carriers' ability to provide TTY users with one (or more) model of TTY-compatible digital wireless phones by October 1, 1998. Mr. Phythyon stated that in his view, carriers who can offer TTY users at least one digital phone model at a reasonable price by October 1, 1998, would be considered in compliance with the E9-1-1/TTY compatibility requirements. Mr. Phythyon also noted that manufacturers of CMRS equipment have their own obligation under Section 255 of the Communications Act with respect to the accessibility or compatibility of their products for TTY users.⁸ CTIA provided this information to the TTY Forum at its April 1998 Meeting in order to facilitate discussion on developing a consensus on this short-term solution.

CTIA clarified that the recommended short-term solution is that each CMRS provider would provide at least one compliant phone model for each digital technology that the service provider offers, *i.e.*, CDMA, TDMA, PCS-1900(GSM), and iDEN. The Consumer Organizations stated that the significant factor is that each service provider must support TTY on its selected digital technology. They stated that it is not acceptable to send a TTY user to another provider using that same technology.

During the discussion of the "one phone model" short-term solution, the Consumer Organizations requested clarification on several issues. They wanted to know what happens after October 1, 1998. Once the short term solution is in place, what time frames exist to ensure that long-term solutions are met? While CTIA and PCIA emphasized their commitment to working with the TTY Forum until the work is completed, the Consumer Organizations recommended that the TTY Forum seek a consensus on benchmarks. Such consensus should include a workplan and discussion with the FCC as to what can be accomplished within the specific time frames and benchmarks.

The Consumer Organizations also expressed their concern that the "one phone model" solution may require their constituents to purchase a phone with inadequate features and functionalities and that only the highest priced models would be made available. Several Forum Members suggested that the Consumer Organizations compile a list of the features and functionalities that the one phone model must have to meet their needs, *e.g.*, vibrator, portability, error rate, and provide that list to the TTY Forum. The Consumer Organizations also stated their concerns regarding the availability of the "one phone model" at the point of sale, *i.e.*, whether the TTY-compatible digital phone would be a "special" product that would take weeks to "special order." Several members of the TTY Forum clarified that a customer who wanted the TTY-

⁸ Mr. Phythyon also indicated that the quarterly status reports submitted to the FCC would be an appropriate mechanism to inform the FCC of the TTY Forum's activities and to seek FCC guidance on regulatory issues that may arise during future meetings. CTIA also asked that an FCC representative attend TTY Forum Meetings as an observer. See Ex Parte Letter from Andrea Williams, Assistant General Counsel, CTIA to Ms. Magalie Salas, Secretary, Federal Communications Commission, dated March 26, 1998, filed in CC Docket No. 94-102.

compatible digital phone model would be treated in the same manner as other customers. If the TTY-compatible digital phone model was out of stock, it would be ordered and delivered to the customer promptly just as any other out of stock phone model would be ordered and delivered promptly to a customer. The Consumer Organizations requested clarification on the connector between the phone and the TTY. For example, would the user obtain the connector from the wireless equipment manufacturer, the carrier, or the TTY manufacturer? Who would pay for the connector?

Several TTY Forum Members acknowledged that the test results and reports from the Working Groups were key to this discussion. The Consumer Organizations expressed their concern that it was futile to discuss this issue at the April 1998 Forum Meeting without information from the Working Groups. Accordingly, the TTY Forum agreed to table this discussion until the May 1998 Forum Meeting.

B. Long-term Solutions

The TTY Forum has identified several long-term solutions that provide for future advancements in technology by looking at solutions beyond 45.45 baud, Baudot signaling. One solution is to develop a method whereby the Baudot signal bypasses the vocoder. Another long-term solution is defining a new service whereby a deaf or hard of hearing person uses a Personal Digital Assistant (PDA) device with a digital interface to connect directly with the digital wireless phone. The TTY Forum also identified data services as a long-term solution.⁹ Although the Stakeholders have different interpretations as to whether the FCC E9-1-1 rules require VCO/HCO access to 9-1-1 over digital wireless systems, it is the consensus of the TTY Forum that Working Group #2 will examine VCO/HCO issues under long-term solutions.

III. Steps Taken To Achieve Proposed Technical Solutions

A. Working Groups Established

At the September 1997 Forum Meeting, the TTY Forum established three Working Groups to address short-term and long-term solutions for TTY access to 9-1-1 over digital wireless systems. The TTY Forum directed Working Group #1 to address the performance of TTY Signals over voice service and Working Group #2 to address the performance of TTY signals over data service ("long-term solutions"). The Forum also directed Working Group #3 to address coupling as a short-term solutions. The TTY Forum agreed on the scope of the work for each Working Group and anticipated that the Working Groups would work concurrently to develop appropriate test standards, conduct tests, evaluate test results, and specify requirements to achieve TTY access to 9-1-1 through digital voice services, data services, coupling and direct connection.¹⁰

⁹ With respect to data services, the TTY Forum envisions a solution that will provide two-way, real-time, open network data capability, *e.g.*, Internet chat room, rather than two-way, delayed text messaging, *e.g.*, electronic mail via Internet.

¹⁰ See Resolution Document from Wireless TTY Forum - 1 in Appendix D, attached hereto.

Based on the impending October 1, 1998, compliance date, the TTY Forum reorganized the efforts of the Working Groups. The TTY Forum agreed to combine Working Groups #1 and 3 and develop a new set of deliverables based on the FCC's October 1, 1998, compliance date. The Forum concluded that in order to meet the compliance date, Working Group #3 would focus on developing interface specifications for acoustic coupling and direct connection. Working Group #3 noted that digital technology currently exists that can operate a modem via an RJ-11 interface, but it is bulky and expensive. The trade-off is that it is readily available, off-the-shelf. A refined handset design, portability, and reasonable cost, however, will not be commercially available by October 1, 1998. Working Group #1 will use the interface specifications developed by Working Group #3 to pass the signal through the vocoder so that it interprets the Baudot tones as if they were voice tones. Working Group #1 will also evaluate the performance of TTY signals over voice sent via acoustic coupling (connection with 2.5mm jack and RJ-11 interface and handset directly placed on TTY's cups). The TTY Forum also redefined the scope of Working Group #2 to deliver a written report by October 1998 which outlines specifications for agreed upon long-term solutions. It was noted that Working Group #2 may have to provide a technical proposal in order to determine the workability of the long-term solutions.

B. Short-term Solutions

Several wireless phone manufacturers indicate that they are in the process of testing the performance of TTY signals over voice services via acoustic coupling and direct connection. However, only one manufacturer to date has demonstrated and shared preliminary results with the TTY Forum on the technical feasibility of these short-term solutions.¹¹

The preliminary results from the demonstrations indicate that in a laboratory, TTY signals may be sent with relatively few errors over an analog wireless system and over a PCS 1900 (GSM) wireless system using acoustic coupling via placing the handset in the TTY cups or via a connection with a 2.5mm jack to a RJ-11 interface. The manufacturer noted that this potential short-term solution has its drawbacks. For example, the TTY device may need design modifications. Another coupler that provides an RJ-11 interface is commercially available but it requires an external power supply. The manufacturer also indicated that while this solution may be technically feasible, it may not support user portability requirements since the handset needs to be streamlined. While it appears technically feasible for the resistors and capacitors to be on the connecting cables, the connection is not simple. The manufacturer indicated that a "middleware" is needed rather than making changes to all existing TTY devices.

The manufacturer's initial findings suggest that standardization of the connection must be undertaken to allow for a variety of TTY devices to interconnect efficiently and effectively with

The Resolution Document describes the scope of the work and the charge to each Working Group.

¹¹ See Appendix B, attached hereto, for preliminary test results submitted by Ericsson. See also Appendix F, TTY Forum - 2 Report, 10-11.