

September 14, 1999

To: TIA TR-45.3

Fr: Consumer Representatives, Wireless TTY Forum
Authors: Judy Harkins, Gallaudet University and Dick Brandt, dB Consulting as consultant to Gallaudet
David Baquis, Self Help for Hard of Hearing People, Inc.
Alfred Sonnenstrahl, Consumer Action Network
Claude Stout, Telecommunications for the Deaf, Inc.
Karen Peltz Strauss, National Association of the Deaf
Norman Williams, Gallaudet University

Re: Guidance to TR-45 on Proposals for Solutions to TTY over TDMA

Presentations on three of the proposals being considered by TR-45 for the TDMA TTY solution were made at the September 9, 1999 meeting of the Wireless TTY Forum. Given the timeframe TR-45 is operating under, and given that the FCC has directed industry to consider consumer issues in determining solutions, we offer this document as guidance to TR-45 as it considers the alternatives.

The information presented at the September 9 meeting was, in some cases, sufficiently sketchy that consumers were unable to ascertain the functional implications of the proposals. Some presentations were also done very late in the process, so there is not sufficient time for analysis.

We do not state a preference for any proposal but hope the following discussion will be helpful.

General Questions and Issues:

1. There is a concern among consumers about the implications of roaming among digital technologies in the future, if a variety of approaches for TTY access are used. Thus we believe consistency in approach across technologies is needed. One of the carriers also strongly expressed this view. This problem needs to be solved for the long term, not just for the current situation where roaming tends to go to the more-accessible analog network. Once these solutions are implemented, if problems arise, consumers will have great difficulty having them addressed because the solutions are within the network and customer service personnel will not be equipped to deal with them.
2. Has there been any analysis indicating that approaches which propose network changes in switches versus changes in base stations, would lead to earlier availability as claimed? Consumers are interested in seeing solid, lasting and effective solutions, and the speed of implementation, while important, should not override usability considerations.
3. All test results presented to date have been obtained using blocks of data sent out from a file stored either in a TTY or in a computer and sent via a TTY modem. It has been noted in tests

run by Gallaudet that results obtained in an interactive mode (two people typing to each other) yielded poorer accuracy. Thus proposals that show errors in transmission should be scrutinized carefully. A full range of system impairments has either not been used in simulation testing or not reported on all of the solutions.

4. Non-activated phone support for 9-1-1 calls is required by the FCC. Has this been considered in the proposals? (See class mark discussion below.)

Appraisal of Specific Solutions:

Vocoder solution. From a consumer perspective, the Lucent “no gain” solution has been most thoroughly presented and appears to have the most transparent accessibility and the most support for consumer needs and requirements. The inclusion of error correction is a major benefit, given that the air interface presents new challenges to TTY transmission. Other, comparable proposals may also have merit (e.g., Nokia), but they have not been thoroughly explained so that consumers can compare them.

Code conversion. The Ericsson (and Nokia?) Code conversion (“tone”) proposals appear to offer the possibility of earlier implementation (see 2 above) and the ability to use many existing handsets, but have the potential of putting the retrofit burden on the consumer. They raise the following concerns:

1. Smart Cable: Consumers are not opposed to the idea of including intelligence in the cable per se, however the following concerns exist:
 - 1.1. How would this intelligence be powered? (This question could not be answered at the Sept. 9 meeting.) There is opposition to the requirement for an additional battery for reasons of cost, bulk, and reliability.
 - 1.2. Who would make and provide the cable?
 - 1.3. Would this intelligence be built into the regular cable product line or would this be a primarily or exclusively “deaf” product? If the latter, experience shows that provisioning and cost may be serious problems. Customers often have to wait many weeks for “special” accessories. We realize standards bodies do not ordinarily address cost issues, but please consider the additional cost of a phone that vibrates (over a low-end phone), the cost of the TTY, and now the potentially high cost of a special-purpose cable with a small market.
 - 1.4. Would one cable fit all (thereby lowering the price and expanding the availability)?
2. Class Mark: Any system that relies on the phone having a class mark denoting that the user uses a TTY is not likely to be successful, because many deaf and hard of hearing people consider self-identification as a possible threat to their security. 9-1-1 operators have never been successful in having deaf and hard of hearing subscribers “sign up” as a TTY telephone number. The procedure is fraught with potential problems and snafus. When someone roamed into a carrier using this solution (not marked), what would happen? Hearing people who use TTYs may not realize they need to enroll their phones. People who have a phone and acquire a TTY later (e.g., after onset of hearing loss) would find the TTY does not work. TTY users could not use someone else’s cell phone. One solution to this problem suggested

at the forum was to mark all phones as TTY. Would carriers agree to this? In short, a system that provides automatic detection of the TTY signal is preferable.

IWF. Although we recognize that IWF proposals are not a part of the present TR-45 TDMA TTY discussions we would also like to provide the following for your information, as they should be considered in development of proposals:

1. There is a strong desire for VCO/HCO capability, which appears to be difficult to implement in IWF solutions at the present time.
2. There is also a strong desire for provision of the line signal power indicator (flickering light) used to interpret call status.
3. Consumers are opposed to (and the DOJ has mandated against) requiring any form of special dialing (e.g., two-stage) or conditioning sequences (e.g., #NN) to reach 9-1-1.
4. It will be important that the delay between powering on a data device and dialing out not exceed the delay experienced with a voice call.

Appendix: Consumer requirements with comments regarding proposed solutions:

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

Comment: All proposals presented to date appear to meet this criterion. Consumers are concerned that there be sufficient testing to validate this in the field.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Comment: All proposals claim to meet this criterion and we have no concerns. (IWF solutions may, however, not be able to meet this one.)

3. There must be a visual indication when the call has been disconnected.

Comment: This specific issue has not been addressed in presentations but is covered by most if not all systems by a message on the display of the phone.

4. A volume control should be provided.

Comment: This item is intended to allow the TTY user to adjust volume for better reception of TTY tones as necessary. Most if not all handsets include this feature anyway. It has not therefore been addressed in presentations on solutions.

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Comment: Again, this is an issue of general provisioning and not related to voice-channel solutions. (However, this will be an issue in IWF solutions.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Comment: All voice-channel solutions to date appear to support this.

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: All solutions to date appear not to require retrofitting of the landline TTY.

8. The wireless party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

Comment: Solutions that do not require retrofitting or special treatment are preferred by consumer representatives.

9. VCO and HCO should be supported where possible.

Comment: Voice-channel solutions presented to date appear to support this requirement. (IWF solutions may not, however.)

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

Comment: No solution presented to date reduces throughput, as nearly as we can tell. This should be verified with the companies proposing solutions.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

Comment: Voice channel solutions should not cause a problem with this.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

Comment: This is of concern because of limited testing of solutions to date.

13. Drive conditions must be supported, again using AMPS as a benchmark.

Comment: This requirement has not been adequately addressed by testing.

APPENDIX F

WORK PLAN

Published as a separate TTY Form Document

APPENDIX G

Typical Operating Characteristics for Wire-Line Based TTYs

The following is a technical description of the typical operating characteristics for existing wire-line based Text-Telephones for the Deaf (TTYs). This document is not intended to be a performance description of any one product, but to give a representation of performance of the majority of the product supplied to wire-line TTY customers in the last five years. TTY manufacturing representatives has reviewed this information and agrees that it represents an accurate account of the performance characteristics of existing wire-line products.

It should be noted that it is not possible to precisely define performance for all products, in all situations, in the field. Variation beyond this technical representation does exist for older product, products that are no longer supported by a manufacturer, individual products that are not operating correctly and improper use of product. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TECHNICAL BACKGROUND

For Frequency Shift Keying (FSK) two signal frequencies are required to modulate the asynchronous serial data to be sent over the conventional voice grade telephone lines of the switched telephone network. For Baudot communications to be useful on the Public Switch Telephone Network (PSTN) these frequencies fall within the central portion of the telephone line pass-band (300 – 3300 Hz).

The two frequencies of the transmitted signal must be sent in accordance with FCC requirements defined in dBm (decibels with reference to a power of one milliwatt for metallic connections, where 0 dBm = 1 milliwatt). The acoustic measurements are in dBSPL for acoustic configurations. This signal is measured at the TTY interface, either at the metallic connections or where it is acoustically coupled to the telephone network.

The receive level, commonly referred to as sensitivity, is also given for each pair of frequencies. This signal, also measured in dBm for direct connections and dBSPL for acoustic configurations, is the typical signal measured at the connection that will result in error-free reception of a test message.

BAUDOT CODE OPERATION

All TTYs provide Baudot code operation employing half-duplex, simplex, asynchronous, FSK transmission.

Frequencies

Baudot code operation used the following frequencies:

Signal	Frequency	Tolerance	
		Transmit	Receive
Mark	1400 Hz	±1%	±4%
Space	1800 Hz	±1%	±4%

Bit Duration

The bit duration is 22.00 milliseconds (ms) ±0.40ms to provide a nominal baud rate of 45.45 bits per second.

CHARACTER FORMAT

Transmit

The Baudot code for each character is transmitted with the following format, the data bits assigned are in accordance with Table 1.2 with a “1” in the binary representation transmitted as a mark and a “0” as a space.

Bit	Start	Data	Data	Data	Data	Data	Stop
Signal	Space	LSB	Bit 2	Bit 3	Bit 4	MSB	Mark
Number of Bits	1	1	1	1	1	1	1.5-2.0 2.0 Typ.

Table 1.1

Where the LSB is the Least Significant Bit and the MSB is the Most Significant Bit. The bits shall be transmitted from left to right.

Receive

The TTY is capable of receiving characters with the format of Table 1.1 with a stop bit of at least 1.0 bit length or longer. The receiver is capable of receiving characters either with the space tone of the start bit as the first tone received or with a mark tone preceding the start bit.

Mark Hold Time

The mark hold time defines an additional period of time during which the TTY transmits a mark hold tone (1400 Hz) following the last character transmitted. Mark hold tone is not transmitted between each character if the character is followed immediately by another character. The mark hold tone is transmitted for a period between 150ms to 300 ms after the end of the stop bit(s).

Transmit Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	108 dBSPL -10 dBm	± 6 dB * - 3 ,+1 dB

Sensitivity Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	72 dBSPL -40 dBm	± 6 dB * ± 5 dB

Most receivers are capable of receiving signal up to at least -5dBm.

* NOTE: Acoustic performance variations greater than listed may be encountered and are a result of many variables including the type of telephone handset used and how well the acoustic coupling is made by the user. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TABLE 1.2

Set of Baudot Codes for TTYs

	DEC	HEX	BINARY	LETTER	FIGURE
0	00	00000	BackSpace	BackSpace	
1	01	00001	E	3	
2	02	00010	LF	LF	
3	03	00011	A	-	
4	04	00100	Space	Space	
5	05	00101	S		
6	06	00110	I	8	
7	07	00111	U	7	
8	08	01000	CR	CR	
9	09	01001	D	\$	
10	0A	01010	R	4	
11	0B	01011	J	'	
12	0C	01100	N	,	
13	0D	01101	F	!	
14	0E	01110	C	:	
15	0F	01111	K	(
16	10	10000	T	5	
17	11	10001	Z	"	
18	12	10010	L)	
19	13	10011	W	2	
20	14	10100	H	=	
21	15	10101	Y	6	
22	16	10110	P	0	
23	17	10111	Q	1	
24	18	11000	O	9	
25	19	11001	B	?	
26	1A	11010	G	+	
27	1B	11011	FIGS	FIGS	
28	1C	11100	M	.	
29	1D	11101	X	/	
30	1E	11110	V	;	
31	1F	11111	LTRS	LTRS	

Note: CR and LF may be manually or automatically generated by the TTY. If automatic generated, the sequence may contain an extra (non-printable) character to provide adequate time for older electromechanical TTYs to respond. CR & LF are inserted into the transmitted characters after a maximum of 72 characters to allow for the carriage return of older electromechanical TTYs.

APPENDIX H

Modem / IWF Manufacturer Contact List

List of Names and Addresses to Receive IWF Letter

Title	FirstName	LastName	JobTitle	Company	Address	Address 2	City	State	Zip
Ms.	Veda	Krishnan		Cirrus Logic	110 Horizon Drive		Raleigh	NC	27615
Mr.	Zarko	Draganic	CEO	Alto Com Inc.	257 Castro Street	Suite 233	Mountain View	CA	94041
Mr.	Edward	Campbell		3Com					
Mr.	Raouf	Halim	VP and General Manager, Network Access Division	Rockwell Semicon ductor Systems	4311 Jambor ee Road		Newport Beach	CA	92660-3095
Mr.	Aaron	Fisher	Vice President , Wireless Products	Lucent Technolo gies	Room 55F-311	1247 S. Cedar Crest Blvd.	Allentown	PA	18105-6209
Ms.	Judy	Sheff	VP Intellectual Property	Lucent Technolo gies	Room 55F18	2 Oak Way	Berkley Heights	NJ	07922-2747
Mr.	Greg	Garen	General Manager Modem and Multimedia Products	Lucent Technolo gies - Microele tronics Group	Room 22W-219(Ma il Stop EQ)	555 Union Blvd.	Allentown	PA	18103-1229
Mr.	Warren	Henderso n	CEO	Henderso n Laborato ries					
Mr.	Moiz	Beguwala	VP and	Rockwell	4311		New	CA	926

Title	FirstName	LastName	JobTitle	Company	Address	Address 2	City	State	Zip
			General Manager, Personal Computi ng Division	Semicon ductor Systems	Jambor ee Road		port Bea ch		60- 309 5

CC: National Association of State Relay Administration (NASRA)
Merilyn Crain, Chair
315 So. College Rd. Suite 208
Lafayette, LA 70503

IWF letter dated November 16, 1998

Sent to:

3Com

Mr. Zarko Draganic, CEO, Alto Com Inc.

Ms. Veda Krishnan, (to be supplied) Cirrus Logic

Mr. Aaron Fisher, Vice President, Wireless Products, Lucent Technologies

Ms. Judy Sheff, VP Intellectual Property, Lucent Technologies

Mr. Greg Garen, General Manager Modem and Multimedia Products Lucent Technologies -
Microelectronics Group

(To be supplied), Motorola

Mr. Raouf Halim VP and General Manager, Network Access Division, Rockwell Semiconductor
Systems

Mr. Moiz Beguwala, VP and General Manager, Personal Computing Division, Rockwell
Semiconductor Systems

Dear Sir/Madam

In response to a FCC inquiry, the Cellular Telecommunications Industry Association (CTIA) and the Personal Communications Industry Association (PCIA) have established a technical forum to address the issue of providing reliable communications for deaf and hard of hearing people over digital wireless systems. Specifically this forum is addressing the issue of deaf and hard of hearing people using digital wireless connections to access 9-1-1 centers.

A solution that appears to offer promise for the longer term, involves the use of new (or modified) communications terminals, used by deaf and hard of hearing people, (TTYs) connected through a serial interface to the digital cell phone. The data channel, provided by the air interface, would then be used to effectively extend this interface to the network. This of course, would require the use of an Interworking Function (IWF)*² in the network that would be capable of supporting TTY communications. We are aware that some of the IWFs being developed will support 45.45 Baudot TTY transmission (the transmission mode most commonly used by deaf and hard of hearing people in the United States). While this caters well to the present need, it has the drawback that it locks deaf and hard of hearing people into this older technology.

A more desirable solution would be one which would involve the use of ITU-T Recommendation, V.18, that specifies a protocol, which provides for higher speed ASCII based communications while at the same time maintaining compatibility with today's Baudot TTY devices. The problem with this solution is that V.18 has yet to be implemented by any major modem manufacturer. We have, however, been given a presentation by a UK based company that has developed a prototype "stand alone" V.18 product which it plans to introduce commercially early next year. In addition to this, we have been given a demonstration of an in-service Swedish IWF, which incorporates V.18 functionality. It might also be of interest to note

² The term IWF is used in its broadest sense in this letter. (See the definition in TIA TSB-100)

that the service provider sees text telephony as a generic service (e.g. not just for deaf or hard of hearing). These two events may be moving V.18 into the readily achievable category.

It seems likely that if the IWF function and the modems installed at the 9-1-1 centers were to incorporate V.18 capability, connections could be made at the higher V.18 rates. Likewise it would appear that the connect time could be shortened as V.18 incorporates a calling tone, which could be instantly recognized by equipment at the 9-1-1 centers, thereby eliminating the loss of precious time, which is normally incurred while attempting to determine the source of a "silent" call.

Assuming that you agree that the timely provision of this functionality is important, we are hoping that you can provide us with an indication of when we might expect to see products (e.g. consumer modems, IWFs) from your company that implement V.18. Any information you could provide to us, by 4th Quarter 1998, would greatly help us in developing our response to the FCC.

APPENDIX I

TTY Forum Chair's Update Memorandums

Date: March 22, 1999

FM: TTY Forum Co-Chairs; Ed Hall, CTIA and Todd Lantor, PCIA
TO: TTY Forum Members and Interested Parties

RE: TTY Forum Update

Greetings,

A recent conversation with Dr. Steven Benno of Lucent Technologies has informed us that he has completed the Lucent software simulation of the TTY "no-gain" solution and it is now released and available to all those interested in exploring its functionality, compatibility and potential benefits with various CLEP vocoders. According to Dr. Benno, the following equipment and infrastructure vendors have requested a copy of his newly released code for testing purposes; Ericsson, Motorola, Nokia, NORTEL and Qualcomm. As co-chairs, we remain hopeful that this Lucent contribution will spark an interest for some manufacturers to re-visit their past efforts with vocoders, which perhaps may lead to follow-on contributions at our next TTY Forum.

During the last TR45 meeting, (March 3-4) CTIA submitted the 2.5mm Jack SRD, on behalf of the Forum. TR45 accepted this contribution and remanded it to the TDMA (TR45.3) and CDMA (TR45.5) sub-committees for information and to the appropriate sub-committee (TR45.1) for Action. Likewise, the TDMA and CDMA sub-committees reported back to the Chair that both of these digital technologies have developed standards supporting the Inter-working Function (IWF) as described in the TTY Forum's SRD on Circuit Switched Data submitted during the December TR45 meeting. This news brings the industry one step closer to the Forum's proposed "long term" data solution. The willingness of some modem manufacturers (3COM) to support the V.18 protocol is the other critical issue needed to make the IWF a viable option to carriers as a means of supporting TTY over digital - long term. The IWF solution opens the doors to the future by allowing end-users the use of ultra-light computers, compact PDA's, etc.

At this point I think it is important to remember that it has been the synergy, team-spirit and positive environment provided by the members of the TTY Forum that has lead us to this point. But, we do not want anyone to have the false impression that the end-all, be-all solution(s) have thus far been developed. Although Dr. Benno's "no-gain" solution remains a major breakthrough for TTY, "short term", voice based (specifically CLEP vocoders) solution and the V.18 protocol a major breakthrough for TTY "long term", data solution these by no means require carriers or manufactures to implement anyone one or both of these solutions. Keep in mind the other solutions brought to the Forum by Lober and Walsh and Ericsson. These solutions have also proved to be quite successful and promising for certain digital technologies. It is important to keep in mind that the carrier is responsible for the selection and implementation of a solution(s) that will allow TTY users to access 9-1-1 over its digital system. The best we as a Forum can do at this point is continue to provide the positive environment, feedback and input to manufacturers and carriers regarding testing and consumer needs and requirements and keep the standards development bodies involved when needed. CTIA and PCIA remain committed.

In conclusion, we propose that at the next TTY Forum we initiate the process to develop the final report to the FCC. Based on the contributions received to date and those anticipated at our next meeting, we believe we will have sufficient information to develop specific comments and recommendations. The TTY Forum can then plan to meet on a quarterly basis to "evaluate" progress and provide the FCC with a periodic, implementation status report.

My thanks to all members of the TTY Forum. Looking forward to seeing everyone in May.

July 23, 1999

Fm: TTY Forum Co-Chairs
TO: TTY Forum

RE: Update: TTY Forum and Interested Parties

Todd Lantor and I would like to take this opportunity to provide you with an overview of some interesting developments that have come to our attention since the last Forum held on May 18th, 1999.

The Lucent "no gain" vocoder solution has been widely accepted by TR45.5, the CDMA air-interface standards group. The "no gain" solution draft standards document has recently been prepared for ballot. Assuming a "clear" ballot response, the industry may have a CDMA TTY standard as early 4Q99. Likewise, TR45.3, the TDMA air-interface standards group is actively pursuing the same course as the CDMA group. The Nokia variation, presented to the Forum during the May meeting is being reviewed and considered. The group plans to complete its deliberation quickly and move toward the final stages by preparing a draft document for ballot.

Ericsson has provided the co-chairs with a copy of a document that proposes an alternative approach to the Lucent "no gain" vocoder solution. In the interest of time, and to take advantage of the TR45.3 meeting cycle, Ericsson thought it prudent to submit the alternative approach directly to the TDMA working group. Although it is being discussed at standards, Ericsson will present this vocoder alternative at the upcoming September TTY Forum.

Concurrently, we are preparing a draft "TTY Forum Status Report" for the FCC. The report, as a minimum, will contain the following sections:

- Updated Work Plan
- TTY testing completed to date
- A Technical Standards Update
 - Voice Based Approach
 - Data Approach
- Comments and Recommendations

Todd and I plan on getting a draft of this report to the TTY Forum Steering Committee for their review and approval before the next TTY Forum: The Steering Committee is comprised of: Toni Dunne, Texas 9-1-1; Billy Ragsdale, Bell South; Claude Stout, TDI; Norm Williams, Gallaudet UN; Jeff Crollick, TIA; John Melcher, NENA.

Next Meeting: We are currently making arrangements for the **September 9, 1999** TTY Forum and will get the meeting logistics out separately.

The meeting will be in the **Washington DC** area but **WILL NOT** be at Gallaudet Univ. Their calendar cannot support us. The meeting will start at **9:00 AM** and adjourn at 5:00 PM. Please do not make travel arrangements leaving the DC area before 6:30 PM. Now that we have reduced the meetings to one day, I see this Forum's agenda as being quite full.

Thank you all and have a very cool and pleasant summer. See you September!

Appendix J

Technical Standards Reference

<u>ID</u>	<u>Description</u>
TIA/EIA 825	FSK
TIA/EIA TSB-121	"2.5 mm AUDIO INTERFACE FOR MOBILE WIRELESS HANDSETS - TEXT TELEPHONES (TTY)"
TIA/EIA-IS-823 (PN-4614)	TR 45.3 5.3 TDMA TTY Solution- 410 vocoder
TIA/EIA-IS-840 (PN-4721)	TR 45.3 5.3 TDMA TTY Min Performance.
TIA/EIA/IS-789-A: IS-733-1, IS-127-2	Electrical Specification for the Portable Phone to Vehicle - CDMA Vocoder Standards - high rate
IS-707-A-2	CDMA Data (V.18) Standard
TIA/EIA-136-270-B	TDMA Third Generation Wireless – Mobile Stations Minimum Performance
TIA/EIA-136-280-B	TDMA Third Generation Wireless – Base Stations Minimum Performance
3GPP TR26.226	Cellular Text Telephone Modem Description
3GPP TR26.230	Cellular Text Telephone Modem Transmitter Code
3GPP TR26.231	Cellular Text Telephone Modem Minimum Performance Specifications

Timeline of Events in CDMA and TDMA standards

CDMA: TIA TR45.5.1.1

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August 2000: Lucent proposed bug fixes to the TTY/TDD addenda and proposed a TTY/TDD Minimum Performance Specification for CDMA.

November 2000: Nortel proposes to add a test vector to the Min Perf Spec in order to handle the hard handoff scenario. This scenario uncovers another bug in the code.

Dec 2000: Lucent proposes another bug fix, which is approved, but the subcommittee doesn't baseline the fixes in order to give more time to find problems.

Jan 2001: Updates to the TTY specifications and Min Perf Specs are baselined and sent to V&V.

TDMA: TIA TR45.3.5

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October 2000: Proposed bug fixes to IS-823 TTY Extension to TIA/EIA 136-410.

December 2000: Proposed additional bug fix similar to the bug fix proposed for CDMA in Dec. 2000.

January 2001: Nokia and Ericsson present contribution questioning the necessity of any bug fixes. Nokia proposes change to standard to improve TTY performance during signaling.

February 2001: A problem is found with IS-840 TTY/TDD Min Perf Spec for TDMA. Nokia (the editor) will provide an update to fix problem and update based on Nokia's proposed change to IS-823.

March 2001: Changes to IS-823 are approved. Nokia commits to having a new version of IS-840 for review by next meeting. The subcommittee decides to ballot new versions of IS-823 and IS-840 together.

APPENDIX K

Glossary of Terms

Telecommunications Standards and Assignment Organizations

ANSI - American National Standards Institute

The ultimate accolade for any standard is ANSI certification. This does not mean that ANSI has reviewed the standard, but that it has been circulated widely throughout the industry and that it conforms to their document design and publication guidelines. TIA standards, for example, start their public life as an IS- (Interim Standard) and then proceed within a few years to a full ANSI standard. The analog cellular standard started as EIA/TIA IS-3 and is now the ANSI standard identified as EIA/TIA-553.

ATIS - Alliance for Telecommunications Industry Solutions

The major US telecom standards organization beside the TIA, most responsible for ANSI SS7 standards. This organization was previously called ECSA; Exchange Carriers Standards Association. SS7 and wireless standards are developed within the T1 committee.

Bellcore - Bell Communications Research

Bellcore is not a standards organization, but they do write technical documents that are treated as if they were standards by many telecommunications carriers, particularly their former owners, the 7 regional bell operating companies. These documents include the GR-145 specification for interconnect, enhanced SS7 specifications beyond ANSI and the WACS low-mobility PCS system. Bellcore also performs many other research and consulting functions.

ETSI - European Telecommunications Standards Institute

The mission of ETSI is "to produce the technical standards which necessary to achieve a large unified European telecommunications market". This includes the specification of the GSM cellular and PCS standard.

IFAST - International Forum on ANSI-41 Standards Technology

A forum on international cellular carriers, vendors and service providers that attempts to resolve international roaming problems with AMPS-compatible systems (i.e. including IS-136 D-AMPS and IS-95 CDMA). The organization has taken responsibility for allocating the International Roaming MIN resources (MIN's starting with the digits 0 or 1) and new blocks of SID codes.

INC - Industry Numbering Committee

The Industry Numbering Committee (INC) is a standing committee of the Carrier Liaison Committee (CLC). The INC provides an open forum to address and resolve industry-wide issues associated with the planning, administration, allocation, assignment and use of resources and related dialing considerations for public telecommunications within the North American Numbering Plan (NANP) area.

ITU - International Telecommunications Union

The ITU is the global equivalent of ANSI for telecommunications standards. In fact, the world is divided into the majority of countries that adhere to ITU standards, and the US and Canada that tend to use ANSI standards. AMPS cellular is an exception, as it

has been implemented in many other countries. ITU standards that are used in AMPS cellular include: E.164 - the global numbering plan. E.212 - the global mobile identification plan. Q.7xx - a series of standards defining Signaling System #7 (used as an alternative to ANSI SS7 in AMPS countries outside the US and Canada).

NANPA - North American Numbering Plan Administration

The organization responsible for allocating numbering resources within the North American Numbering Plan Area: USA, some of its territories, Canada and several Caribbean nations. Controlled by Bellcore until January 1998, it is now managed by Lockheed-Martin. It is responsible for assignment of new area codes within the North American Numbering Plan and office code assignments within US states and territories.

NENA - National Emergency Number Association

NENA, along with NASNA (National Association of State 9-1-1 Administrators), APCO (Association of Public Safety Communications Officials) and the TIA are responsible for promoting enhanced 9-1-1 standards for wireless systems.

TIA - Telecommunications Industry Association

WWITF – Wireline Wireless Integration Task Force

Government and Regulatory Organizations

Australian Communications Authority (ACA)

The organization responsible for the management of radio spectrum and telecommunications in Australia, formed by a merger of AUSTEL and SMA. APUMP represents people who are unhappy with the decision to eliminate analog cellular by the year 2000 in favor of the three GSM systems.

RSP - New Zealand Radio Spectrum Authority

Responsible for the management of radio spectrum in New Zealand.

US Dept. of Commerce

The Office of Telecommunications provides a great online source of worldwide wireless telecommunications information.

FCC - US Federal Communications Commission

The organization responsible for the management of telecommunications in the United States. Their responsibilities for public radio communications, such as cellular, include allocation of frequencies, the development of regulations that govern their use and monitoring to ensure that regulations are followed.

Wireless Telecommunications Trade Associations

ATIS – Alliance for Telecommunications Industry Solutions

CTIA - Cellular Telecommunications Industry Association

A trade association of wireless carriers in the United States, Canada and other countries. Originally a cellular organization, it now has members that are Manufacturers, PCS, ESMR and Satellite carriers.

CWTA - Canadian Wireless Telecommunications Association

A trade association of wireless carriers in Canada.

MMTA - Multi-Media Telecommunications Association

An association of companies focused on computer-telephony integration. They announced in November 1996 that they were merging with the TIA.

PCIA - Personal Communications Industry Association

Formerly Telocator, this organization represents Paging, PCS, ESMR, SMR and mobile data service providers as well as communications site managers, equipment manufacturers, and others providing products and services to the wireless industry.

TIA - Telecommunications Industry Association

United States Telephone Association.

A trade association for US local exchange carriers.

Wireless Forums

CDG CDMA Development Group

A trade association dedicated to the promotion of CDMA wireless technology.

MIPS Mobile Internet Phone Services Forum

A new group dedicated to promoting the development of Internet access technologies, services and features from mobile devices.

PACS Providers Forum

PACS (Personal Access Communication System) is a PCS system based on Bellcore's WACS and Japan's PHS, that will provide 64kbps voice and data, but is restricted to low mobility applications.

Universal Wireless Communications Consortium

Promoters of the IS-136 TDMA digital cellular and PCS standards, mostly through conferences and symposiums.

WDF The Wireless Data Forum is an independent, protocol-neutral trade group dedicated to promoting the wireless data industry. WDF's members include wireless operators and equipment providers, application developers and information technology companies working to advance wireless and mobile data products and services.

Glossary

Analog Signal A signal that varies in a continuous manner, such as voice.

ANI Automatic identification of the calling station

ANSI American National Standards Institute.

ATIS Alliance for Telecommunications Industry Solution (formerly ECSCA). Responsible for ANSI SS7 standards and US GSM standardization.

BS Base Station

CPAS Cellular Priority Access Service

ESN Electronic Serial Number

GETS Government Emergency Telephone Service

HLR Home Location Register (database of subscriber records)

IFAST International Forum for AMPS Standards Technology

INC Industry Numbering Committee

IS TIA Interim Standard.

JEM Joint Experts Meeting

J-STD Joint ATIS and TIA standard.

LERG Local Exchange Routing Guide

LEA Law Enforcement Agency
MS Mobile Station (i.e. wireless phone)
MSC Mobile Switching Center (aka MTSO)
NAG Numbering Advisory Group
PACA Priority Access Channel Assignment
PN TIA Project Number. Identifies a project during development of a standard.
SP ANSI Standards Proposal. ANSI equivalent of a PN
TLDN Temporary Local Directory Number
TIA Telecommunications Industry Association
TTY Text Telephony
TDD Telecommunications Device for the Deaf
VLR Visited Location Register
WIN Wireless Intelligent Network

APPENDIX L
Industry Implementation Status Reports
Contained within are written industry TTY implementation
status reports as submitted to the Secretariat.

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AT&T Wireless

10 October, 2001

3rd Quarter TTY Progress Report

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Please Note: AT&T Wireless' current network, supporting approximately 16 million customers in markets nationwide, operates on the TDMA (ANSI-136) air interface. The company is launching a new network based upon the GSM air interface standard, for which AT&T Wireless seeks to ensure TTY compatibility per the FCC's regulations. Please note, however, that the overwhelming majority of the company's current customer base is supported by the TDMA network.

Network Infrastructure Software Development

TDMA Network: AT&T Wireless has received the following information regarding the status of TDMA (ANSI-136) IS-823A software development:

Ericsson: Ericsson is completing integration of IS-823A support as a correction to Version 7 ANSI, which should be available to our lab for testing in Q4, 2001

Nortel: Nortel has integrated IS-823A support as a "prep" release in MTX10

GSM Network: AT&T Wireless has received the following information regarding the status of TTY-capable GSM network software and hardware:

Ericsson will support TTY through a separate network element, known as the CTM node. This node will convert CTM (Cellular Text Modem, as defined by 3GPP TS 26.226 and related standards) signals from the air interface to Baudot, and vice-versa. The CTM node should be available for lab testing in Q4, 2001

Handset Development and Testing Plans

TDMA Handsets: AT&T Wireless has obtained information from three TDMA (ANSI-136) handset vendors concerning the status of their TIA/EIA IS-823 development and testing efforts. The information obtained from each is summarized below:

Ericsson: Ericsson reports that they are planning to support IS-823A on a handset that should be available to our lab in Q4, 2001

Motorola: Motorola reports that they are planning to support IS-823A on a handset that should be available to our lab in Q4, 2001

Nokia: Nokia reports that they are planning to support IS-823A on a handset that should be available to our lab in Q4, 2001

GSM Handsets: AT&T Wireless has obtained information from three GSM handset vendors concerning the status of their CTM (as defined by 3GPP TS 26.226 and related standards) development and testing efforts. The information obtained from each is summarized below:

Ericsson: Ericsson reports that they are planning to support CTM on a handset that should be available to our lab in Q4, 2001

Motorola: Motorola reports that they are planning to support CTM on a handset that should be available to our lab in Q4, 2001

Nokia: Nokia reports that they are planning to support CTM on a handset that should be available to our lab in Q1, 2002

Beta and Lab Testing

AT&T Wireless has in place a full integration lab for Ericsson, Lucent, and Nortel TDMA infrastructure equipment. As of the date of this report, TTY software for Lucent R17.0 and Nortel MTX-10 (both of which support IS-823A) has been loaded into test switches within the AT&T Wireless test lab for regression testing and preliminary TTY feature testing. TTY software from Ericsson will be loaded into its test switches as releases become available. In all cases, TTY-compatible switch software will be thoroughly tested in the AT&T Wireless lab before being released to a FOA (First Office Application) market.

Release and General Availability to Carriers of Software

TDMA Network: AT&T Wireless has obtained information from all three of our TDMA (ANSI-136) infrastructure vendors concerning the release of their TIA/EIA IS-823A software for general availability. The information obtained from each is summarized below:

Ericsson: Ericsson's support of IS-823A as a correction to Version 7 ANSI should be generally available as of Q4, 2001

Lucent: Lucent has integrated IS-823A support into 5ESS software release 5E15.1 BWM01-0008, and it became Generally Available in Q3, 2001

Nortel: Nortel supports IS-823A in MTX10. MTX10 will be GA in Q4, 2001 but the General Availability date of the TTY/TDD feature is still to be determined

GSM Network: AT&T Wireless has received the following information regarding the general availability of TTY-capable GSM network equipment:

Ericsson's CTM node should be generally available in Q1, 2002

Availability to Carriers of Full Acceptance Test Units

TDMA Handsets: AT&T Wireless has obtained information from four TDMA (ANSI-136) handset vendors concerning the general availability (GA) of TTY-compatible handsets. The information obtained from each is summarized below:

Ericsson: Ericsson reports that they are planning to have an IS-823 handset available for GA in Q1, 2002

Motorola: Motorola reports that they are planning to have an IS-823 handset available for GA in Q1, 2002

Nokia: Nokia reports that they are planning to have an IS-823 handset available for GA in Q1, 2002

Panasonic: Two Panasonic TTY-compatible handsets were accepted by AT&T Wireless for commercial availability in Q3, 2001

GSM Handsets: AT&T Wireless has obtained information from three GSM handset vendors concerning the general availability (GA) of CTM-capable handsets (as defined by 3GPP TS 26.226 and related standards). The information obtained from each vendor is summarized below:

Ericsson: Ericsson reports that they are planning to have a handset supporting CTM available for GA in Q1, 2002

Motorola: Motorola reports that they are planning to have a handset supporting CTM available for GA in Q1, 2002

Nokia: Nokia reports that they are planning to have a handset supporting CTM available for GA in Q2, 2002

Carrier Testing Activities, Including Field Testing and Consumer End-to-End Testing

Lucent TTY FOA

AT&T Wireless conducted a FOA (First Office Application) of TTY software in a production TDMA system during early July, 2001. This FOA took place in west suburban Chicago, utilizing Lucent infrastructure. The purpose of this FOA was to validate proper operation of the IS-823A algorithm under field conditions. Performance evaluation consisted of the transmission and reception of both plain- and random-text scripts, with independent measurements on the uplink and downlink. "Streaming" text, combined with the Lober & Walsh scoring application, was used to analyze and quantify TTY performance. Test files were collected from a number of mobile to landline and mobile to mobile calls. Propagation conditions included stationary mobile devices, slow-moving mobiles, and rapidly moving (freeway speed) mobiles. Under the majority of stationary test conditions, we found that a TCER of less than 1% was achievable on both the uplink and downlink. During mobile conditions, we found that a TCER of less than 2% was possible in the uplink and downlink during the majority of test cases, with several instances of TCER at or below 1%. However, we also found that some slow-speed drive areas and some mobile to mobile calls resulted in a much higher than expected downlink TCER (2-4%). Some of these instances of higher than expected TCER may be attributable to localized downlink interference. In general, almost all data collected using streaming text resulted in better performance in the uplink than the downlink.

Subsequent to the official FOA in July, an AT&T Wireless employee who is hearing-impaired has been utilizing TTY from an Ameriphone Q90 and a Panasonic mobile in the suburban Chicago area on a regular basis, looking for any unusual operation.

Nortel Lab Test Results

In July, AT&T Wireless performed preliminary TTY testing in its Redmond, WA labs, using Nortel network equipment and Panasonic TTY handsets. "Streaming" text, combined with the Lober & Walsh scoring application, was used to analyze and quantify TTY performance. Our initial test results indicate that the performance of the Nortel IS-823A TTY software is very good, even in simulated RF channels with a very low signal to noise ratio. We found TTY character loss due to handoffs between 1900 MHz and 850 MHz cells to be minimal, typically in the range of one to three characters. TTY calls were also successfully handed off between digital and analog channels and from analog back to digital. Two to three characters were typically lost during a digital to analog handoff, an analog to digital handoff typically resulted in a loss of two to four characters. Digital handoffs between the Nortel and the Lucent switches resulted in a typical character loss of two to three characters, and character loss during maintenance functions (e.g. disabling a radio for maintenance resulting in an intra-cell handoff) typically resulted in the loss of only one or two characters.

One interesting aspect of our testing involved measurement of TCER on an analog channel. During such operation, we found that the TCER, even on a nearly perfect RF channel, was in the 4% range. During

digital operation, almost all calls displayed a TCER of well under 1% for streaming-data random character sets. The vast majority of digital calls displayed a TCER in the uplink and the downlink of close to 0%. This performance was obtained with calls made from the mobile to the landline and from mobile to mobile.

ATIS Incubator TTY Test Effort

AT&T Wireless has in place a full integration lab for Ericsson, Lucent, and Nortel TDMA infrastructure equipment. Although the availability of this infrastructure equipment in the lab is invaluable, the observed performance of TTY under lab conditions is not necessarily a good indication of TTY performance under real-world field conditions. Consequently, in addition to the Lucent FOA conducted in early July, AT&T Wireless also hosted an industry-wide field test effort in conjunction with the ATIS TTSI (TTY Technology Standards Incubator). This TTY field test took place during the week of 10 September in the west Chicago suburb of Lisle, IL, using the Lucent TDMA network operated by AT&T Wireless and the analog network operated by Cingular Wireless. Test cases included stationary tests (minimal RF fading), slow-moving mobile TTY tests, stationary and mobile analog TTY performance testing, and numerous benchmarking tests to verify the basic performance of TTY devices when communicating with one another directly (no airlink or PSTN). All tests were executed using Gallaudet's TTY Tools V1.0 or 1.1 in conjunction with either the fast or slow typist scripts.

In general, TTY performance when using Gallaudet's "fast typist" script was consistent with that noted by AT&T Wireless during previous lab and FOA testing when utilizing "streaming" text, with the exception that the downlink was typically better than the uplink. Results with the Gallaudet "slow typist" script were slightly worse than expected, with measured TCER in the 2% range. Further investigation of the disparity between these two scripts, as well as the reversal in uplink and downlink performance, will be required. The results of this industry-wide test effort have been compiled in a database maintained by ATIS.

In an effort to help facilitate future industry-wide testing, AT&T Wireless contributed a generic ANSI-136/IS-95 test plan to the ATIS TTSI Incubator. This test plan addresses the key aspects of TTY evaluation under field conditions, although it could be adapted for use in the lab. In addition to specifying test cases, the document includes step-by-step procedures and references to standardized testbed configurations. The inclusion of these procedures and references is intended to assure consistent test results.

Retail Availability of Necessary Consumer Equipment

As noted earlier in this report, two Panasonic TDMA TTY-compatible handsets (models EB-TX310 and EB-TX320) were accepted by AT&T Wireless during Q3, 2001. Because of the many variables present at this time, AT&T Wireless cannot provide more specific information concerning retail availability of the Panasonic handsets or any other consumer equipment.

Kentucky RSA 3, Kentucky RSA 4 Cellular General Partnership
Cumberland Cellular Partnership
d/b/a Bluegrass Cellular Inc.
TTY Report
Third Quarter 2001

Background

Bluegrass Cellular uses AMPS/TDMA (IS-136) technology.
Infrastructure vendor is Nortel
Phone manufactures include Nokia, Motorola, Ericsson.

Status

Bluegrass Cellular is waiting on solutions to be made available by the handset and infrastructure vendors. The infrastructure vendor has stated they will have a solution available to carriers by late fourth quarter to early first quarter 2002. The solution will be made available in software release MTX10.

Phone manufactures have also stated basically the same with possibility of a late fourth quarter 2001 release.

Until the equipment/software is available and dates are more precise, Bluegrass Cellular is unable to give timelines and procedures for testing, and consumer availability.

Bluegrass Cellular is actively working with both its vendors and the TTY Forum to ensure consumer availability as quickly as possible.

TTY/911 for **TDMA** Systems
4-10-01 Version

Background:

The TDMA solution, authored by Lucent, has had many suggested algorithm code changes from the author. The standard committee for the TDMA solution voted to change the standard in April, 2001. Nortel Networks has completed development of a solution that complies with the IS-823 & EIA 136-410 standards. Lab testing of the solution has identified some problems with the test handset from Panasonic. Nortel Networks has not had time to fully evaluate the impact of new TDMA algorithms developed by Lucent, relating to new standards IS-823 & EIA 136-410, approved in April, 2001. It is unclear how much of the new Lucent code can be included in the MTX-10 release. Nortel will incorporate important TDMA code changes in MTX-10. Lucent has identified to Nortel Networks that some critical TDMA code changes must be included to assure the desired functionality. Interoperability issues may arise if different manufactures implement different portions of the Lucent code included in products delivered to carriers by December 31, 2001. Nortel is currently evaluating the new code and the impact on compatibility. Nortel Networks will support new standards in future software releases, but it may not be possible to include all the Lucent suggested changes in MTX-10.

Standards & FCC Requirement

IS 823 and EIA 136-410 are the approved standards as of April 2001.

The FCC deadline is for carriers to acquire solution hardware and software by December 31, 2001, and to offer service by June 30, 2002.

The FCC requires carriers to file quarterly status reports regarding the carrier's implementation status to support TTY/911 calls over their digital systems. While carriers can directly file reports with the FCC, the FCC rules ("Fourth R & O") permit carriers to report through ATIS (Alliance for Telecommunications Industry Solutions). The next quarterly report is due April 15, 2001, however as the 15th is a Sunday, reports are actually due by April 16, 2001.

Nortel Network Solution Set

The Nortel Network software solution is in release MTX-10, scheduled for general availability week 44, 2001.

Development and Testing

Lab testing has not identified problems in the Nortel Network solution, though some problems were observed in the test handset. Lack of availability of TDMA test handsets prevented testing of a wider range of handsets.

Product Time Line

MTX-10, scheduled for general availability week 44, 2001, supporting code for the IS-823 & EIA 136-410 standards. The “important” TDMA solution code recently provided by Lucent will be included in MTX-10.

Issues and Concerns

- The changes to TDMA TTY/911 code and the April 2001 standard change has created much difficulty to design solutions to a “moving target”.
- The FCC’s date for carriers to acquire TTY/911 equipment and software is December 31, 2001; a standard change was in April 2001. There is not sufficient time between April and December to fully evaluate all changes, and incorporate all proposed changes in software that customers will have in December 2001.
- Some proposed changes are more important than others. Manufacturers can incorporate important changes without incorporating all. It is not known how different equipment using different mixes of equipment will interoperate
- Nortel Networks believes standards must be “locked down” for equipment developers to design to a common target for initial equipment deployment. Future changes in initial equipment standards should provide time developing a stable and fixed second round design target
- Industry solutions only support Baudette 45.5 TTY transmissions, propriety TTY transmissions, and European Baudot 50 is not supported.

According to Lucent, manufacturers must incorporate the important parts of the recent TDMA solution code distributed by Lucent, or the solution will not work.

Caprock Cellular Limited Partnership

Progress of TTY-Digital Deployment Solutions
CC Docket No. 94-102
3rd Quarterly Report
September 30, 2001

#1 Network infrastructure software development:

Caprock Cellular utilizes Nortel Networks equipment to provide TDMA digital services in Texas RSA 4. A report from Nortel Networks states that development of software is complete, and product tests have been completed as well. Testing was limited to Panasonic prototype handset, as other equipment was not available during the test.

#2 Handset development and testing plans

Caprock Cellular must rely on handset vendors to develop the required handsets. When handsets are available testing can be performed with area PSAPs to insure compatibility.

#3 Beta testing and lab testing

Caprock Cellular must rely on Nortel Networks and handset vendors for initial conformance testing.

#4 Release and general availability to carriers of network infrastructure software

Nortel Networks has stated that the required software load, MTX10, will be generally available week 44 of 2001. The exact date of deployment of this software load is not known at this time, but is tentatively scheduled for the 3rd Quarter of 2002.

#5 Availability to carriers to full acceptance test units

Nortel Networks plans to test and confirm the solution performance during the six-month extension allowed for this purpose.

**Caprock Cellular Limited Partnership
Progress of TTY-Digital Deployment Solutions
CC Docket No. 94-102 - 2nd Quarterly Report**

#6 Efforts toward achieving digital wireless solution capability with enhanced TTY devices.

The solution provided by the MTX10 software load addresses Baudot type messages only. Other capabilities may be included later, after standards are adopted.

#7 Carrier coordination of testing with PSAP

See response to item #2 above.

#8 Carrier testing activities, including field testing, consumer end-to-end testing, and other necessary tests.

Caprock Cellular cannot begin testing activities until the correct software load is installed in the switch and handsets are generally available.

#9 Retail availability of necessary consumer equipment

At this time it is unknown when handsets will be available.

#10 Geographic scope of network infrastructure deployment

According to Nortel Networks, the MTX10 software is the only requirement for implementation. The mobile switch, if currently at MTX09, nor the cellsite equipment will require hardware changes. (Caprock Cellular does not own the mobile switch, Plateau Telecommunications provides switching for Caprock's cellsites. Due to this fact Caprock cannot control implementation dates for the required software.)

North Carolina RSA 3 Cellular Telephone Company
d/b/a Carolina West Wireless
TTY Report
Third Quarter 2001

Background

Carolina West Wireless uses TDMA technology
Infrastructure vendor is Nortel
Phone manufactures include Nokia, Motorola, Ericsson and NEC

Status

There is no change from the second quarter report concerning the availability of handset and infrastructure solutions from the vendors. The infrastructure vendor continues to set the release of the MTX10 software for late December 2001 or early January 2002. The tentative schedule to deploy the MTX10 software, based on this release, is the first quarter of 2002.

Phone manufactures continue to set possible availability of equipment for late fourth quarter 2001.

Carolina West Wireless is unable to predict precise dates for testing and consumer availability until the software and equipment are made available.

Carolina West Wireless continues to actively work with its vendors and the TTY Forum to ensure TTY availability as quickly as possible.

October 10, 2001

Magalie Roman Salas
Office of the Secretary
FCC
445 12th Street S.W.
Washington, D.C. 20554

Re: FCC Docket No. 94-102

Dear Ms. Salas:

The following is submitted in satisfaction of the quarterly reporting requirements for 911 TTY transmissions.

- 1) Network Infrastructure Software Development: Currently under exploration with our network equipment vendor.
- 2) Handset Development and Testing Plans: Currently under exploration with handset suppliers.
- 3) Beta testing and Lab testing: Not currently scheduled.
- 4) Release and General Availability to Carriers of network Infrastructure Software: Currently under exploration with our network equipment vendor.
- 5) Availability of full acceptance Test units: Currently under exploration with handset suppliers and network vendor.
- 6) Current efforts toward achieving digital wireless solution compatibility with enhanced TTY devices: Currently under exploration with handset suppliers and network vendor.
- 7) Carrier coordination of testing with PSAP: No requests from the PSAPs have been received.
- 8) Full Testing: Not currently scheduled. Awaiting information from handset and network vendors.
- 9) Retail availability of equipment: Not currently available. Awaiting information from handset vendors.
- 10) Coverage Area: Eleven counties in East Central Illinois; IL 7 & 3 northern counties of IL 9.

Sincerely,

Steve Bragorgos
Operations Manager
Cellular Properties, Inc.

September 17, 2001

To: TTY Forum

From: Susan Palmer and Ken Evans

TTY Forum #19 Report
Cingular Wireless LLC

Overview

Cingular Wireless LLC (Cingular) is satisfied with the progress that has been made since the last Forum. Communications amongst all parties continues to improve.

We have conducted testing in the TDMA environment on the proposed solutions for the technical problems highlighted in our July Report. Using total character error rate (TCER) as a measure, the results to date have been favorable. Our manufacturers have indicated delivery of handsets will be timely, however, it should be noted that we had difficulty obtaining TTY ready handsets for testing purposes.

Cingular has conducted testing with three different handset vendors. Handset performance varies from vendor to vendor. However, all handsets tested to date have yielded acceptable results. Cingular is concerned that any delays in the availability of TTY compatible handsets could frustrate customers and delay implementation of a viable TTY solution.

At this point, we do not have the equipment necessary for testing GSM technology in our labs or network. We have been assured that equipment will be delivered to us by early November. The lack of GSM testing remains a concern. It is possible that unforeseen technical issues could exist. However, Cingular is committed to work together with manufacturers and consumers to resolve any technical issues.

In addition to technical issues, to have effective TTY access, supporting documentation and information regarding handset and handset connectivity must be given to service providers in time to develop appropriate customer care and sales support. Methods and procedures must be developed to ensure that TTY compatible handsets and cables are available to customers in a timely fashion. If it appears that a low volume of units will be available initially, manufacturers, service providers and representatives of the Deaf community should work proactively to address this issue.

TDMA

Cingular Wireless has conducted individual and joint testing (with TTSI) of the No Gain solution in Ericsson and Lucent switches. The results have yielded a total character error rate that is similar to results obtained in analog environments. Additional testing is needed to insure various mobile scenarios yield acceptable results.

Cingular is in the process of finalizing an implementation schedule that will result in first office application (FOA) and some commercial deployments prior to the end of the year. However, handset availability may limit testing in our FOA sites.

GSM

Cingular plans to begin testing GSM infrastructure software for the CTM solution in mid November. The same concerns described regarding the availability of handsets for infrastructure testing in the TDMA environment are applicable for GSM.

Conclusion

Cingular Wireless notes that progress was made last quarter toward resolving many of the technical issues highlighted in the July Report. However, there might still be technical issues that have not been diagnosed, particularly in the GSM environment, because technologies have not been fully tested. Handset availability continues to delay this process and availability of handsets will be a critical part of providing TTY access to consumers. The cooperation noted this quarter must continue in order to meet the June 2002 deadline.

Corr Wireless Communications, L.L.C.

Corr Wireless Communications, L.L.C. (Corr Wireless) is working with vendors to insure compliance with the FCC implementation deadline.