



Appendix B – Test Data

Date	No.	Description	Error Rate	Characters					RSSI (dBm)				No. Chan.	BER Histogram							
				Total	Correct	Added	Missing	Changed	Max	Min	Avg	Std		<.01%	0.01%-0.1%	0.1%-0.5%	0.5%-1%	1%-2%	2%-4%	4%-8%	
6/18/98	1	landline->Aeon, office, ACELP	1.80%	4272	4195	3	8	69	-80	-114	-89.7	4.6	1	1514	48	38	18	12	11	1	
6/18/98	2	Aeon->landline, office, ACELP	2.32%	4272	4173	2	27	72	-78	-97	-84.2	2.5	1	996	5	5					
6/18/98	3	Aeon->landline, office, AMPS	0.09%	4272	4268	0	3	1	-80	-120	-98.8	4.9	2								
6/19/98	1	landline->Aeon, office, AMPS	3.42%	4272	4126	18	97	47													
6/20/98	1	landline->Aeon, home, ACELP	2.96%	8544	8291	142	163	90	-67	-104	-77.8	4	1	1972	24	15	5	2	1		
6/20/98	2	Aeon->landline, home, ACELP	4.75%	8544	8138	94	118	288	-68	-88	-74.5	2.5	1	2251	2	1					
6/20/98	3	Aeon->landline, home, AMPS	0.00%	8544	8544	0	0	0	-74	-124	-82.0	4.7	1								
6/20/98	4	landline->Aeon, home, AMPS	0.03%	21360	21354	0	3	3	-70	115	-76.9	3.1	3								
6/22/98	1	landline->Aeon, Lab, ACELP	1.78%	8544	8392	132	28	124	-62	-69	-64.9	1.4	1	1875	6	4					
6/22/98	2	landline->Aeon, Lab, AMPS	0.42%	4272	4254	1	9	9	-70	-77	-72.8	1.1	1								
6/22/98	3	Aeon->landline, Lab, AMPS	0.19%	4272	4272	0	4	4	-69	-84	-73.8	2.6	2								
6/22/98	4	Aeon->landline, Lab, ACELP	2.39%	8544	8340	32	47	157	-62	-70	-65.7	1.7	2	2194	2	1					
6/22/98	5	Aeon->landline, Driving, ACELP	3.98%	4272	4102	41	83	87	-35	-106	-61.7	12	13	466	121	210	56	23	20	7	
6/22/98	6	Aeon->landline, Driving, AMPS	6.20%	4272	4007	123	214	51													
6/22/98	7	landline->Aeon, Driving, AMPS	???						-14	-110	-68	15.5	20								
6/22/98	8	landline->Aeon, Driving, ACELP	20.21%	8544	6817	403	983	744	-28	-100	-62.6	12.0	19	957	356	313	99	94	87	22	

APPENDIX B

**CONTRIBUTION
ON
V.18 STANDARD**

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May 21, 1998

D-Tel 100 Modem

A major advance in communications for the hard of hearing and profoundly deaf.

- ∞ Full implementation of V.18 standard
- ∞ Compatible with all existing textphones
- ∞ Display & storage of calls with separation of sent and received messages
- ∞ Supports simultaneous use of voice and text
- ∞ Constant telephone line monitor
- ∞ Digital answering machine features
- ∞ Phonebook/organiser database
- ∞ Standard and customisable automatic greetings
- ∞ Autotext
- ∞ E-mail option
- ∞ Speech recognition option

Text telephones developed to date to enable hard of hearing and profoundly deaf users to communicate have used a variety of incompatible communications standards. For the first time with the D-Tel 100 modem, a Windows/DOS PC user is able to communicate with all existing textphones. Designed using advanced digital signal processing technology with controlling Windows or DOS based user interface.

Full Implementation of V18 standard

Introduced to enable automatic interworking with the variety of existing text telephone standards.

Compatible with existing textphones

Interworking tested with textphones using any of the following standards: Baudot 50; Baudot 45; EDT; V21; V23 and DTMF.

Digital answering machine features

Auto answer records date and time of calls received.

Records text messages & e-mail only limited by size of disk.

Enables call review: next call, last call, selection by date & time, fast forward/reverse word search.

Option to customise outgoing voice messages.

Remote accessing of stored messages under password control.

Automatic scheduling of calls for example to take advantage of cheap overnight rates.

Supports Simultaneous Use of Voice and Text

Enables both parties to make full natural use of both voice and text interactively as required.

Constant telephone line monitor

Operates in background while the computer is being used for other applications with a pop-up message box on ring detect after a customisable number of rings.

Call connection progress is displayed

Recognises and displays PSTN call progress tones.

Bar graph line quality monitor

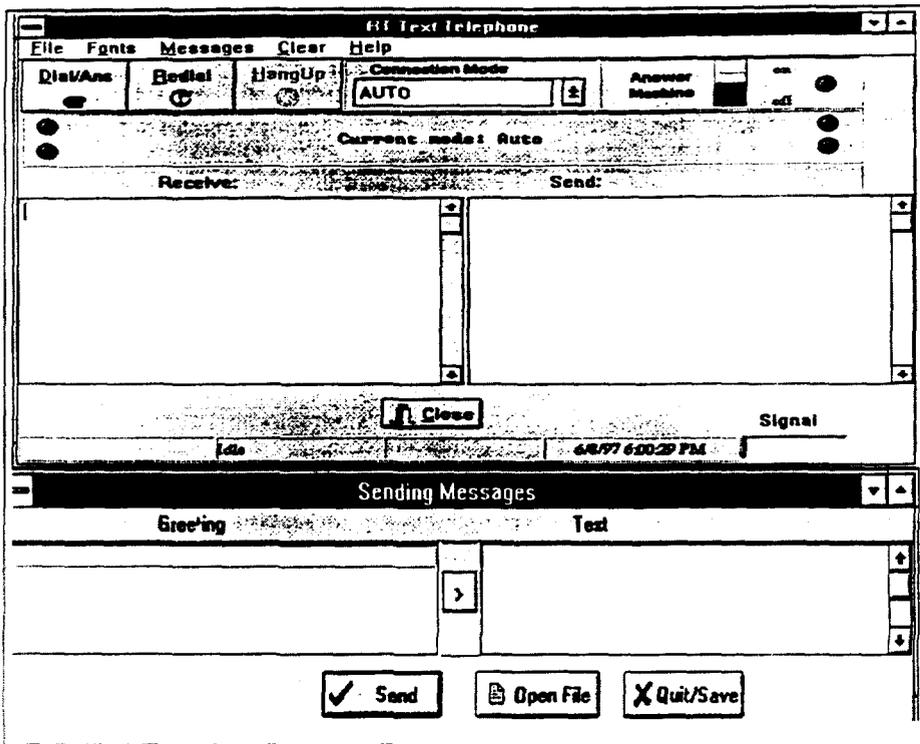
If the telephone line quality is poor you can check and advise the telephone company.

Choice of line interfaces

Connects to PSTN, GSM, PABX (via handset port) or acoustic coupler

Speech recognition option

Optional state-of-the-art speech recognition software allows deaf users to input text verbally with a minimum of training.



Display & Storage of calls with separation of sent and received messages

Displayed for review or printing as separate scrollable windows maintaining the relationship between your messages and responses from the other party.

Standard and customisable automatic greetings

Optional automatic 'hello' text message for textphone callers and outgoing voice messages for voice callers; customisable voice messages can be created using an attached telephone or via a soundblaster card

Autotext

Customisable store of frequent responses that can be used during calls to speed up conversation.

E-mail option

Messages can be pre-prepared and sent as an e-mail or used to reduce time on-line when making an interactive call.

Phonebook/organiser database

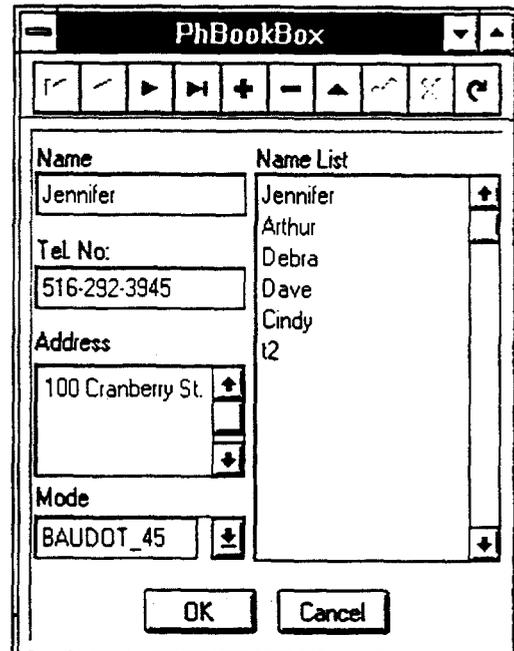
Store phone numbers, names, addresses, personal notes, key words for use in a search index to find a required phone number when, for example, only the service required is remembered. The type of modem or text telephone used is also stored and used with CLI (Calling Line Identification) for automatic immediate adapting to the modem/textphone of the other party.

Full control of type and size of font

The type and size of font can be changed to suit your preferences.

Software automatically upgradeable from bulletin board

As systems develop it is possible to have your software automatically upgraded to add new features over the telephone line.



Contact:

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D-Tel 500 Textphone

The First Global Textphone

- ∞ Full implementation of V.18 standard
- ∞ Able to communicate with all existing textphones.
- ∞ Interfaces to the telephone line (PSTN)
- ∞ Display & storage of calls with separation of sent and received messages on a 2 line 40 character back lit liquid crystal display
- ∞ Approximately 18 hours battery or mains operation
- ∞ 128K bytes non volatile memory provides ample capacity for storing important conversations and messages prepared off line
- ∞ Digital answering machine features
- ∞ E-mail option
- ∞ Phonebook
- ∞ 64 key keyboard with 10 customisable function keys
- ∞ Incoming call signalling system
- ∞ Emergency alarm button
- ∞ Standard and customisable automatic greetings
- ∞ Automatic caller recognition in countries where CLI available
- ∞ Autotext
- ∞ Future-proofing by remote upgrade via telephone line

Text telephones developed to date have used a variety of incompatible communications standards. For the first time with the D-Tel 500 a user is able to communicate automatically with all existing textphones. Designed using advanced digital signal processing technology, it sets new standards of features, cost performance and reliability by which other textphones will be judged.

Full implementation of V.18 standard

Introduced to enable automatic interworking with the variety of existing text telephone standards.

Compatible with existing textphones

Automatic recognition defaults to unknown calling party textphone. Interworking tested with textphones using any of the following standards Baudot 50; Baudot 45; EDT; V21, V23, DTMF.

Display & storage of calls with separation of sent and received messages on a 2 line 40 character backlit liquid crystal display

Another feature unique to the D-Tel range aids clarity and where full duplex communication is possible, for example when communicating with another D-Tel user, allows the same natural interaction that is available to those who are able to hear when using a normal telephone.

Supports simultaneous use of voice and text

Enables both parties to make full natural use of both voice and text interactively as required.

Mains or battery operation

For users on the move messages can be prepared off-line and sent when a phone line is available without a mains supply by using 4 internal standard alkaline or rechargeable batteries that allow up to 18 hours use.

128K bytes non-volatile memory

Provides a large capacity for storing auto answered text messages and important conversations.

Phonebook

Stores phone numbers, names and the type of textphone used. The D-Tel 500 will automatically dial and adjust to the correct type of textphone when a name in the phonebook is selected.

Incoming call and emergency signalling system

As standard a call is signalled by a flashing light on the D-Tel 500.

Digital answering machine features

Auto answer after a customisable number of rings.

If caller line identification (CLI) available the caller's phone no. will be recorded and if in the D-Tel 501 phone book, the caller's name will be recorded.

Records text messages & e-mail in non-volatile memory.

Enables call review: next call, last call, selection by date & time, fast forward/reverse word search.

Option to customise outgoing voice messages.

Emergency button

Automatic dialling and transmission of an emergency message can be carried out by simply pressing the emergency button on the textphone.

E-mail option

Enables off-line preparation of e-mail messages.

Able to use the INTERNET for e-mail via the DSPG Textphone Internet Service.

Automatic caller recognition in countries where CLI available

If the caller's details are entered in the D-Tel 500a phone book, the D-Tel 500a will display the caller's name and adapt to the caller's textphone standard before the call is answered.

Standard and customisable automatic greetings

The standard 'hello' text for textphone callers can be customised.

Autotext

A customisable store of frequent phrases is available for instant use by use of hot keys, to help reduce the time spent keying.

Call connection progress is displayed

Recognises and displays PSTN call progress tones.

Interfaces to the telephone line

Connects to PSTN.

Remote upgrade via telephone line

As new features and additional options become available it will be possible to upgrade automatically over the telephone line.

Deliverables

Textphone, Power supply, Training video, Operating manual

Contact:

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253a Kilburn Lane

LONDON W10 4BQ

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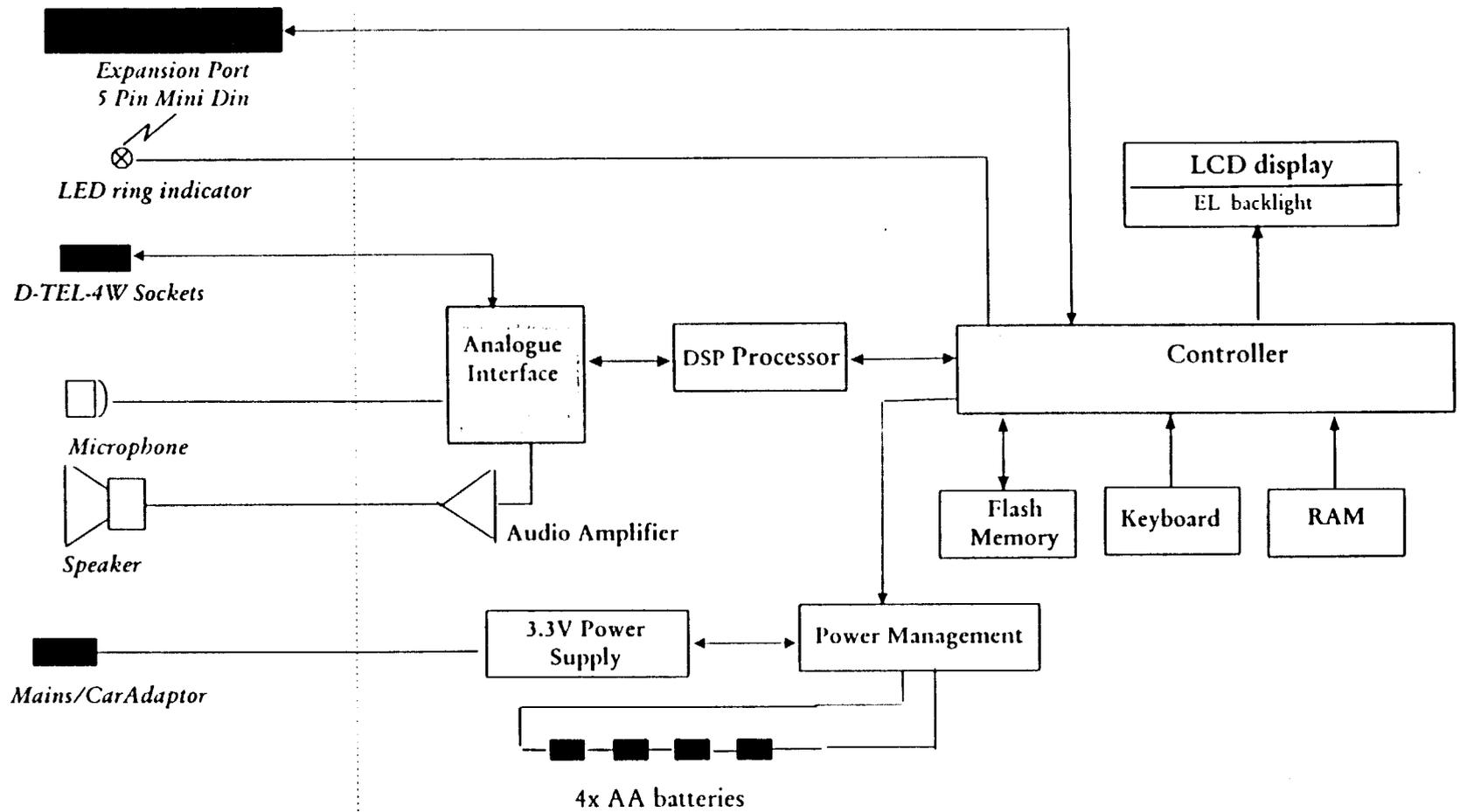
Facsimile: (+44) 81 964 0720

E-mail: enquiry@dspg.co.uk

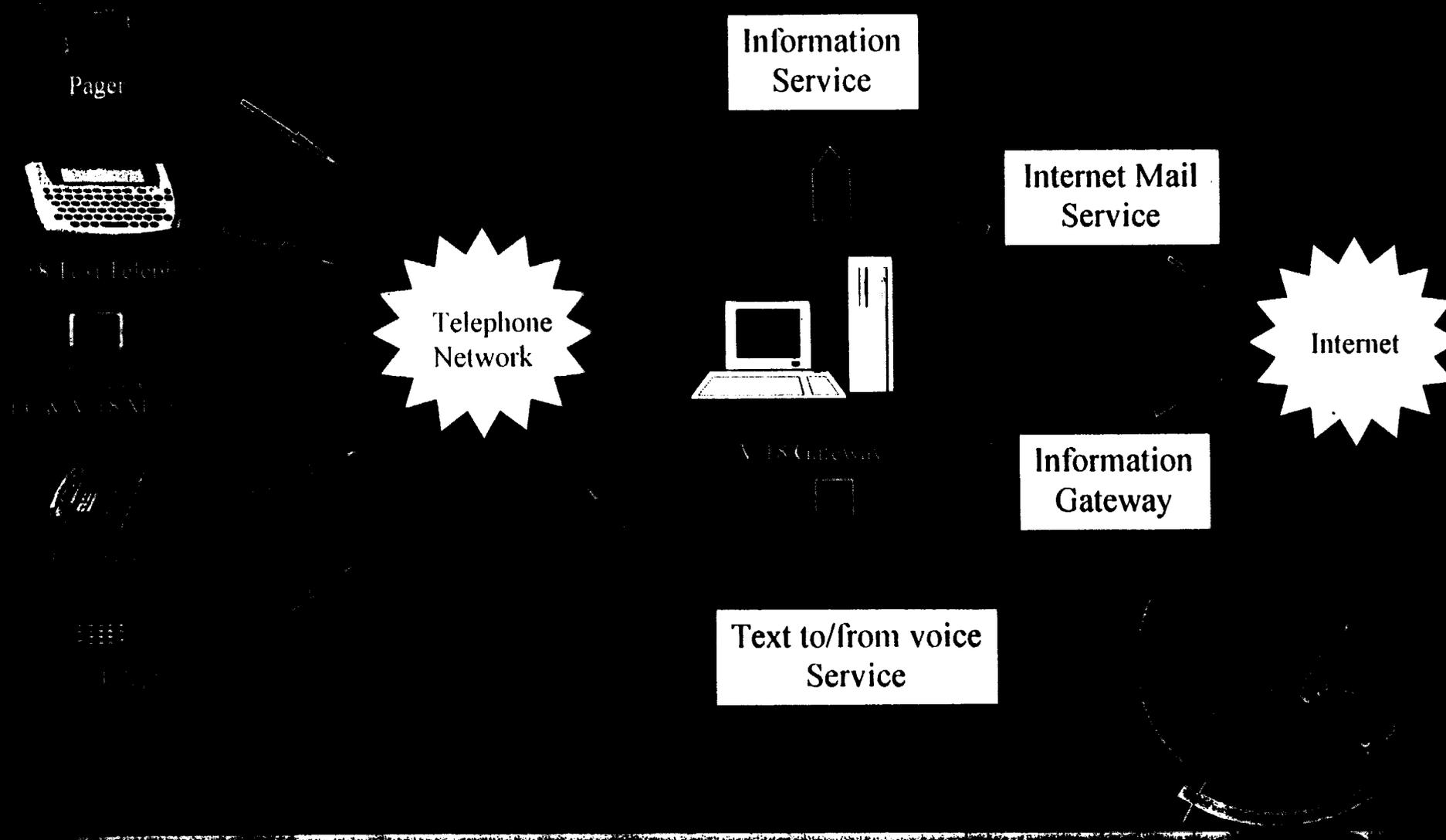
D-TEL 500

Internal Block Diagram

User Interfaces



Text-Telephone Integration



Text Telephone Products & Services

Products:

- D-Tel 100:* PC-based V.18 modem (at production stage). Connects to PSTN via various interfaces. The *D-Tel* range uses a proprietary internal protocol based on memory mapped registers.
- D-Tel 101:* PC-based V.18 modem with ISDN compatibility (near production stage).
- D-Tel 150:* PC-based V.18 modem with simultaneous voice capability (at prototype stage).
- D-Tel 200:* Stand-alone modem unit connecting to serial port of PC implementing the standard Hayes AT protocol (at design stage).
- D-Tel 500:* Stand-alone text telephone Basic low-cost version (at prototype stage).
- D-Tel 501:* Stand-alone model with full features (at production stage).
- D-Tel 600:* PC-based V.18 modem card for operation of relay service. Powerful floating point processor allows future enhancement (at prototype stage).
- D-Rel 100:* Relay service equipment. Connects via 34-way cable to *D-Tel 600*. Allows operators to communicate with both deaf and hearing customers with voice-over capability (at prototype stage).
- D-Tel 901:* Payphone attachment for indoor use. Based on *D-Tel 500* telephone (at prototype stage).
- D-Tel 902:* Payphone attachment for outdoor use (at design stage).
- V.18 Chip Set:* DSPG are currently developing an IC chip version of V.18 modem implementation (presently undergoing extensive tests).
- V.18 Test:* During the development stage of the V.18 modem, BT Laboratories jointly with DSPG produced a sophisticated testing environment allowing quick assessment of V.18 performance. The current tester incorporates some of this work.

Accessories:

- D-Tel PSTN 1:* PSTN interface, based on commercially available line interface module XECOM (available as prototype only).
- D-Tel PSTN 2:* Optimised low-cost version of PSTN interface capable of operation with most networks (at prototype stage).
- D-Tel PABX 1:* PSTN interface to text telephone using any telephone with detachable handset as a line interface. Allows use of most telephone handsets as a microphone and speaker for voice-over.
- D-Tel AC 1:* Acoustic coupler for modems.
- D-Tel GSM NK:* Interface to Nokia GSM mobile phone.
- D-Tel GSM EC:* Interface to Ericsson GSM mobile phone.

Software:

- D-Tel WIN:* Windows 3.11/95 based software for all *D-Tel 100* family modems.
- D-Tel DOS:* DOS based software for *D-Tel 100* modems.

Services:

- Internet/E-mail:** Access to Internet /E-mail via DSPG Internet server.
- Telephone Directory:** Automated telephone directory service without Minicom operator.

APPENDIX C

Hearing and speech impaired to benefit from new standards

(Report from ITU News 10/97)

“... ”

The first Recommendation, called T.140, defines a universal presentation-level protocol for text conversion which will work with all multimedia protocols and with existing Recommendation for text telephony, V.18 [believe we discussed V.18 before]. The second, known as Recommendation T.134, is a companion to Recommendation T.140 and defines a simple data protocol for text conversion in a data conferencing environment. Support for Recommendation T.140 has also been added to Recommendation H.324, which defines multimedia communications over the public switched telephone network (PSTN). These two Recommendations are expected to greatly improve the lives of those reliant on text-based conversation systems, such as the hearing and speech impaired.

The Rapporteur for the work on these new standards, Gunnar Hellstrom (Sweden), said “The results we have achieved are very important. By providing standardized video, text and voice conversation services, users will be able to choose whichever combination supports their system capabilities.

Our work represents a great step forward for users who suffer from hearing- or speech-related problems. These people, who in the past have suffered from a fragmented market of incompatible text telephony systems, will benefit greatly from having global standards on which future systems can be based. And, given the huge and growing popularity of internet-based ‘chat’ systems, it’s clear that many other users will also benefit from our work on these new Recommendations.””

Ken Wells
Philips Consumer Communications
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30 Apr. 98

APPENDIX D

Systems Requirements Document
For
Circuit Switched Data

Release D.00.00.01

May 20, 1998

TTY Forum

Circuit Switched Data and IWF Technical Requirements Document

1. Acronyms and Definition of Terms

BSC	Base Site Controller
CO	Central Office
CSD	Circuit Switched Data
DTE	Data Terminal Equipment
ERP	Effective Radiated Power
FRU	Field Replaceable Unit
IWF	Interworking Function
LAN	Local Area Network
MS	Mobile Station
MSC	Mobile Switching Station
MS	Mobile Station
MSO	Mobile Switching Office
PCM	Pulse Code Modulation
RLP	Radio link protocol
SRD	Systems Requirements Documents
SU	Subscriber Unit
TCH	Traffic Channel
TDD	Telecommunications Device for the Deaf

Circuit Switched Data and IWF Technical Requirements Document

- increased number of T1/E1 channels per platform
- flexible platform allowing easy feature addition and channel expansion with minimum hardware changes
- IWF platform must be functionally backward compatible to the previously installed carrier base.

3. Customer and Service Provider Requirements

The **customer functionality expectations** include:

- Enables asynchronous, non-transparent Facsimile and Data Services to a wireless network containing an MSC.
- No impact to existing subscribers.
- Supports Group 3 Fax Teleservice and a wide range of 300 - 33,600 bps modem data.

The **Service Provider expectations** include:

- 24/30 IWF T1/E1 data ports as a minimum configuration.
- Expandable in 24/30 IWF T1/E1 data port increments.
- Each IWF will contain a redundant -48Vdc internal power supply.

3.1 Customer Statement

Not Available

3.2 Operational Scenarios for Circuit Switched Data

3.2.1 CSD System Overview:

Circuit Switched Data (CSD) is a service which is complementary to the existing suite of Voice and Data services including telephone interconnect, Short Message Service (SMS) and Packet Data. CSD enables subscribers to directly connect a laptop or facsimile device to their Multi-Service portable for remote wireless modem and fax data communications to wireline data services.

The Interworking Function (IWF) contains the hardware and software element that provides the rate adaptation and protocol conversion between a land destination Public Switched Telephone Network (PSTN) and the network for both data and fax services. The IWF is required at each Mobile Switching Center (MSC) to support circuit switched data.

Circuit Switched Data and IWF Technical Requirements Document

A customer's Fixed End Host, internetworked with the circuit switched data system, can send TDD transmissions, other modem transmissions, and facsimile to any Mobile Host within the coverage area that has its DTE powered on and has registered with the circuit data System. Fixed End Hosts are not aware of the Mobile Host's actual location and do not need any special software to support mobility.

3.2.3.2 Mobile Host Initiated Communications

A Mobile Host within the coverage area of the network can send TDD data, standard modem data, and Facsimile to any Fixed End Host internetworked with the circuit switched network.

A Mobile Host can appear to Fixed End Hosts as part of a LAN and have full access to existing LAN services available. This may include file server access, e-mail, and other applications supported by the Fixed End Host Operating System.

4. Assumptions and Observations

During the time this SRD is constructed, reasonable assumptions are placed on the network, subscriber, and customer which are important to document. These assumptions convey the base or foundation upon which the SRD's requirements are created and defined. Some of these assumptions help portray the expected conditions at the time of feature deployment. More define expected customer behaviors. Others define features that will not be impacted or supported by this feature (i.e. negative requirements). These assumptions, if not held true, would impact the SRD requirements, either by making them incorrect, insufficient or not workable.

4.1 Applicable Call Model

The IWF Call Model is as follows:

- 180 sec hold time
- 0.005 Erlangs per IWF call
- 0.1 IWF Blocking Rate
- 0.1 Calling Rate

4.1.1 Traffic Model

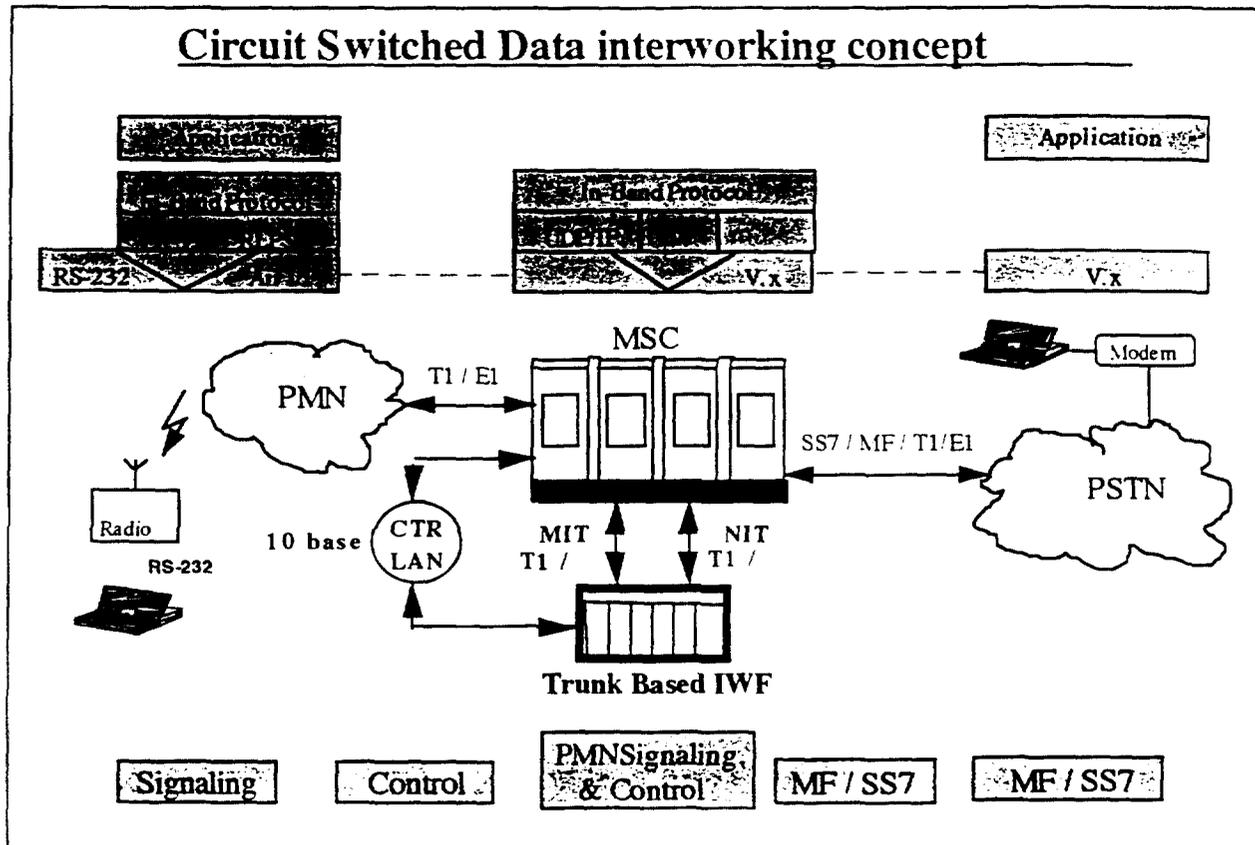
A 24 T1 port - IWF will support approximately 2,920 CSD subscribers based upon the Call Model above. If the user call pattern differ from the above model, fewer overall subscribers may be supported.

4.2 Approach

Successful development of the IWF is the critical first step required to provide a multi-access platform that enables the addition of customer features and functions that are needed by the deaf and hard of hearing community. The approach is to employ an X.86 based platform that incorporates "off the shelf" hardware and software components to leverage commercial product cost curves and multi-vendor availability.

Circuit Switched Data and IWF Technical Requirements Document

The diagram below shows the network including the Circuit Switched Data elements.



The minimum elements required to be added to an network to implement CSD as shown above include:

- Trunk based IWF Unit - 24/30 T1/E1 ports minimum capability
- A Mobile Interface Trunk (T1/E1) and Network Interface Trunk (T1/E1)
- MSC/IWF Control 10BaseT ethernet LAN external interface equipment
- IWF software

The required infrastructure software modifications include:

- MS UNITS: Must be equipped and enabled for data
- Wireless Infrastructure: Must support CSD and air data interface framing.
- MSC: Requires new call setup elements including IWF control functionality, mobile termination number translation, and new billing fields for existing carrier billing systems.

5. Numbered Requirements

5.1 System Requirements

The following paragraphs describe the CSD IWF system requirements.

Circuit Switched Data and IWF Technical Requirements Document

interface.

R12 Network Interface Trunk (NIT) Compatibility Requirements:

The network-side function supports the protocol interworking between the IWF and a fixed network. The NIT moves the 64Kbps Pulse Code Modulation (PCM) digital representation of the subscriber/host fax/modem data to/from the PSTN . The IWF modems perform the PCM encoding/decoding and places the data into the appropriate DSO channel. The MSC connects to the Network-side Interworking function over a Network-side IWF Trunk. The IWF/MSC NIT interface must be a standard T1, PCM 24 channel interface.

5.3 Subscriber Provisioning Requirements

The MS formats the data stream from the DTE for transmission over the radio interface. This involves a number of steps, depending on the speed and type of data supplied. The MS also performs the user side of the Radio Link Protocol (RLP) and forwards the data from the network to the connected DTE.

The system operator is responsible for configuring subscriber classes to permit IWF CSD functionality.

R13 Subscriber DTE interconnect Cable and Peripheral Requirements

An adapter cable for the data-capable subscriber unit, and a personal computer is required.

5.3.1 Provisioning Requirements

R14 Subscriber Enabling

Subscriber units must be equipped and enabled for data. This enabling is done through the service provider interface to the MSC-HLR..

5.3.2 Interaction with Existing or New Service Options

R15 SMS

Short messages can be delivered to the mobile during circuit switched data. However, short message notification is not performed until after completion of the CSD call.

R16 Interconnect voice

Interconnect voice calls will not be delivered to the subscriber during CSD calls.

R17 Call Forwarding

Call Forwarding for CSD must work the same as voice except that it can be provisioned separately from voice. (separate activation status and call forwarding number can be associated with each call forwarding type, separate from voice). Note data call forwarding activation/deactivation must be performed by the system operator; it cannot be done at the mobile as can voice call forwarding

5.4 Mobility Requirements

R18 Handoff

APPENDIX E

User Requirements for "One phone model per service provider" by October 1, 1998

Draft May 19, 1998

1.0 Digital Access

- 1.1 The nominally accessible model will use the digital wireless system; that is, it will not achieve compliance by defaulting to analog.
- 1.2 Each service provider must provide one accessible model for each digital technology supported by that service provider.
- 1.3 If necessary to support VCO/HCO, a second model may be required for that purpose.

2.0 Time period

- 2.1 One-model-per-provider to be acceptable for one year, after which other models supported must be accessible.

3.0 Availability of model

- 3.1 Model and related adapters should be easily and quickly obtainable, in line with other customers' experience when purchasing. The model shall be available through the full range of retail outlets for phones supported by the service provider.
- 3.2 Special ordering must not be required.

4.0 Features and prices

- 4.1 Features of the phone should be representative of a cross section of all digital phones supported by the service provider, and should not be limited to only those features available on the lowest- or highest-end digital phones.
- 4.2 Adapters and extra parts must not incur additional expense over cost of phone.
- 4.3 Customer must not be required to pay for retrofitting TTY to fit the phone model
- 4.4 Essential features include
 - 4.4.1 Model must have built-in vibrating ring signal or come with remote vibrator. (If handsfree adapter is plugged in, phone should still vibrate.)
 - 4.4.2 Volume control
 - 4.4.3 Pass through of line energy (to indicate presence of ring, busy, etc.) to the TTY.
 - 4.4.4 A visual indication when call has been disconnected.

5.0 Customer Information

- 5.1 A single point of contact should be identified for obtaining customer information about digital telephones and their compatibility with TTYs. Contact must be available via fax and e-mail; and where accessible by voice phone, direct access by TTY should also be provided.
- 5.2 Service providers will advertise the availability of an accessible model in consumer publications reaching deaf and hard of hearing TTY users.
- 5.3 Television ads for digital wireless service shall be captioned.

APPENDIX F

TTY/TDD FORUM - 4

**Seeking Solutions to TTY/TDD Through Wireless
Digital Systems**

**Draft Report .02
(April 15, 1998)**

***April 1 - 2, 1998
Gallaudet University
Washington, DC***

This report will follow the structure of the agenda (included below). The agenda number will be used to precisely identify topics. An additional heading was added to accurately reflect the discussion topics addressed during the forum.

AGENDA

Forum Goal: ***Seeking Solutions to TTY/TDD Through Wireless Digital Systems***

9:00 AM

1. Call to Order & Opening Remarks	Co-Chairs, CTIA/PCIA
2. Introductions and Attendance Roster	Co-Chairs
3. Call for and Numbering of Contributions	Co-Chairs
4. Review & Approve Agenda	Co-Chairs
5. Review & Approve TTY Forum - 3 Summary	Co-Chairs
6. Review TTY Forum <i>Agreements</i>	Steering Committee ¹
7. Review TTY Forum Correspondence	Steering Committee
8. TTY Forum Regulatory and Administrative Issues	CTIA, NAD and Chairs
9. Review / Impacts RE: <i>TTY Consumer Notification</i>	Open Discussion
10. Agreement Statement RE: carriers responsibility for 10/1/98 deadline and dual-mode handsets	Co- Chairs
11. Working Group Reports:	
• Working Group #1/3: Performance of TTY over Voice Services and Coupling. Through Put testing	Wesley Howe Doug Neeley, Chairs
• Working Group #2: TTY via Data Services	Brye Bonner, Chair
12. Define End User Test	Toni Dunne
13. How to Implement TTY Forum Solutions/Proposals	Open Discussion

¹ TTY Forum Steering Committee: Toni Dunne; Billy Ragsdale; Claude Stout; Norm Williams; Jeff Crollick, John Melcher

14. New Business/Next Steps. Develop list of Analog phones and devices best suited for TTY transport	Co-Chairs
15. Next Meeting	
16. Adjournment	