TS-103-A

Public Switched Telephone Network (PSTN);
Subscriber line protocol over the local loop for display (and related) services;

Part A: On-hook data transmission

Telenet Secretariat

Contents

1 Foreword

The present document is part A of a multi-part document covering the PSTN subscriber line protocol over the local loop for display (and related) services, as described below:

Part A:"On-hook data transmission" : TS-103-A

Part B: "Off-hook data transmission": TS-103-B

Part C:"Data link message and parameter codings": TS-103-C

2 Scope

The present document specifies the subscriber line protocol for the support of PSTN display services at Local Exchange (LE). The subscriber line protocol is accomplished by using asynchronous voice-band Frequency-Shift Keying (FSK) signalling.

The requirements imposed on the FSK signalling-based subscriber line protocol deal with data encoding, data transmission requirements and the three layers of the protocol at the network side of the interface: presentation layer, data link layer and physical layer.

3 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] ETSI ETS 300 659-1 : Public Switched Telephone Network(PSTN);Subscriber line protocol over the local loop for display (and related) services; part 1: On-hook data transmission.

[2] ETSI ETS 300 778-1 : Public Switched Telephone Network(PSTN);Protocol over the local

loop for display and related services; Terminal equipment requirements;
Part 1: Off-line data transmission.

[3] ETSI ETS 300 659-2 : Public Switched Telephone Network(PSTN);Subscriber line protocol over the local loop for display (and related) services; part 2: Off-hook data transmission.

[4] ETSI ETS 300 778-2 : Public Switched Telephone Network(PSTN);Protocol over the local

loop for display and related services; Terminal equipment requirements;
Part 2: On-line data transmission.

[5] ITU-T Recommandation V.23 (1998): "600/1200-baud modem standardized for use in the general switched network.

[6] Bellcore GR-30-CORE : Voiceband Data Transmission Interface Requirements.

[7] ITU-T Recommendation T.50 (1992): "International Reference Alphabet (IRA) (Formerly International Alphabet No.5 or IA5) - Information technology - 7-bit coded character set for information interchange".

[8] Telenet Specification: TS-101: Specification of physical and electrical characteristics at the 2-wire analogue presented NTP on the Telenet network.

SEQSEQSEQSEQSEQSEQDefinitions, symbols and abbreviations

4.1. Definitions

For the purposes of the present document, the following terms and definitions apply:

Answer signal	Indication that a terminal is answering an incoming call
Calling line identity	The number (information) identifying the calling party
Clear indication	Indication that the network is attempting to release a connection
Clear signal	Signal indicating that a terminal is attempting to release a connection
Long silent period	Silent period between ring patterns
Loop state	Status of the TE
Mark bit	Symbol "1", presented by a specific FSK signalling tone
Network Termination Point(NTP)	Physical point at boundery of the PSTN intended to accept the connection of a TE
"off hook"	Status of LE in which a DC current drawn by a TE in loop state is sufficient to activate the LE. See Telenet Specification: TS-101[8].
"on hook"	Status of the LE in which a DC current drawn by a TE in quiescent state is insufficient to activate the LE. See Telenet Specification: TS-101 [8]
Ring pattern	A ring pattern consists of one or more ringing pulses separated by short silent periods
Ringing state	Condition of the network where a ringing/alerting signal has been applied at the NTP
Ring trip	Removal of the ringing signal at the NTP in response to a valid answer signal applied to the NTP
Ringing Pulse Alerting Signal (RP-AS)	Pulse of ringing current used to alert the TE that a data transmission will follow. Duration of RP-AS is specified in the present document.
Seize signal	Signal indicating that a terminal is attempting to establish a connection by means of applying a loop condition
Space bit	Symbol "0", presented by a specific FSK signalling tone

4.2. Abbreviations

For the purposes of the present document, the following abbreviations apply:

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AN	Access Network
AS	Alerting Signal
CLI	Calling Line Identity
CPN	Calling Party Name
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
DT-AS	Dual Tone-Alerting Signal
FSK	Frequency-Shift Keying
IRA	International Reference Alphabet
LE	Local Exchange
MSG	Message
MWI	Message Waiting Indicator
NTP	Network Termination Point
PSTN	Public Switched Telephone Network
RP-AS	Ringing Pulse Alerting Signal
SAS	Subscriber Alerting Signal
TAS	TE Alerting Signal
TE	Terminal Equipment
TE-ACK	TE Acknowledgment Signal

5 Protocol requirements

5.1. Overview

This specification defines 3 layers of communication between the network and TE.
Physical, datalink and presentation layer.

· Physical layer: defines data symbol encoding, modulation and analogue line conditions.

· Datalink layer: defines framing of messages for transmission and a simple error check procedure.

· Presentation layer: defines how application-related information is assembled into a message.

Presentation layer messages are contained within datalink messages (see Figure 1):

Figure 1 - Message format
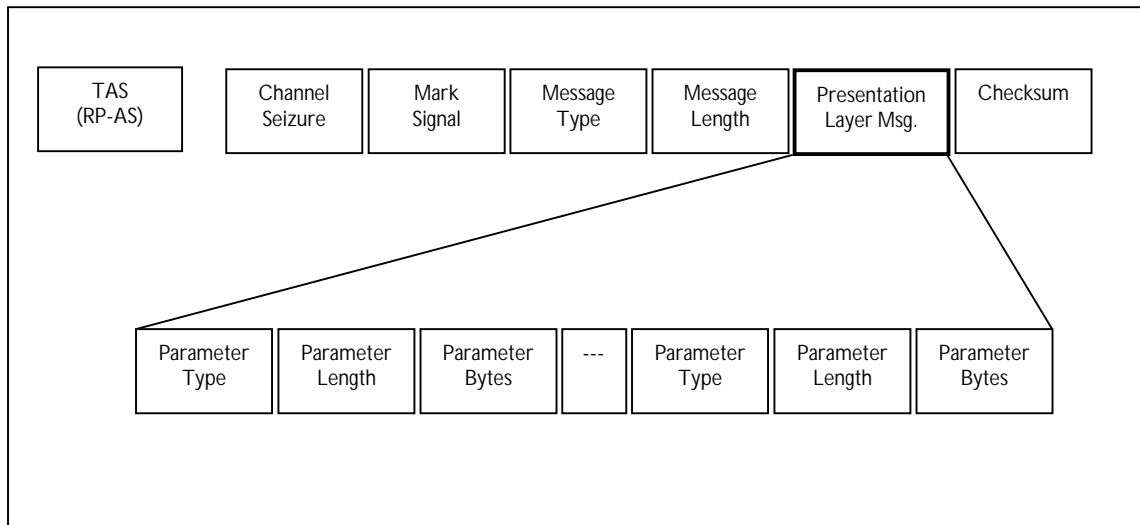
The datalink layer packet is preceded by a RP-AS.

5.2. Physical layer

The existing class modem resource (CMR) cards in the Nortel DMS 100-E switches complies with the Bellcore Bell 202 modem signalling specification. Currently the CCITT V.23 CLASS modem signalling for A-law line cards are in development process. This new line cards will replace the Bellcore Bell 202 modem signalling cards, and therefore both mark and space frequencies are mentioned in table 1.
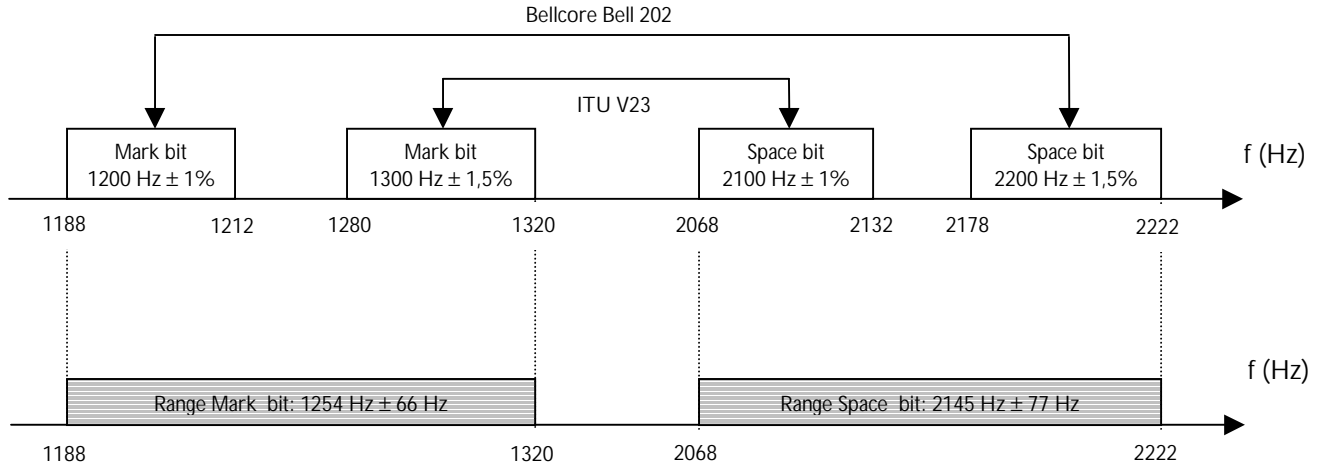
The signal parameters are described in table 1.

Table 1: Signal parameters

Modulation	FSK (Frequency Shift Keying)
Mark bit	1254 Hz ± 66 Hz
Space bit	2145 Hz ± 77 Hz
Signal Level for Mark bit	-13,5 dBm ± 1,5 dB
Signal Level for Space bit	-13,5 dBm ± 1,5 dB
Unwanted signals	Total power of all extraneous signal in the band 300-3400 Hz shall be at least 30 dB lower than the power of signal fundamental frequency, measured at the point of application to the loop
Transmission rate	1200 ± 12 Baud

5.3. Data link layer

The Data link layer is responsible for providing bit error detection capability and for prepending the channel seizure signal and the mark signal to the presentation layer message.
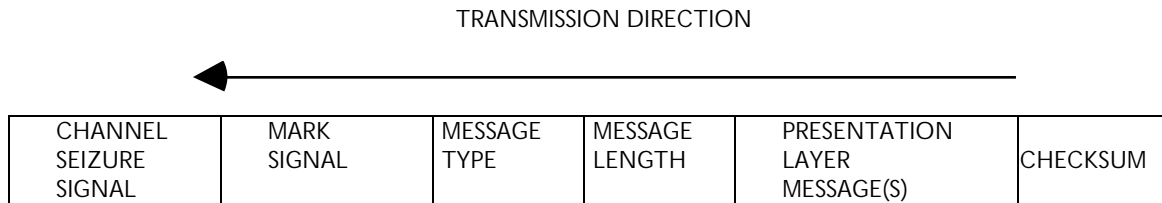The data link layer message format is illustrated in figure 2.

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CHANNEL SEIZURE SIGNAL	MARK SIGNAL	MESSAGE TYPE	MESSAGE LENGTH	PRESENTATION LAYER MESSAGE(S)	CHECKSUM

Figure 2: Data link message format

Channel seizure signal   Consist of a continuous bitstream of alternating "0"s and "1"s. See table 2.

Mark signal   Consists of a continuous bitstream of mark bits ("1").
See table 2.

Message type (1 octet)   Contains an assigned binary encoded value to identify the message.

Message length (1 octet)   Contains the binary encoded number of octets of the data link layer message (not including the message type, message length and checksum octets).

Checksum octet (1 octet)   Contains the two's complement of the modulo 256 sum of all the octets in the message , starting from the message type octet up to the end of the message (excluding the checksum itself).

The protocol does not support error correction or message retransmission. No sequence number or acknowledgment shall be used for the data messages transmitted from the LE to the TE.

NOTE: Any incorrect data link message should be discarded by the TE.

Table 2: Data link parameters

Channel seizure signal	300 bits of alternating "0"s and "1"s
Mark signal	180 $\pm$ 25 mark bits

5.4. Presentation layer

The presentation layer specifies the formats and sequence of information that the LE transmits to the TE (presentation layer message).
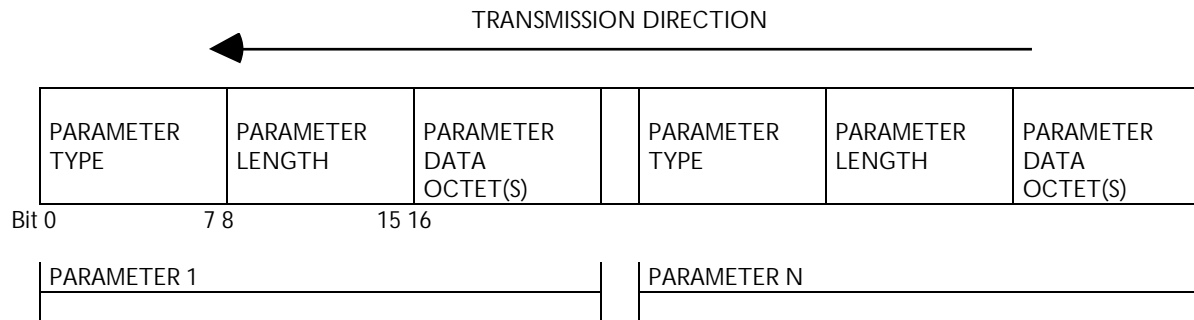The presentation layer message format is illustrated in figure 3.

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PARAMETER TYPE	PARAMETER LENGTH	PARAMETER DATA OCTET(S)		PARAMETER TYPE	PARAMETER LENGTH	PARAMETER DATA OCTET(S)

Bit 0   7 8   15 16

PARAMETER 1	PARAMETER N

Figure 3: Presentation layer message format

Each parameter consists of a parameter type, a parameter length and parameter octets(s):

Parameter type (1 octet)   Contains an assigned binary encoded value to identify the parameter.

Parameter length (1 octet)   Contains the binary encoded number of parameter octets that follow.

Parameter data octet(s)   Contains 1 or more octets. The value shall be either binary encoded or encoded in accordance with CCITT Recommendation T.50 [7].

6 Data transmission requirements: signalling, timing and tolerance

A TE Alerting Signal (TAS) is used to signal to the TE that data transmission is to be expected. The TAS is a Ring Pulse Alerting Signal (RP-AS).

6.1. TAS (RP-AS) physical characteristics

The physical characteristics of RP-AS is described in table 3.

Table 3: TAS (RP-AS) physical characteristics

Frequency (in Hz)	See Telenet Specification TS-101,chapter 12
Amplitude (Vrms)	See Telenet Specification TS-101,chapter 12
Duration of the RP-AS (in ms)	300 ms $\pm$ 50 ms
NOTE: The RP-AS may cause unwanted bell tinkle in case of a MWI, if the signal is not suppressed in the TE.	

6.2. Data transmission associated with ringing, but prior to ringing (not for MWI, see chapter 6.3)

The used TE Alerting Signal (TAS) is a Ringing Pulse Alerting Signal (RP-AS) that signals the TE that data transmissions to be expected. Data transmission shall occur prior to normal first ring pattern, after the TAS. TAS (RP-AS) shall precede FSK modulation transmission by not less than 500 ms. The application of ringing current shall start not less than 200 ms after FSK modulation transmission is stopped (see figure 4 and table 4). The lower limits are required to enable TE to apply and remove appropriate impedance for data reception.

If the TE goes in loop state before or during the data transmission, normal incoming call procedures shall occur and the data transmission shall be aborted.
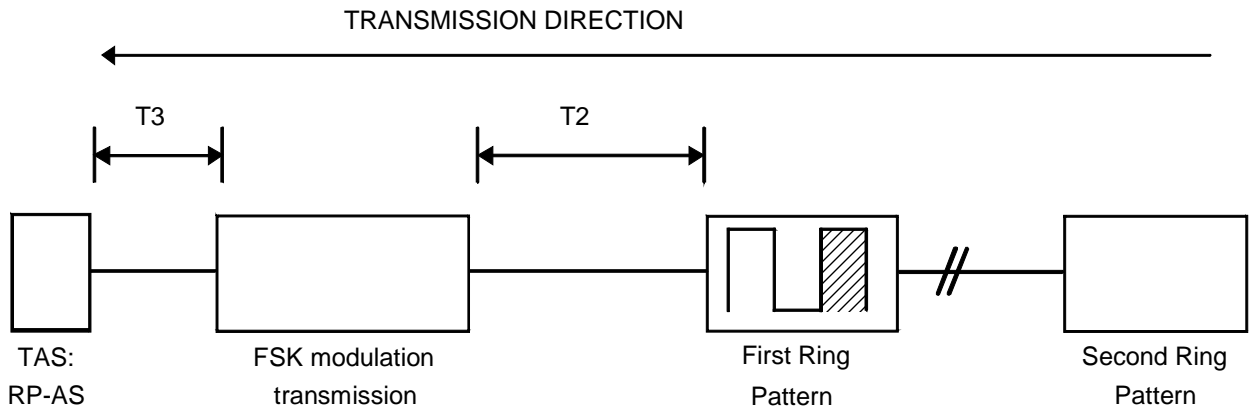
Timing-diagram :

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T3   T2

| TAS: RP-AS | FSK modulation transmission | First Ring Pattern | Second Ring Pattern |

Figure 4: Data transmission prior to ringing - RP-AS

Table 4: Data transmission prior to ringing - timer values

Timer	Values
T3	T3 > 500 ms
T2	T2 > 200 ms
Ring pattern	See Telenet Specification TS-101, chapter 12

6.3. Data transmission not associated with ringing used for MWI

The used TE Alerting Signal (TAS) is a Ringing Pulse Alerting Signal (RP-AS) that signals the TE that data transmission is to be expected. RP-AS shall precede FSK modulation transmission by not less than 500 ms. The LE shall re-establish the condition existing before the TAS is sent within a minimum of 200 ms after FSK modulation transmission is stopped (see figure 5 and table 5). The lower limit is required to enable TE to apply and remove appropriate impedance for data reception.

If the TE goes in loop state before or during the FSK modulation, normal incoming call procedures shall occur and the data transmission shall be aborted.
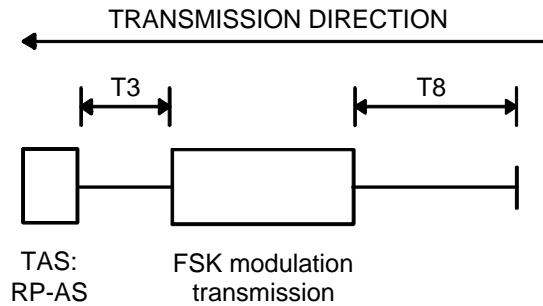
Timing-diagram :

Figure 5: Data transmission not associated with ringing - RP-AS

Table 5: Data transmission not associated with ringing - timer values

Timer	Values
T3	T3 > 500 ms
T8	T8 > 200 ms

History

Document history		
Version	Date	Milestone
1p1	03/04/2000	First Draft, Internal Telenet Review Only
1p2	06/06/2000	Second Draft
1p3	15/06/2000	Third Draft, First series of review vendor included
1	15/06/2000	First released edition