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KCOM GROUP PLC
Public Switched Telephone Network (PSTN)

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The information in this document is provided in accordance with the requirements of the Telecommunications (Voice Telephony) Regulations 1997 and Radio Equipment and Telecommunications Terminal Equipment Regulations 2000 to publish (in accordance with the EC Voice Telephony Directives 95/62/EC & 98/10/EC and Radio and Telecommunications Terminal Equipment Directive 99/05) technical characteristics of interfaces to the public fixed telephone network.

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1 Introduction

KCOM Group PLC provides the Public Switched Telephone Network (PSTN), enabling delivery of PSTN services over either single copper analogue exchange line or customer premises fibre termination equipment to the service specific equipment in a customer premise to a common Network Termination Equipment (NTE) interface.

This document specifies the technical characteristics of a single analogue line interface of the PSTN operated by KCOM Group PLC and known commonly as a Direct Exchange Line (DEL), delivered to a customer at the Network Terminating Point (NTP).

Much of the information contained in this document has been published previously in various documents such as ETSI and BSI standards.

Changes to the network that affect the correct working of approved terminal equipment will be published by KCOM Group PLC in various documents made available from the address below. If the changes impact on this document then it will be updated.

Enquiries relating to the technical content of this document and the availability of other publications should be directed to:

KCOM Group PLC Regulatory Affairs
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E-mail: regulatory@kcom.com

2 The Network Termination Point

The Direct Exchange Line (DEL) interface conforms to ETSI ETS 300 001[1] § 1.4.3 however for completeness the interface is detailed below.

The DEL interface consists of two conductors designated as the “A” and “B” wires. The customer access to the DEL interface can either be a KCOM Master Socket or in the form of an Insulation Displacement Connection (IDC) or Screw Terminal cable termination. The demarcation point is the interface on the NTE5B Master Socket.

2.1 Connections used in Master Sockets

Where the DEL is terminated on a Master Socket, the connections for a suitable plug (conforming to ETS 300 001 § 8.2 (GB) 1) are as shown in Figure 1.

1	Not Used for PSTN
2	“A” or “B” wire
3	Local Earth when required
4	Shunt Connection, when required
5	“B” or “A” wire
6	Not Used for PSTN

Note: Plug Latch is adjacent to Pin 6

Figure 1: Plug Contacts

Terminals which meet the requirements of ETSI ETS 300 001 (GB) will be supported by the DEL interface.

The shunt connection is the centre point of a 470 kΩ resistor and 1.8 µF capacitor connected across the A and B wires within the master socket. An overvoltage protection device in accordance with BT Specification 26A is connected across the A and B wires within the master socket.

2.2 Insulation Displacement Connectors

Where the DEL interface is terminated on insulation displacement connectors they will support the connection of copper conductors having diameter between 0.35 mm and 0.65 mm.

2.3 Screw Terminal Connectors

Where the DEL interface is terminated with screw terminal connectors they will support the connection of copper conductors having diameter of 0.35 mm and 0.9 mm.

Note: New installations will not normally be terminated with this type of connection.

2.4 Fibre delivered service

KCOM has a program of fibre delivered services to replace the copper installations on new and existing sites. As this part of the exchange derived copper connectivity is replaced with an active, locally powered, fibre unit that provides an alternative delivery of the service via the same final customer presentation on an NTE5B. There are feature alterations noted in CIP001a and CIP038a.

As part of this delivery type an active locally power NTU is supplied that terminates the fibre connection and can provide multiple services including PSTN type voice. It is supplied with a battery backup unit with user serviceable batteries. As part of this a standard household mains socket is required to power the system. Please see KCOM CIP038 for further details.

3 Line Conditions

Line conditions are fully detailed in ETSI ETS 300 001

3.1 On-Hook (Off-Line) condition

The On-Hook condition is as per ETSI ETS 300 001 § 1.4.5.1 (GB) 1 and/or 2.

The maximum DC current drawn from the interface to remain in the “On-Hook” condition is given in ETS 300 001 § 2.2.1 (GB) 4.

3.2 Off-Hook (On-Line) condition

The Off-Hook condition is as per ETSI ETS 300 001 § 1.4.5.3

The DEL interface provides a constant current linefeed of 40 mA nominal (36.8mA to 42mA) into lines with a loop resistance of up to 1150 ohms including the phone. Thereafter a constant voltage linefeed (-48V nominal) is provided into higher resistance loops maintaining: -

>25mA into loops < 1840 ohms (inc. phone)
>20mA into loops < 2300 ohms (inc. phone)

The maximum DC current sourced by the exchange line circuit is therefore 42mA under normal operating conditions.

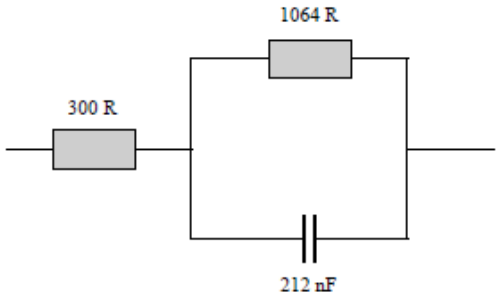
3.3 Line Polarity

The polarity of the DEL interface will normally be negative to the ‘B’ wire and earth to the ‘A’ wire in the ‘On-Hook’ condition. During call progress the polarity may be reversed.

3.4 Network Termination Impedance

The input impedance presented at the NTP is a combination of the impedance presented

by the local exchange and the impedance characteristics of the local cable types. The local exchange impedance is nominally 300 ohms in series with a 1064 ohms / 212nF parallel combination i.e.



The values are subject to production tolerances, however a minimum return loss of 16dB can be expected.

4 Outgoing Calls

4.1 Call Initiation

The DEL interface will respond to the application of an 'Off-Hook' condition (described in 3.2 above) by the calling terminal.

4.2 Proceed Indication

When the DEL interface is ready to receive routing information a proceed indication (Dial Tone) will be given to the calling terminal. This Dial Tone is in accordance with ETSI ETS 300 001 § 1.7.1.

Note: Remarks 1.7.1 (GB) 3 and 1.7.1 (GB) 4 do not apply within the KCOM network.

4.3 Routing information

The DEL interface will respond to routing information received from the calling terminal either in Multi-Frequency Tone format (as per ETS 300 001 § 5.4) or Decadic (Loop Disconnect) format (as per ETS 300 001 § 5.3).

4.4 Call Progress information

4.4.1 Ringing Tone

Ringing Tone will be applied to the interface when the call has been established and the called Customer is being alerted. The tone will conform to ETS 300 001 §1.7.2.

4.4.2 Busy Tone

Busy Tone will be applied to the interface when the call to the Dialled number cannot be connected due to the called customers line being engaged. The tone will conform to ETS 300 001 § 1.7.3.

4.4.3 Congestion Tone

Congestion Tone will be applied to the interface when the network cannot connect the Dialled call. The tone will conform to ETS 300 001 § 1.7.4.

4.4.4 Number Unobtainable Tone

Number Unobtainable tone will be applied to the interface when the Dialled number is not obtainable due to reasons other than the line or network being engaged. Information messages may replace N.U. tone in certain circumstances.

The tone will conform to ETS 300 001 § 1.7.7.

5 Incoming Calls

5.1 Call Arrival Indication

The call arrival indication (Ringing) is as per ETSI ETS 300 001 § 1.4.5.2 with the signal conforming to ETSI ETS 300 001 § 1.7.9. This signal will be presented to any 'On-Hook' line.

Note: At the present time KCOM Group PLC. service does not support "No Ring Call" operation. However if and when this is supported the details will be published.

5.2 Called Customer Answer

When the called customer answers the DEL interface responds to the 'Off-Hook' condition and may under certain circumstances present a reversal of the 'A' and 'B' wire polarity to the calling customer for the duration of the call.

5.3 Ring Trip

In normal operation ringing current may continue to be applied for typically 110 ms to 510 ms after the 'Off-Hook' state is established.

6 Call Clearing

6.1 Terminal Initiated Clearing

6.1.1 By A Calling Terminal

The DEL will detect a calling terminal returning to an 'On-Hook' state and initiate a "Network Initiated Clearing" sequence (described in 6.2 below) with the additional of an information message being sent to the called customer indicating the 'Caller' has cleared.

6.1.2 By A Called Terminal

When the called terminal returns to the 'On-Hook' state the DEL will detect the change of condition and initiate a time-out process lasting up to two minutes. After the time-out period has expired a "Network Initiated Clearing" sequence (described in 6.2 below) is offered to the calling terminal

6.2 Network Initiated Clearing

The DEL interface will offer a sequence of clearing signals at the NTP as a result of terminals ending the call or a failure to send valid routing digits during call set-up.

7 Additional Information

BS 6305[2] provides a variety of additional information which may or may not be covered in ETSI ETS 300 001 covering topics such as: Positive Battery; Voltage transients; verbal announcements; Private Meter Pulses; Noise, induced voltages and line surges; End to End insertion loss; and Relative group delay.

Note: Values applicable to End to End Characteristics apply only to calls connected wholly within networks operated by KCOM Group PLC.

8 Safety and EMC Information

8.1 Safety

The normal working voltage of the interface is defined in section 3.2 above. The interface presented to the customer is classified as exposed as defined in CENELEC Report/ETSI Guide ROBT-002/EG 201 212[3].

8.2 EMC

The network equipment and network terminating equipment related to the provision of the interface comply with the current EMC regulations.

Whilst predominantly installed in residential and commercial environments, this does not preclude the interface being installed in other environments e.g. light industrial. This should be taken into account by the terminal equipment manufacturer when determining the limits of compliance relevant to their equipment in relation to the protection requirements of the EMC directive.

9 Recommended Terminal Equipment Standards

For avoidance of doubt, service will not be provided on Centrex or PABX Group exchange lines.
The minimum recommended terminal equipment performance specifications are: -

- Corded Handset telephones - ETSI TBR21[4] & TBR38[5]
- Cordless Handset telephones - ETSI TBR21[4] & TBR38[5]
- Handsfree telephones - ETSI TBR21[4]
- Answering/recording equipment - ETSI TBR21[4]
- Facsimile machines / modems - ETSI TBR21[4]

The minimum recommended terminal equipment EMC specifications are listed in the Official Journal of the European Communities for use under the Electromagnetic Compatibility Directive (89/336). The lists are updated regularly and the terminal manufacturer is recommended to comply with the listed standards applicable to their equipment and the target electromagnetic environment.

The minimum recommended terminal equipment electrical safety specifications are listed in the Official Journal of the European Communities for use under the Low Voltage Directive (73/23/EEC). The lists are updated regularly and the terminal manufacturer is recommended to comply with the listed standards applicable to their equipment.

10 Supplementary Services

A range of supplementary services, such as Caller Display, are available on the KCOM single analogue line. These services are described in a separate document: “CIP001a Technical Characteristics of the Single Analogue Line Supplementary Services”.

11 Glossary

BS	British Standard
DEL	Direct Exchange Line
EC	European Community

ETS	European Telecommunications Standard
ETSI	European Telecommunications Standards Institute
IDC	Insulation Displacement Connector
NTP	Network Terminating Point
PSTN	Public Switched Telephone Network

12 References

Reference	Standard	Title	Date
[1]	ETS 300 001	Attachments to Public Switched Telephone Network (PSTN); general requirements for equipment connected to an analogue subscriber interface in the PSTN	1997
[2]	BS 6305	General requirements for apparatus for connection to public switched telephone networks run by certain public telecommunications operators.	1992
[3]	R0BT-002/EG 201 212 V.1.2.1 (1998-11)	Electrical Safety; Classification of interfaces for equipment to be connected to telecommunications networks.	1998
[4]	ETSI TBR 21	TE attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks of TE (excluding TE supporting the voice telephony service), in which network addressing, (if supported) is by means of dual tone multi-frequency signaling.	1998
[5]	ETSI TBR 38	Public Switched Telephone Network: attachment requirements for terminal equipment incorporating and analogue handset function capable of supporting the justified case service when connected to the analogue interface of the PSTN in Europe.	1998

The above documents may be obtained from:

British Standards Institution
Customer Services, Sales Department
389 Chiswick High Road,
London W4 4AL

Tel: +44 (0) 208 996 9001
Fax: +44 (0) 208 996 7001

[1]	IEEE 802.3	Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements— Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications	1988
[2]	KCH CIP 016	Technical Characteristics of the 10Mbit/s and 100Mbit/s digital leased line	
[3]	RFC 791	Internet Protocol DARPA Internet Program Protocol Specification	
[4]	RFC 826	An Ethernet Address Resolution Protocol -- or -- Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware	
[5]	RFC 1042	A Standard for the Transmission of IP Datagrams over IEEE 802 Networks.	
[6]	ETS 300 001 § 8.2 (GB)	Attachments to Public Switched Telephone Network (PSTN); general requirements for equipment connected to an analogue subscriber interface in the PSTN	1997
[7]	KCH CIP 021	Technical Characteristics of the ADSL Interface	
[8]	KCH CIP 001	Technical characteristics of the Single Analogue Line Interface	
[9]	RFC 2364	PPP Over AAL5	
[10]	RFC 2516	A Method for Transmitting PPP Over Ethernet (PPPoE)	
[11]	RFC 2865	Remote Authentication Dial In User Service (RADIUS)	
[12]	RFC 2866	RADIUS Accounting	
[13]	ITU-T G.992.1 Annex G	Asymmetric digital subscriber line (ADSL) transceivers	02/07/1999
[14]	ITU-T G.992.5 Annex A	Asymmetric digital subscriber line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2plus)	Jan-09

[15]	RFC 1661	IETF: The Point-to-Point Protocol (PPP)	
[16]	RFC 1994	IETF: PPP Challenge Handshake Authentication Protocol (CHAP)	
[17]	BS EN 60825-1/2	Safety of laser products – Part 1: Equipment classification and requirements	2007
[18]	ROBT-002/EG 201 212	Electrical Safety ; Classification of interfaces for equipment to be connected to telecommunications networks	1998

Reference [1] may be obtained through www.ieee802.org/

References [13] and [14] may be obtained from www.itu.int
References [2], [7] and [8] may be found at: www.kcomplc.com/regulatory/kcom-wholesale/service-information/technical-interface-information/

References [6] and [18] may be found at www.etsi.org/website/standards/standard.aspx

References [3], [4], [5], [9], [10], [11], [12], [15] and [16] may be found at www.ietf.org/rfc.html

Reference 17 may be obtained through www.standardsuk.com

12 History

Date	Issue	Comments	Author
Precursor document: Technical Characteristics of the Single Analogue Line Interface [Issue 2.0 May 2000] KCL CIP001			
Dec 2003	Issue 1.0	Kingston Communications (HULL) PLC publication to replace the above	M. D. Crowther
Aug 2007	Issue 1.1	KCOM Group PLC and change of contact information publication to replace the above.	M. D. Crowther
Apr 2016	Issue 1.2	Change of company name from KC to KCOM and document format changes	Amanda Woodard
July 2018	Issue 1.4	Inclusion of Fibre to the Home delivery of PSTN	I.P.