



Specification of analogue network interface

Table of Contents

1	Introduction	2
2	References	3
3	Interface Types	4
4	Connection Methods	4
5	Driving Capability	4
6	DC Voltages and feed conditions.....	4
6.1	DC Voltage - on hook	4
6.2	Polarity.....	5
6.3	Line current.....	5
7	Seizure	5
7.1	Conditions at the NTP not recognized as a seizure.....	5
7.2	Conditions at the NTP to facilitate line testing.....	5
7.3	Conditions at the NTP which will be interpreted as a seize signal	5
7.4	Time required for a seizure signal to be recognized.....	5
8	Transmission.....	6
8.1	Frequency band	6
8.2	Relative level.....	6
8.3	Input Impedance	6
8.4	Longitudinal conversion loss.....	7
8.5	Coding Law	7
8.6	Noise.....	7
9	Acceptable signal levels at the NTP.....	7
10	Supervisory Tones	7
10.1	Dial Tone	7
10.2	Howler Tone.....	8
10.3	Special dial tone.....	8
10.4	Busy tone	8
10.5	Congestion tone.....	8
10.6	Ringing tone.....	8
10.7	Call waiting tone	8
10.8	Confirmation Tone.....	9
10.9	Special Information Tone.....	9
10.10	Number unobtainable tone.....	9
11	Dialling.....	9
11.1	Dialling Type.....	9
11.2	Reception of first digit	9
11.3	Number and timing of call attempts	9
11.4	DTMF dialling.....	9

- 11.5 Loop disconnect dialling.....9
- 12 Ringing signals10**
- 13 Register recall10**
- 14 Answer Signal.....10**
- 15 Charge information10**
- 16 Clearing signal10**
- 17 Signalling for Supplementary services 11**
 - 17.1 Anonymous Call Rejection 11
 - 17.2 Call Forward Unconditional..... 11
 - 17.3 Call Forward No Reply11
 - 17.4 Call Forward Busy..... 11
 - 17.5 Call Waiting..... 11
 - 17.6 Last Caller..... 11
 - 17.7 Remove Last Caller From List 11
 - 17.8 Last Caller Redial 12
 - 17.9 Last Caller Barring following a call 12
 - 17.10 Withhold number on per call basis 12
- 18 Signalling for PSTN display services 12**



1 Introduction

This document has been produced to comply with article 4.2 of Directive 1995/5/EC on radio equipment and telecommunications terminal equipment (R&TTE Directive) [1]. This document provides the current specification of the analogue line interfaces offered by British Sky Broadcasting Group plc. (BSkyB).

The document follows the guidelines set forth in the ETSI guidelines for publication of interface specifications ETSI EG 201 730-1 General and Common Aspects [2] and ETSI EG 201 730-2 Analogue narrow-band wire-line interfaces [3]

This document is the copyright of British Sky Broadcasting Ltd (Sky), first published August 2013. Users may only disseminate within their organisation copies of the document in its entirety. Users must not edit the document or reproduce extracts without Sky's written permission. Users must not remove or alter Sky's trade marks, logos, notices or headings.

Sky reserves the right to amend, update or replace the information in this document at any time. Although Sky makes reasonable efforts to update the information in this document, it makes no representations, warranties or guarantees, whether express or implied that the information in this document is accurate, complete or up-to-date. This document is provided for general information only and should not be used or relied upon in place of conducting your own tests.

BSkyB and its subsidiaries shall have no liability in contract, tort (including negligence) or otherwise for any loss or damage arising from the use of, or reliance upon the information in this document by any person. Notwithstanding this, BSKyB and its subsidiaries do not exclude or limit any liability that cannot be excluded or limited by English law.



2 References

[1]	Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
[2]	ETSI EG 201 730-1: "Terminals' access to Public Telecommunications Networks; Application of the Directive 1999/5/EC (R&TTE), article 4.2; Guidelines for the publication of interface specifications; Part 1: General and common aspects".
[3]	ETSI EG 201 730-1: "Terminals' access to Public Telecommunications Networks; Application of the Directive 1999/5/EC (R&TTE), article 4.2; Guidelines for the publication of interface specifications; Part 2: Analogue narrow-band wireline interfaces".
[4]	SIN 351 Issue 4.5 May 2006 "BT Public Switched Telephone Network (PSTN): Technical Characteristics Of The Single Analogue Line Interface
[5]	ETSI EG 201 120 Public Switched Telephone Network (PSTN) ; Method of rating terminal equipment so that it can be connected in series and/or in parallel to a Network Termination Point (NTP)
[6]	ITU-T Q.552 Transmission characteristics at 2-wire analogue interfaces of digital exchanges
[7]	ITU-T Recommendations g.711: "Pulse code modulation (PCM) of voice frequencies"
[8]	ETSI 201-235 -2 Specification of Dual Tone Multi-Frequency (DTMF) Transmitters and Receivers
[9]	ETSI EN 300 659-1 Access and Terminals (AT); Analogue access to the Public Switched Telephone Network (PSTN); Subscriber line protocol over the local loop for display (and related) services; Part 1: On-hook data transmission.
[10]	ETSI EN 300 659-2 Access and Terminals (AT); Analogue access to the Public Switched telephone Network (PSTN); Subscriber line protocol over the local loop for display (and related) services; Part 2: Off-hook data transmission.
[11]	ETSI EG 201 188 Public Switched Telephone Network (PSTN); Network Termination Point NTP) analogue interface; Specification of physical and electrical characteristics at a 2-wire analogue presented NTP for short to medium length loop applications



3 Interface Types

BSkyB offers analogue interfaces to residential customers based on an unbundled local loop (ULL) using products provided by Openreach

- Openreach Metallic Path Facility (MPF)
- Openreach Shared Metallic Path Facility (SMPF).

For the SMPF the service is provided by BskyB using the Openreach Wholesale Line Rental 3 product. For these analog lines the specification is documented in a Supplier Information Note [4].

For the MPF the method of indirect access and responsibility for publishing is documented in the ETSI Guidance [3].

For this scenario Public Network Operator PNO B is BskyB who is responsible for publishing the interface which will reference technical information on the local access network supplied by PNO A.

4 Connection Methods

This section is for describing the mechanical and contact assignments of the Network Termination Point (NTP). As BskyB provide service through ULL, the details are provided in SIN 351 [4]

5 Driving Capability

The NTP driving capability is the ability to support one or more terminals connected in parallel or serial to the NTP. The Loading Factor is a proportion of the available resources used by a terminal or set of terminals expressed in an arbitrary unit: the Loading Unit. (LU) as specified in ETSI EG 201 120 [5] Each TE connected to the NTP will consume a number of LUs.

The NTP can support a total load of 100 LU.

6 DC Voltages and feed conditions

6.1 DC Voltage - on hook

The maximum dc voltage between the A and B wires at the NTP when terminated in a 300Ω resistor is 48 +/- 5V

The DC feeding resistance is 2 x 200 Ω

In a ULL both BskyB and the local loop PNO can invoke line testing. During line testing the voltage may not be continuous. Line testing voltages from the PNO providing the line may result in other voltages being present detailed in [4].



6.2 Polarity

The A wire will have a positive voltage with respect to the B wire when the circuit is not engaged on a call. Polarity reversals are also used as alerting signals in conjunction with display services (section 18).

Note: maintenance activity in the copper access network may cause the A and B wires to be reversed.

6.3 Line current

The line current into TE from the NTP is a function of the feeding source, the line resistance and the TE resistance.

The maximum dc loop feeding current for the majority of lines will be 24mA +/- 2 mA

The line will enter a park condition if signaling is not recognized after a minimum timeout of 3'.56" and a maximum timeout of 5'.53"

Loop current in the park condition is 0 mA.

7 Seizure

7.1 Conditions at the NTP not recognized as a seizure

The interface will recognize a loop resistance of greater than 10 k Ω between the 'A' and 'B' wires as an off-line (on-hook) condition. A current of less than 3.5mA will not be recognized as a seizure condition

7.2 Conditions at the NTP to facilitate line testing

To facilitate automatic line testing the resistance presented by the TE or multiple TEs in parallel needs to be significantly greater than the minimum value that will not be recognized as a seizure.

The minimum resistance that should be presented across the A and B wires by the TE or multiple TEs is 1M Ω . The TE equipment should also provide at least a 10M Ω resistance between the A wire and earth or the B wire and earth.

7.3 Conditions at the NTP which will be interpreted as a seizure signal

The interface will recognize a loop resistance of less than 1 k Ω between the 'A' and 'B' wires as a seizure condition. A current of 10mA will be recognized as a seizure condition.

7.4 Time required for a seizure signal to be recognized

A seizure signal that is applied across the A and B wires at the NTP for > 50 ms will be recognized as a seizure condition.



8 Transmission

8.1 Frequency band

The transmission channel has the capability to transfer the frequency range 300 Hz – 3400 Hz..

The characteristics of the BT loop as described in BT-SIN 351 match with those of a PE05 cable as defined in ETSI TS 101 388 V1.4.1 (2007-08). Below is the IL (insertion loss) for that cable type at the specified frequency, loop length and termination impedance.

1600 Hz, 600 Ω

IL for PE05 cable @ 1600 Hz, length = 100m, Termination = 600 Ω -> 0.12 dB

IL for PE05 cable @ 1600 Hz, length = 9000m, Termination = 600 Ω -> 14.41 dB

1020 Hz, 600 Ω

IL for PE05 cable @ 1020 Hz, length = 100m, Termination = 600 Ω -> 0.21 dB

IL for PE05 cable @ 1020 Hz, length = 9000m, Termination = 600 Ω -> 12.41 dB

1600 Hz, BT Complex impedance (= 611 Ω at 1600 Hz)

IL for PE05 cable @ 1600 Hz, length = 100m, Termination = 611 Ω -> 0.18 dB

IL for PE05 cable @ 1600 Hz, length = 9000m, Termination = 611 Ω ->14.07 dB

1020 Hz, BT Complex impedance (= 723 Ω at 1020 Hz)

IL for PE05 cable @ 1020 Hz, length = 100m, Termination = 723 Ω -> 0.18 dB

IL for PE05 cable @ 1020 Hz, length = 9000m, Termination = 723 Ω -> 11.74 dB

Further details on how to calculate cable insertion loss can e.g. be found in ETSI STC TM6

8.2 Relative level

Relative input level (L_i) at 1020 Hz at the T point: -0.3 dBr

Relative output level (L_o) at 1020 Hz at the R point: -7.3 dBr

L_i and L_o defined in the ETSI Guidelines for the publication of interface specifications; Part 2 [3]

8.3 Input Impedance

The Nominal Central Office Impedance (Line Exchange) is specified as 300+ 1000 Ω //220nF



8.4 Longitudinal conversion loss

Longitudinal Conversion Loss (LCL) as defined in ITU-T Recommendation Q.552 [6] at the NTP is > 40 dB in the frequency range 300-600 Hz, and > 46 dB in the frequency range 600-3400 Hz.

8.5 Coding Law

The speech signal is coded in accordance with ITU-T G.711 [7]

A Law compounding algorithm

Packetisation time is configured to 10 ms in the BSkyB network but could be negotiated to 20ms by interconnected network

8.6 Noise

The noise characteristics are in accordance with ITU-T Q.552 [6] based on the line being terminated by the ETSI reference impedance of $270\Omega + 750\Omega//150nF$

9 Acceptable signal levels at the NTP

The network specification for the maximum acceptable signal level at the NTP meets the characteristics defined in the ETSI 201 188 [11] which specifies the overload point in a PCM A-law coder to +3.14 dBm0.

10 Supervisory Tones

The frequencies' levels below are specified for a 0Ω loop and 600Ω equivalent resistive load.

10.1 Dial Tone

Dial tone (which is one of the proceed tones) will be returned within 1000 ms of the seize event being recognized.

Frequency :350 Hz + 440 Hz

Cadence: Continuous

Frequencies' Level: -14 dBm

Duration: either

- 16 s followed by busy tone for 40s, followed by howler for 180s then silence

Or

- 20s followed by an announcement for 33s followed by silence for 180s and howler for 120s then silence.



10.2 Howler Tone

An audible indication to attract the attention of a customer whose telephone has been left in the 'off-hook' state. When heard in a telephone receiver the tone has a distinctive sound. Over a period of 12 seconds (+/-2 seconds), the level increases as a continuous rise at a constant rate to a level, which is expected to attract attention at a distance of 6m from the customers' telephone receiver. The howler tone is removed automatically if the telephone handset is replaced (on hook), or after 3 minutes, whichever is sooner.

The howler tone is of the frequency swept type with the tone varying in the range 800Hz to 3.2 kHz, at a sweep rate of 1Hz with a peak power of +20dBm.

10.3 Special dial tone

A special dial tone is applied to indicate a message is waiting in a voice mail system.

Frequency: 350 Hz + 440 Hz

Cadence: 350Hz tone 0.75s ON, 0.75s OFF

Frequencies' Level: -14 dBm

10.4 Busy tone

Frequency: 400 Hz

Cadence: 0.375s ON, 0.375s OFF

Frequency Level: -19 dBm

10.5 Congestion tone

Frequency: 400 Hz Long tone, 400Hz Short tone

Cadence 0.4s ON 0.35s OFF, 0.225s ON 0.525s OFF

Frequency Level : (long) -25 dBm

Frequency Level: (short) -19 dBm

10.6 Ringing tone

Frequency1: 400 Hz + 450Hz

Cadence 0.4s ON 0.2s OFF, 0.4s ON 2.0s OFF

Frequencies' Level: -19 dBm

10.7 Call waiting tone

Frequency1: 400Hz

Cadence 0.1s ON 2-5s OFF

Frequency Level: -19 dBm



10.8 Confirmation Tone

Frequency 1: 300 Hz

Frequency 2: 500Hz

Cadence: F1:0.5s ON 0.1 OFF, F2: 0.5s ON 0.1s OFF, F3: 0.5s ON 1.5s OFF

Frequencies' Level: -19 dBm

10.9 Special Information Tone

Frequency 1: 950 Hz Frequency : 1400 Hz Frequency 3: 1800 Hz

Cadence:F1:0.33s ON 0.03s OFF, F2: 0.33s ON 0.03s OFF, F3: 0.33s ON 0.03s OFF

Frequencies' Level: -19 dBm

10.10 Number unobtainable tone

Frequency: 400 Hz

Cadence: Continuous

Frequency Level: -19 dBm

11 Dialling

11.1 Dialling Type

The analogue network interface supports both DTMF dialling and Loop disconnect dialling.

11.2 Reception of first digit

Dial tone (or an alternative proceed tone) will be returned to the TE when the seize condition is recognized by the network. The proceed tone will be returned within 1000ms

11.3 Number and timing of call attempts

The network will recognize a clear condition when the line break exists for >3 seconds. A clear condition will not be recognized when the line break <20 0ms. Follow on calls should therefore be at an interval of greater than 3 seconds.

11.4 DTMF dialling

The network accepts DTMF transmitters meeting the characteristics specified in ES 201 235-2 [8]

11.5 Loop disconnect dialling

The network is ready to receive the first digit after the Dial tone that will be returned within 200 ms of the seize event being recognized.

The Min Off-hook event timeout before any signal being applied on the line is 50 ms and the min On-hook event timeout before any signal being removed from the line is 200 ms



The break period has to be in the range $20 \text{ ms} < t < 103 \text{ ms}$ and the make period has to be in the range $20 \text{ ms} < t < 200 \text{ ms}$. The inter-digit timeout is 240 ms.

The maximum dialing pulse rate is 10 +- 1

12 Ringing signals

Standard ringing signal is sent to the called party to indicate an incoming call. The injection of the ringing signal is balanced, i.e. the ringing voltage is applied to both the a- and b-wire.

As long as the call has not been answered by the called party or forwarded to the voice mail after 20s or released by the calling party. The ring tone is applied to most of the lines not more than 120s. The ring tone is applied to some few lines not more than 300s.

Frequency: 25 Hz +1/-5 Hz

Ringing AC voltage: 70 Vrms +15 / -6 Vrms

Ringer equivalent: $7\text{k } \Omega + 55 \text{ H}$ (Resistor in series with inductor)

Maximum number ringer equivalents: 4

Ringing timeout [for all ringing cadences]: 300s

Ring sequence: 0.4 s ON / 0.2 s OFF / 0.4s ON / 2s OFF

13 Register recall

Terminal equipment generates a Register Recall signal (R-signal) by breaking the normal DC loop for a specific period (timed break recall) in communication state. The PSTN will accept register recall signals meeting the following description:

Minimum duration of the break period: 80 ms

Maximum duration of the break period: 150 ms

14 Answer Signal

The network does not provide line signals to indicate an answer condition to the TE

15 Charge information

The Network does not provide charging information to TE.

16 Clearing signal

The interface will recognize a loop resistance of greater than $10 \text{ k } \Omega$ between the 'A' and 'B' wires as an off-line (on-hook) condition.



17 Signalling for Supplementary services

A range of supplementary services are available dependent upon the product purchased by the customer.

17.1 Anonymous Call Rejection

Activate feature: *227#

Deactivate Feature: #227#

Check Status of feature: *#227#

17.2 Call Forward Unconditional

Activate feature: *21#Number to divert to#

Deactivate Feature: #21#

Check Status of feature: *#21#

17.3 Call Forward No Reply

Activate feature: *61# Number to divert to#

Deactivate Feature: #61#

Check Status of feature: *#61#

17.4 Call Forward Busy

Activate feature: *67# Number to divert to#

Deactivate Feature: #67#

Check Status of feature: *#67#

17.5 Call Waiting

Activate feature: *43#

Deactivate Feature: #43#

Check Status of feature: *#43#

Recall to accept the new call

Recall to switch back to original call

17.6 Last Caller

Dial: 1471

17.7 Remove Last Caller From List

Dial: 1475



17.8 Last Caller Redial

Dial: 14713

17.9 Last Caller Barring following a call

Dial: 14258

17.10 Withhold number on per call basis

Dial 140

18 Signalling for PSTN display services

The network implements the signaling method for the On-hook state meeting the characteristics specified in ETSI EN 300 659-1 [9] and in particular at the paragraph 6.1.2 (c).

The network implements the signaling method for the Off-hook state meeting the characteristics specified in ETSI EN 300 659-2 [10]

Base Standard: ETSI

Frequencies: 2130 and 2750 Hz

Frequencies nominal level: -13.5 dBm0





Document Information

Document created by	[Sky Network Services]
Job title	[]
Date created	[August , 2013]
Version	[Issue 1.0]
email address	[]
Mobile Phone	[]
Landline Phone	[]