

BS 8521:2009



BSI Standards Publication

Specification for dual-tone multi-frequency (DTMF) signalling protocol for social alarm systems

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 24, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 April 2009. It was prepared by Subcommittee GW/1/12, *Social alarms*, under the authority of Technical Committee GW/1, *Electronic security systems*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 7369:1991, which is withdrawn.

Information about this document

This is a full revision of BS 7369, and introduces the following principal changes:

- message structure has been extended to reflect the evolution of user requirements, and extended range of alarm generation sources;
- extended definitions of parameters are provided and an error detection checksum has been added to alarm messages;
- a remote parameter programming and enquiry facility has been introduced;
- tone durations and signal timing have been revised.

The aim of this British Standard is to provide a replacement to the BS 7369:1991 social alarm DTMF signalling protocol implementation employed by manufacturers within the social alarm market place to enable a solution toward meeting the requirements of the current market place. BS 8521 is intended to ensure that equipment users can benefit from improved equipment interoperability, irrespective as to the source of their equipment.

BS 8521 is not interoperable with BS 7369:1991.

Compliance with this British Standard does not infer that all the functions listed herein are available within any given item of alarm equipment.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

This British Standard has been prepared in response to requests from purchasers and users of social alarm systems for the establishment of a common signalling protocol to ensure that social alarm systems from different manufacturers exchange essential information and controls in a compatible manner. Essential information and controls include identification of an individual local unit and controller, the nature of any alarm, with the type of trigger initiating this, and the controls necessary to operate any speech link between a local unit and an alarm receiving centre (ARC).

This British Standard specifies requirements for dual tone multi-frequency signalling, for the transfer of messages and commands, this being an acknowledged method for transmitting information over the public switched telephone network once a call has been established between the local unit and controller and the ARC.

1 Scope

This British Standard specifies requirements for the transfer of information and controls within a social alarm system, by means of dual-tone multi-frequency (DTMF) tone signals passing between site control or local equipment and an alarm receiving centre via the public switched telephone network (PSTN) supporting voice traffic conforming to ITU-T Recommendation G.711 [1].

The standard specifies an in-call protocol which supports the 300 ms maximum round trip delay specified in the UK National Transmission Plan [2] for connections over the fixed network.

2 Normative references

BS EN 50134-1, *Alarm systems – Social alarm systems – Part 1: System requirements*

BS EN 50134-3, *Alarm systems – Social alarm systems – Part 3: Local unit and controller*

ES 201 235-1, *Specification of dual tone multi-frequency (DTMF) transmitters and receivers – Part 1: General*

ES 201 235-2, *Access and terminals (AT) – Specification of dual tone multi-frequency (DTMF) transmitters and receivers – Part 2: Transmitters*

ES 201 235-4, *Access and terminals (AT) – Specification of dual tone multi-frequency (DTMF) transmitters and receivers – Part 4: Transmitters and receivers for use in terminal equipment for end-to-end signalling*

3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS EN 50134-1 and the following apply.

3.1 clear

termination of audio communication whilst retaining connection to a controller

- 3.2 clear-down**
termination of a PSTN connection between a controller and an ARC
- 3.3 command**
coded instruction
- 3.4 grouped equipment**
local system installation in which multiple local units are connected to a single controller
- 3.5 listen**
speech direction to an ARC from a local unit
- 3.6 message**
coded information sent as data between a local unit and controller and an ARC
- 3.7 null field**
any data element where the data digits are set to value zero (DTMF 0)
- 3.8 simplex tone controlled speech**
voice channel operated by tone commands which determine the direction of speech
- 3.9 speak**
speech direction to a local unit from an ARC
- 3.10 tones**
 - 3.10.1 acknowledge tone**
DTMF signal transmitted to confirm receipt of data or a command
 - 3.10.2 data request tone**
DTMF signal sent by the receiving equipment to inform the sending equipment that contact has been established
 - 3.10.3 enquiry tone**
tone, within the audible frequency range, transmitted prior to the sending of information by local unit and controller to indicate that the call was initiated by electronic means
NOTE This tone serves the purpose of identifying to an uninformed recipient that the call is generated by automated equipment and is not a nuisance caller.
 - 3.10.4 guard tone**
DTMF signal transmitted to indicate to equipment that a command follows and to mute the audio channel to and/or from a local unit as appropriate
 - 3.10.5 start tone**
DTMF signal transmitted at the commencement of the transmission of data or commands
 - 3.10.6 stop tone**
DTMF signal transmitted at the completion of the transmission of data or commands
- 3.11 VOX**
voice operated speech switching

4 Information transfer

4.1 General

Information transfer shall be by means of DTMF tone signals representing digits as specified in ES 201 235-1. Signal output from the DTMF transmitter shall conform to the requirements specified in ES 201 235-2. Determination of the receipt of a valid tone at the receiver shall follow the requirements specified in ES 201 235-4. The tones assigned to social alarm information transfer and command functions and their timing shall be in accordance with Table 1.

The sending of information from automatic equipment shall be preceded by an enquiry tone of (250 ± 50) ms duration, repeated at (2 ± 0.4) s intervals, which shall be ignored for signalling purposes by automatic receiving equipment.

Table 1 DTMF digit assignments

Tone (key)	Value	Function/command	Duration of tone transmitted to network ^{A)}
0	0	Select local unit	(80 ± 5) ms
1	1	Request information on outstanding calls	(80 ± 5) ms
2	2	Manufacturer-specific functions	(80 ± 5) ms
3	3	Speech control functions	(80 ± 5) ms
4	4	Parameter programming	(80 ± 5) ms
5	5	Parameter enquiry	(80 ± 5) ms
6	6	Data mode request	(80 ± 5) ms
7	7	Speak	(80 ± 5) ms
8	8	Listen	(80 ± 5) ms
9	9	Clear (clear speech)	(80 ± 5) ms
*	*	Padding character	(80 ± 5) ms
#	#	End of data (stop)	(80 ± 5) ms
[A]	A	Guard	(250 ± 12.5) ms
A	A	Commencement of data (start)	(80 ± 5) ms
B	B	Acknowledge	(80 ± 5) ms
[B]	B	Data request	$(1\ 000 \pm 50)$ ms
C	C	Enter programming	(80 ± 5) ms
D	D	Clear down	(80 ± 5) ms

^{A)} Tone sequences are sent with a (80 ± 5) ms gap between tones.

4.2 Start and stop tones

There shall be an interval of not less than (600 ± 30) ms between the end of the stop tone and the commencement of the start tone of subsequent transmissions from the same source.

4.3 Guard tone

On receipt of a guard tone, the local unit shall mute the audio channel for a period not exceeding 500 ms.

5 Communication

5.1 Session initiation

Following completion of call set-up signalling, the local unit and controller shall send an enquiry tone to the line to indicate that automatic equipment is using the line.

When the ARC detects ringing current, it shall loop the line and shall send a data request tone to the local unit and controller. If no data request tone is detected by the local unit and controller, it shall disconnect from the network.

A received tone shall be interpreted as a data request tone by the local unit and controller only if its duration is not less than 500 ms.

When the local unit and controller detects the data request tone, it shall cease to send the enquiry tone and shall wait until the end of the data request tone; after a delay of (80 ± 5) ms the local unit and controller shall then send an alarm transmission message to the ARC.

If no acknowledge tone or start of data transmission is received by the ARC within (600 ± 30) ms of the end of a data request tone, the ARC shall send a further data request tone. This shall be repeated up to four times, after which the ARC shall disconnect from the network if no acknowledge or start of data transmission is received by the ARC within (600 ± 30) ms of the end of the fourth data request tone.

If an acknowledge tone or start of data transmission is received by the ARC within (600 ± 30) ms of the end of a data request tone, the ARC shall cease to send the data request tone and shall wait to receive a valid data transmission.

If a valid data transmission is not received by the ARC within 25 s from the end of the transmission of the originating data request tone, it shall disconnect from the network.

If no acknowledge tone is received by the local unit and controller within (600 ± 30) ms of the end of an alarm transmission message, the local unit and controller shall send a further alarm transmission message. This shall be repeated up to four times, after which the local unit and controller shall disconnect from the network if no acknowledge tone is received by the local unit and controller within (600 ± 30) ms of the end of the fourth alarm transmission message.

Any redial or reconnection attempts shall be made in accordance with BS EN 50134-3.

5.2 Alarm transmission message format

The message sent by the local unit and controller to the ARC shall consist of the sequence:

A CC TT GGGGGGGG RRRR EEE LL P SS XX #

where:

A and # are the message string start and stop delimiters;

CC is the two-digit system configuration, to indicate the type of equipment (see Table 2);

TT is the two-digit system type assignment, to indicate to the ARC whether the local unit and controller is using the standard protocol or a proprietary variant (see Table 3);

GGGGGGGG is the eight-digit controller identification field, to uniquely define the identity of the specific site/installation;

NOTE 1 This is right-justified, padded with leading zeros (i.e. zero is transmitted as DTMF 0).

RRRR is the four-digit local unit identification field, to uniquely define the identity of the local unit within the installation;

NOTE 2 This is right-justified, padded with leading zeros (i.e. zero is transmitted as DTMF 0).

NOTE 3 In grouped equipment, the controller has the reserved identity of 0000.

NOTE 4 For a combined local unit and controller, the unique identity of that specific unit is given by the combined twelve digits of both the local unit and controller and local unit fields as a single entity. This is right-justified, padded with leading zeros (i.e. zero is transmitted as DTMF 0).

EEE is the three-digit event code, to define the nature of the alarm (see Table 4);

LL is the two-digit location information field, to allow detailed locations of alarm events to be indicated (see Table 5);

P is the single-digit priority field, to indicate that a priority over other alarms has been assigned to this event (see Table 6);

SS is the two-digit status code, to indicate the status of the local unit (see Table 7);

XX is the two-digit checksum (see 5.3).

NOTE 5 An example of an alarm transmission protocol is shown diagrammatically in Figure 1.

Table 2 System configuration assignments

First digit (CC)	System type and local unit status	Second digit	Speech link type
0	Local unit and controller	0	Non-speech
1	Grouped equipment with supervisor off duty	1	VOX
2	Grouped equipment with supervisor on duty	2	Tone controlled switched speech, with guard tone
3	Grouped equipment with supervisor on duty acting as an ARC	3 to 9	Reserved to BSI ^{A)}
4	ARC		
5 to 9	Reserved to BSI ^{A)}		

NOTE The type of equipment is described by any combination of the first and second digits, e.g. an ARC operating on tone controlled switched speech with guard tone will have a system configuration of 42.

^{A)} System configuration codes that are reserved to BSI might be defined in a future revision of this standard. Where a new code is required, users of this British Standard should propose the new code description to BSI for consideration for future editions.