bsia
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a guide to
fast format protocol
for intruder alarm reporting

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Introduction

The Fast Format Protocol may be used to transmit information about alarms, events and status from intruder alarm systems to alarm receiving centres. It is a simple but reliable protocol with a limited capacity. The protocol allows for transmission of sub-system information although compliance with all necessary requirements may make this difficult. If transmission of more information is required, then an "extended format" should be used (such as SIA or Contact-ID).

The original basis for the Fast Format Protocol was the Acron Superfast format. This was simplified by Ademco to create Ademco Fast Format, which in turn was extended to create "Contact-ID". The Scancom/BSIA Fast Format is a subset of Ademco Fast Format and has reduced status information.

Except as noted below, this revision of the document should not require modification to existing operational equipment designs but clarifies some technical matters and harmonizes the use of terminology associated with the industry switch from BS 4737 to EN 50131.

Equipment intended for connection to networks must comply with all relevant regulatory requirements.

Next Generation Networks (BT "21CN" Project)
This document anticipates the introduction of Next Generation Networks (NGNs) and focuses on the BT "21CN" project. It includes recommendations for equipment changes to deal with the transmission delays that are anticipated when this is implemented.

1. Scope

This document defines a method of communicating between a digital communicator and an alarm receiving centre receiver, using Fast Format signalling. It also describes a more comprehensive implementation of Scancom and Ademco Fast Format transmission protocols with 8, 16 and 24 channel and multiple partition status reporting enhancements (see BSIA Guidelines for Intruder and Hold-Up Alarm Systems incorporating "Sub-Systems", BSIA document No 327).

2. Normative references

BS EN 50136-1-3	System requirements for digital communicators
BS EN 50136-2-3	Equipment requirements for digital communicators
ETSI ES 203 021	Access and Terminals; Harmonized basic attachment requirements for Terminals for connection to analogue interfaces of the Telephone Networks.
NICC ND1701:2009/04	UK National Transmission Plan for Public Networks (Issue 5)
NICC ND1704:2009/05	End-to-End Network Performance Rules & Objectives for the interconnection of NGNs (V1.2.2)

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3. Definitions

For the purposes of this BSIA guide, the following definitions apply:

3.1 Acknowledge tone

An 'acknowledge' signal emitted by the ARC receiver to the digital communicator to indicate that a transmission of data has been satisfactorily received.

3.2 Alarm receiving centre receiver

The part of the Alarm Transmission System located at the ARC, consisting of a transceiver to handle incoming calls from a number of I&HAS.

3.3 Digital communicator

Supervised premises transceiver used in a digital communicator system (EN 50136-1-3 Clause 4.12)

3.4 DTMF digits

The frequencies of the tone-pairs and their numeric meaning are given in ETSI Standard ES203 021. DTMF digits follow the hexadecimal sequence from 0 – F, but may be restricted to the numeric sequence 0 – 9 on some equipment.

3.5 DTMF signaling

Data transmitted from the digital communicator to the ARC receiver by means of the DTMF (Dual tone multi-frequency) tone-set.

3.6 Handshake tone

A 'handshake' signal emitted by the ARC receiver on answering an incoming call to indicate to the digital communicator that connection has been established.

3.7 Next Generation Network (NGN)

A packet based telecommunications network such as BT's 21CN.

3.8 Restore

Message sent to alarm receiving centre by a digital communicator, if configured to do so, when an alarm channel has reverted to a non-alarm state.

Note 1: *This is a special application of the term "restore," which differs from its usage in EN50131-1.*

Note 2: *European Norm terms "set" and "unset" are used in preference to alternatives such as "closed" and "open," "armed" and "disarmed."*

3.9 Stream

Is a packet of data as described in clause 6.1

4. Functional description of a digital communicator

4.1 An example of a digital communication PSTN connection

a) This section gives a general overview of the function of a digital communicator. It describes the operation of setting up a call, through to data transmission and shut down of a call. It also describes situations when a digital communicator makes repeat attempts or sends follow-up messages. Details of call establishment are listed in ETSI Standard ES 203 021.

b) The receiver answers by looping the PSTN line. The ARC receiver should pause to give time for the PSTN to establish a speech link and then emit a handshake tone. If there is no response to the ARC receiver's handshake, the ARC receiver should repeat the handshake. If there is still no response from the calling device, the ARC receiver should release the line and be ready for another incoming call.

4.2 Data transmission

a) When the digital communicator detects the ARC receiver handshake, it should send to the ARC receiver a data message consisting of a stream of DTMF digits. This stream should be repeated until the ARC receiver sends an acknowledge tone, or up to 4 streams have been sent without acknowledgement

Note: *The receiver will emit an acknowledge tone following reception of two identical DTMF streams.*

b) If the digital communicator has no more information to give, it will close down and release the telephone connection.

c) The receiver remains on line for a short period after issuing the acknowledge tone awaiting further data messages from the digital communicator, and it releases the line if no further DTMF digits are received.

Note: *The acknowledge tone will only be sent after the second, third or fourth stream and never after the first stream.*

4.3 Repeat attempts

a) If a digital communicator does not receive acknowledgement from an ARC receiver, it releases the telephone connection, waits off-line for a period and re-dials. It may dial an alternative number to ensure the repeat attempt is made to a different receiver.

b) If all attempts fail, the digital communicator is allowed to close down and reset as if its message had been successfully delivered. However, it should give a local indication of 'fail to communicate'.

Notes:

i. The maximum number of repeat attempts and the timings, which can be made by a communicator are defined in ETSI Standard ES203 021.

ii. The maximum time permitted for a communicator to try to obtain a successful transmission and before giving a 'fail to communicate' indication is restricted by EN 50136-2-3 (clause 5.3.6 part b) (see also BSIA Form 171 clause 8.1.4b).

4.4 Follow-on messages

The digital communicator may have multiple messages to report within the call. In this case, the next data message will be transmitted until acknowledged by the receiver or up to a maximum of 4 times. Further messages after a second acknowledgement within one telephone call are unlikely, but the ARC receiver should be prepared to accept as many messages as the digital communicator has to send.

5. Data format

5.1 Standard and extended data packets.

The data packet consists of 8, 16 or 24 channels. The 16 and 24 channel data packets will have the same timing as the 8-channel version and will be constructed as follows:

8 channels (Standard)

Account No				Channels								Status
a	a	a	a	c	c	c	c	c	c	c	c	s

16 channels (Extended)

Account No				Channels														Status
a	a	a	a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	s

24 channels (Extended)

Account No				Channels																				Status
a	a	a	a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	s

Notes:

i. 'a' represents a digit of the Account Code or Site Identity number.

ii. 'c' represents the status of each channel in numerical sequence starting from channel 1.

iii 's' represents the status of the communicator.

The packet size will be determined by the installer in agreement with the ARC. The selection may be made automatically or manually.

5.2 Account number (a)

The account number is a number, which allows the ARC to identify the site. It is normally 4 digits, and each digit can be 0 to 9 (0 – F if equipment permits).

Notes:

i. The account number may also be 5 or 6 digits, but this will depend on the agreement between the installer and the ARC.

ii. Separate account numbers may be used for sub-systems.

5.3 Channel information (c)

Channel information is a sequence of digits representing the state of each channel in turn. The first of these digits represents channel 1, and the eighth represents channel 8. The value of the digit (c) shows the state of the channel, as follows:

5.3.1 Alarm status

Value of digit (c):

1 New alarm – not previously reported
3 New restore – not previously reported
5 Not in alarm – previously been reported
6 In alarm – previously been reported

5.3.2 Set/unset status

Value of digit (c):

2 New unsetting – intruder alarm system has been unset
4 New setting – intruder alarm system has been set
5 IAS set – previously been reported
6 IAS unset – previously been reported

5.4. Status digit (s)

The transmission finishes with a single digit whose value shows the state of the communicator, as follows:

7 Normal; or low voltage restored
8 Low voltage
9 Test call

Notes:

i. The test call does NOT include confirmation of the continuation of, or the restoral of, a "low voltage" condition.
ii. The digital communicator may send other digits for channel and status information, providing the receiver at the alarm receiving centre is able to handle them.

6. Frequencies and timings

All timings shown in this section should be accurate to ± 10% and the frequencies (other than DTMF tones [± 1.5%]) should be accurate to ± 2%. These tolerances should be adhered to, unless otherwise stated.

Note: *The frequencies stated below are those used in the UK, different frequencies may be used in other countries.*

6.1 DTMF data transmission

The duration of each DTMF digit is nominally 60ms followed by an inter-digit pause of 60ms silence. The minimum is 50ms and the maximum should be 100ms, in each case.

Notes:

i. These timings do not follow those used for DTMF dialing protocols.

ii. Some existing equipment may not accept values lower than the nominal stated.

6.2 Handshake tone

Handshake consists of a 1.4 kHz tone for 100ms, silence for 100ms and a 2.3 kHz tone for 100ms.

6.2.1 Guard tone

The 2.3 kHz tone may be accompanied by a guard tone of a level 6dB to 12 dB lower than the level of the 2.3 kHz tone, which should be transmitted at least for the period the 2.3 kHz tone is present. The guard tone should be 1.15 kHz and in phase with the 2.3 kHz tone.

Notes:

i. This guard tone is not used in most current equipment.

ii. Some existing receivers may use an alternative frequency for the guard tone. This is not recommended for new designs as it may cause difficulties with some methods of detecting the handshake tone.

6.3 Acknowledge tone

Acknowledge consists of a single tone of 1.4 kHz with a duration of 750ms minimum and 1.0s maximum and digital communicator timings.

The following timings allow for potential problems resulting from the implementation of Next Generation Networks (NGNs), such as the BT "21CN" project, which could introduce transmission delays of up to 150ms in each direction.

Table 1 Receiver timings

		Times (Seconds)	
	Actions	Min	Max
A1	Time between answering a call and sending a handshake signal	0.1	2
A2	Time between end of first, and start of second handshake, if no stream received	0.7*	2
A3	Time from end of received DTMF stream to start of acknowledgement tone	0.1**	0.250
A4	Time from end of acknowledgement tone to line release, if no follow on data received	3	5

* – equipment may be designed with a minimum value of 0.5s. The higher value is recommended for compatibility with the 21CN network.

** – A lower value is recommended to improve round trip delay for NGN routing scenarios.

Table 2 Digital communicator timings

		Times (Seconds)	
	Actions	Min	Max
B1	Time from end of handshake tone to start of stream	0.1	0.2
B2	Time between first and second stream in any message	0.2	0.5
B3	Time between second and subsequent stream	0.9*	1*
B4	Time for acknowledgement tone to be accepted as valid	0.5	0.7
B5	Time from end of acknowledgement validation (end of B4) to line release	0	1
B6	Time from end of acknowledgement tone (not from the end of B4) to follow on data	0.1	0.5

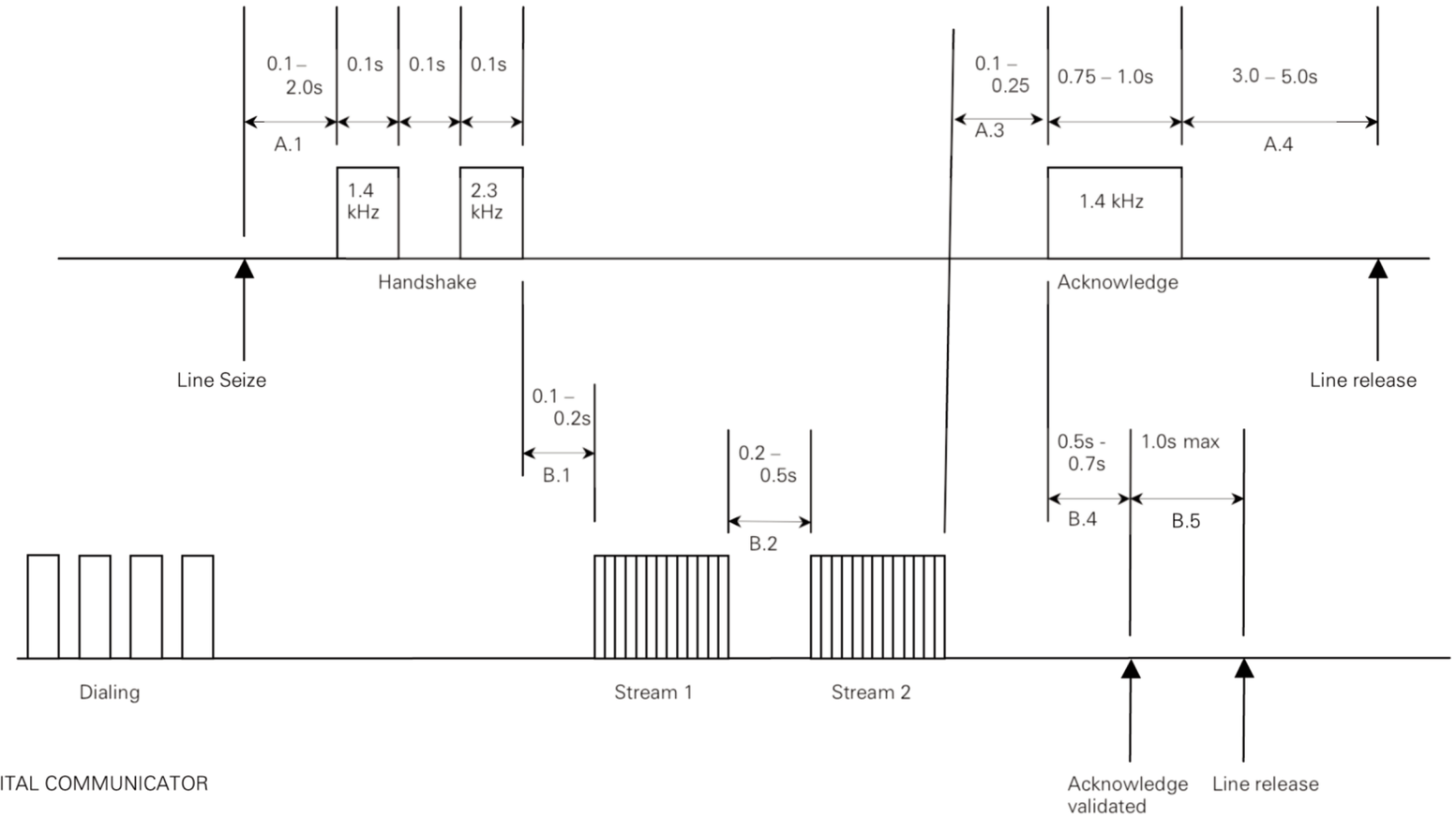
* – a time between 0.5 and 0.7 seconds should be suitable for use with existing equipment. The higher values in table 2 are recommended for compatibility with NGNs.

6.4 Timing diagrams

A series of timing diagrams are shown below, identifying the various scenarios encountered.

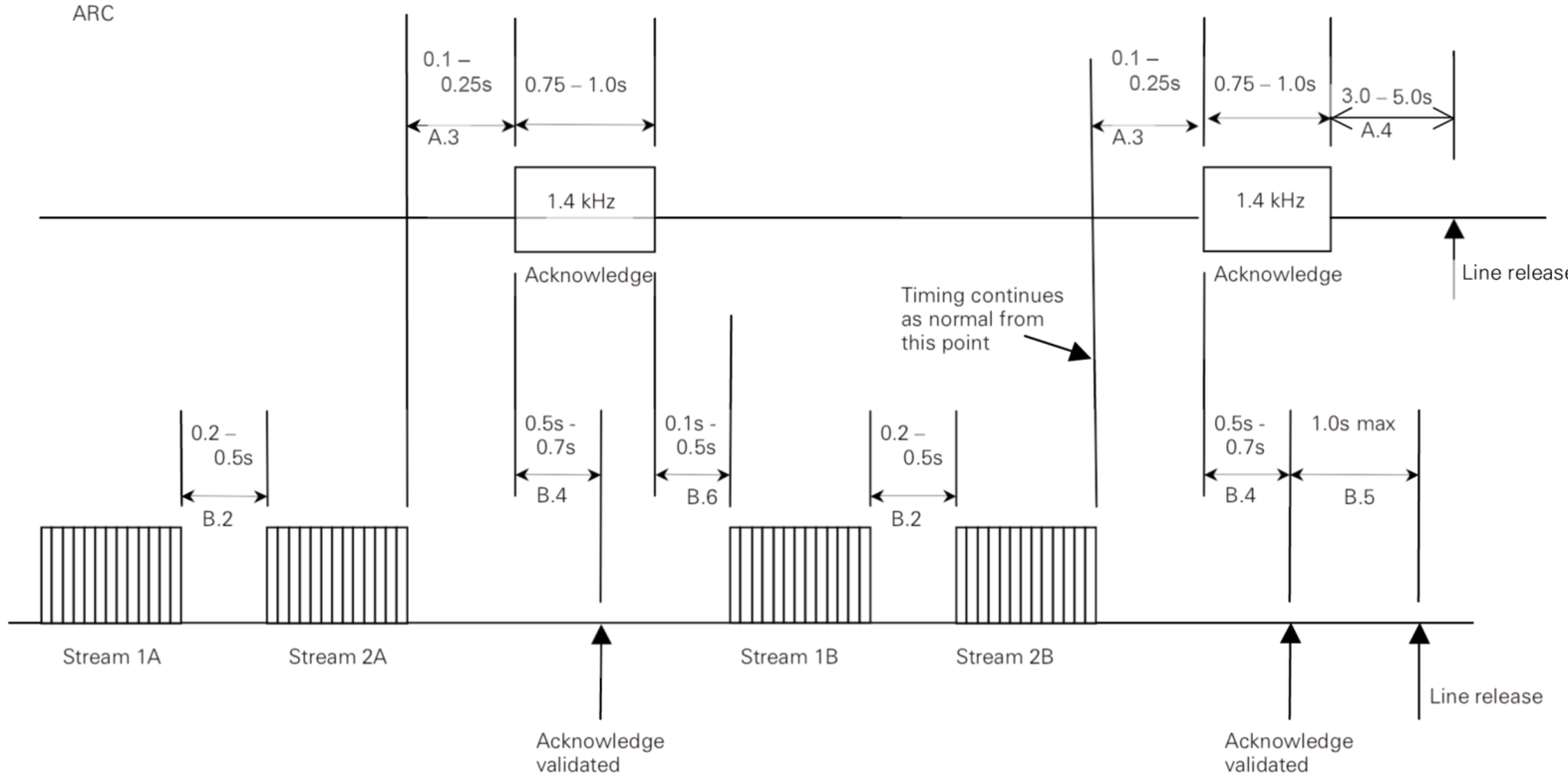
6.4.1 Timing diagram for a correctly sent/received sequence

ARC.



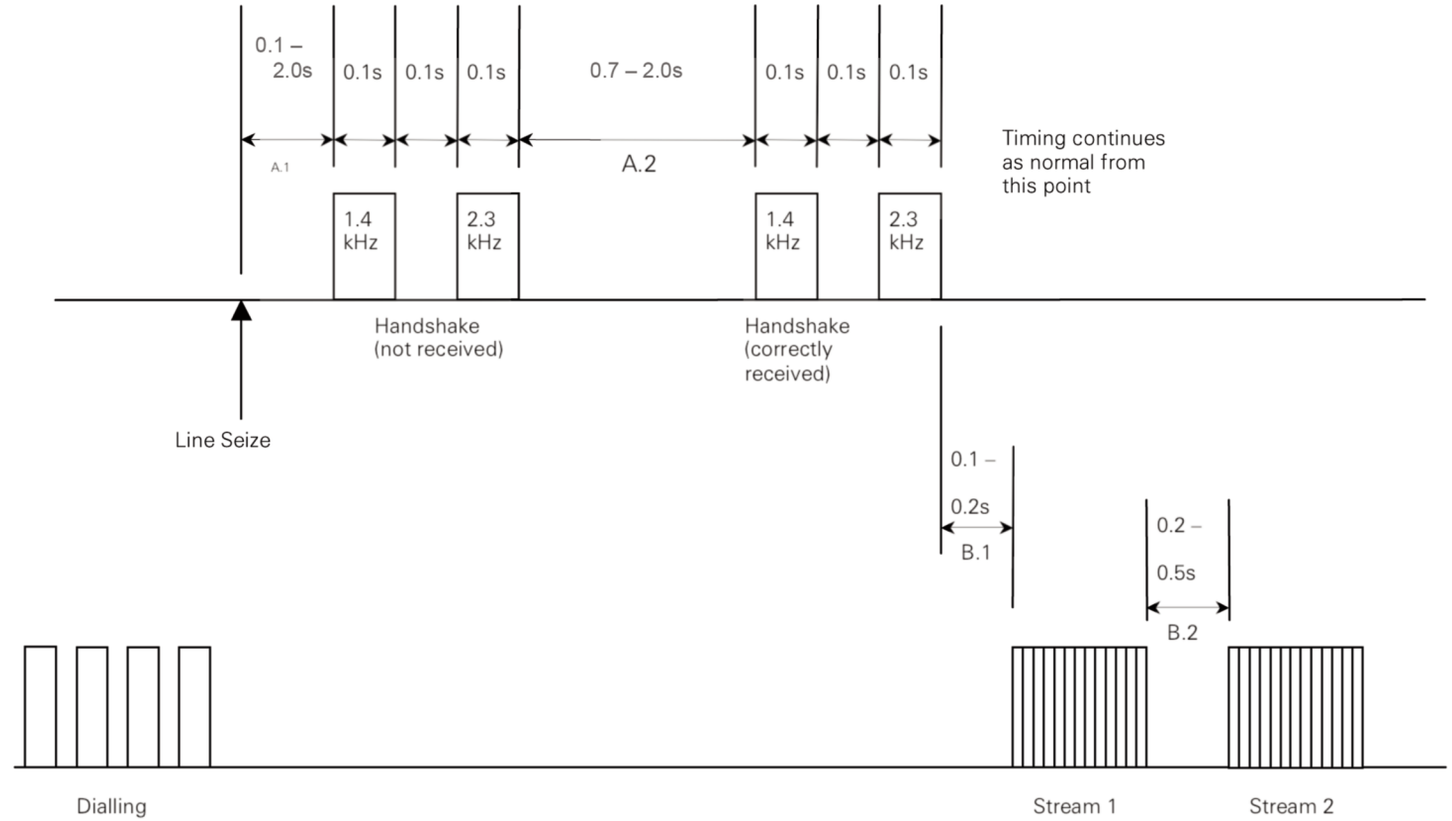
DIGITAL COMMUNICATOR

6.4.2 Timing diagram for follow on data



6.4.3 Timing diagram for Digi failing to receive first handshake

ARC



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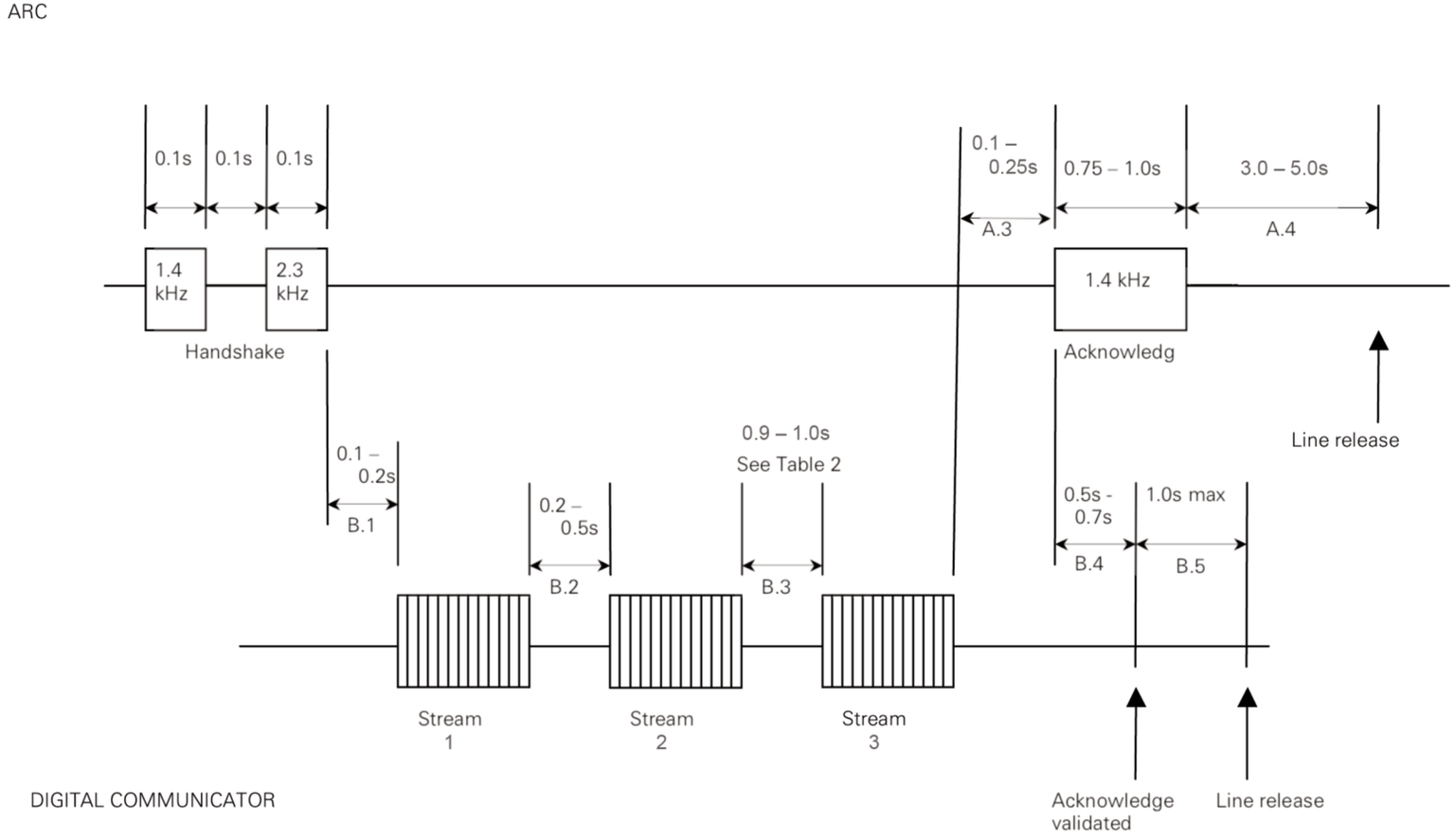
6.4.4 Timing diagram for the ARC failing to validate and therefore not acknowledge the first two data streams



7. Typical channel order

7.1 Channel conventions

The first 4 channels of a digital communicator are usually assigned to particular functions:

Channel 1	Alarm	Fire
Channel 2	Alarm	Hold-Up
Channel 3	Alarm	(Unconfirmed) Intruder
Channel 4	System Unset and System Set	

A convention for the meaning of each remaining channel should be agreed with the ARC in advance of installation.

Table 3 is an illustration only:

Table 3: Example channel allocations:

Description	Default Channel
Fire (circuit initiated)	1
Fire (keypad initiated)	1
Hold-up (circuit initiated)	2
Duress, keypad PA, hold-up (keypad initiated)	2
(Unconfirmed) intruder	3
I&HAS unset	4
I&HAS set	4
Misoperation	4
Fault	5
Circuits inhibited manually	6
Circuits inhibited automatically	6
Sequentially confirmed alarm	7
Circuit tamper	8
System tamper	8
Prime power source (AC mains) failed [note 1]	9
Dynamic periodic test [note 2]	status
Static periodic test [note 4]	status
Low voltage [note 5]	status

Notes:

1. *PD6662 permits a delay of up to 60 minutes when this information is transmitted. The cumulative delay imposed by the CIE and SPT should not exceed this time.*
2. *To protect unoccupied premises.*
3. *Refer to Para 5.4.*
4. *To check system is working.*
5. *Low voltage status is included with all non-test fast format transmissions.*

7.2 Signal prioritisation

It should be noted that prioritisation of signals received and dealt with at the ARC will not necessarily follow the numerical order of the signaling channels.

8. Reporting Modes

A digital communicator may use different dialing modes to report to the ARC. In each case, the "primary" number is that programmed to be attempted first.

In all cases, a "fail to report" should be reported to the CIE after 240 seconds without successful communication (see note (ii) to 4.3).

8.1 Single mode

A single telephone number is automatically dialed up to the maximum permitted by ETSI Standard ES203 021.

8.2 Alternative mode (primary and secondary numbers)

Two different telephone numbers are automatically dialled, alternately (the first, then the second, then the first again, etc). Once a successful communication has been established, the dialling sequence is complete.

8.3 Sequential mode (primary and secondary numbers)

Two different telephone numbers are automatically dialled. The first is tried to a programmable number of attempts. If these attempts fail, the second telephone number is tried similarly.

8.4 Dual mode

As Alternate Mode, but to complete the call the message must be accepted on **both** numbers.