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H. Schulzrinne
Columbia U.
T. Taylor
Nortel

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Definition of Events for Channel-Oriented Telephony Signalling

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This memo updates RFC 4733 to add event codes for telephony signals used for channel-associated signalling when carried in the telephony event RTP payload. It supersedes and adds to the original assignment of event codes for this purpose in Section 3.14 of RFC 2833. As documented in Appendix A of RFC 4733, some of the RFC 2833 events have been deprecated because their specification was ambiguous, erroneous, or redundant. In fact, the degree of change from Section 3.14 of RFC 2833 is such that implementations of the present document will be fully backward compatible with RFC 2833 implementations only in the case of full ABCD-bit signalling. This document expands and improves the coverage of signalling systems compared to RFC 2833.

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1. Introduction

1.1. Overview

This document extends the set of telephony events defined within the framework of RFC 4733 [4] to include signalling events that can appear on a circuit in the telephone network. Most of these events correspond to signals within one of several channel-associated signalling systems still in use in the PSTN.

Trunks (or circuits) in the PSTN are the media paths between telephone switches. A succession of protocols have been developed using tones and electrical conditions on individual trunks to set up telephone calls using them. The events defined in this document support an application where such PSTN signalling is carried between two gateways without being signalled in the IP network: the "RTP trunk" application.

In the "RTP trunk" application, RTP is used to replace a normal circuit-switched trunk between two nodes. This is particularly of interest in a telephone network that is still mostly circuit-switched. In this case, each end of the RTP trunk encodes audio channels into the appropriate encoding, such as G.723.1 [13] or G.729 [14]. However, this encoding process destroys in-band signalling information that is carried using the least-significant bit ("robbed bit signalling") and may also interfere with in-band signalling tones, such as the MF (multi-frequency) digit tones.

In a typical application, the gateways may exchange roles from one call to the next: they must be capable of either sending or receiving each implemented signal in Table 1.

This document defines events related to four different signalling systems. Three of these are based on the exchange of multi-frequency tones. The fourth operates on digital trunks only, and makes use of low-order bits stolen from the encoded media. In addition, this document defines tone events for supporting tasks such as continuity testing of the media path.

> Implementors are warned that the descriptions of signalling systems given below are incomplete. They are provided to give context to the related event definitions, but omit many details important to implementation.

1.2. Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in RFC 2119 [1] and indicate requirement levels for compliant implementations.

In addition to the abbreviations defined below for specific events, this document uses the following abbreviations:

KP Key Pulse

MF Multi-frequency

PSTN Public Switched (circuit) Telephone Network

RTP Real-time Transport Protocol [2]

ST Start

2. Event Definitions

Table 1 lists all of the events defined in this document. As indicated in Table 8 (Appendix A) of RFC 4733 [4], use of some of the RFC 2833 [11] event codes has been deprecated because their specification was ambiguous, erroneous, or redundant. In fact, the degree of change from Section 3.14 of RFC 2833 is such that implementations of the present document will be fully backward compatible with RFC 2833 implementations only in the case of full ABCD-bit signalling. This document expands and improves the coverage of signalling systems compared to RFC 2833.

Note that the IANA registry for telephony event codes was set up by RFC 4733, not by RFC 2833. Thus, event code assignments originally made in RFC 2833 appear in the registry only if reaffirmed in RFC 4733 or an update to RFC 4733, such as the present document.

Event	Frequency (Hz)	Event Code	Event Type	Volume?
MF 0...9	(Table 2)	128...137	tone	yes
MF Code 11 (SS No. 5) or KP3P/ST3P (R1)	700+1700	123	tone	yes
MF KP (SS No. 5) or KP1 (R1)	1100+1700	124	tone	yes
MF KP2 (SS No. 5) or KP2P/ST2P (R1)	1300+1700	125	tone	yes
MF ST (SS No. 5 and R1)	1500+1700	126	tone	yes
MF Code 12 (SS No. 5) or KP'/STP (R1)	900+1700	127	tone	yes
ABCD signalling	N/A	144...159	state	no
AB signalling (C, D unused)	N/A	208...211	state	no
A bit signalling (B, C, D unused)	N/A	206...207	state	no
Continuity check-tone	2000	121	tone	yes
Continuity verify-tone	1780	122	tone	yes
Metering pulse	N/A	174	other	no
Trunk unavailable	N/A	175	other	no
MFC Forward 1...15	(Table 4)	176...190	tone	yes
MFC Backward 1...15	(Table 5)	191...205	tone	yes

Table 1: Trunk Signalling Events

2.1. Signalling System No. 5

Signalling System No. 5 (SS No. 5) is defined in ITU-T Recommendations Q.140 through Q.180 [5]. It has two systems of signals: "line" signalling to acquire and release the trunk, and "register" signalling to pass digits forward from one switch to the next.

2.1.1. Signalling System No. 5 Line Signals

No. 5 line signalling uses tones at two frequencies: 2400 and 2600 Hz. The tones are used singly for most signals, but together for the Clear-forward and Release-guard. (This reduces the chance of an accidental call release due to carried media content duplicating one of the frequencies.) The specific signal indicated by a tone depends on the stage of call set-up at which it is applied.

No events are defined in support of No. 5 line signalling. However, implementations MAY use the AB bit events described in Section 2.4 and shown in Table 1 to propagate SS No. 5 line signals. If they do so, they MUST use the following mappings. These mappings are based on an underlying mapping equating A=0 to presence of 2400 Hz signal and B=0 to presence of 2600 Hz signal in the indicated direction.

- o both 2400 and 2600 Hz present: event code 208;
- o 2400 Hz present: event code 210;
- o 2600 Hz present: event code 209;
- o neither signal present: event code 211.

The initial event report for each signal SHOULD be generated as soon as the signal is recognized, and in any case no later than the time of recognition as indicated in ITU-T Recommendation Q.141, Table 1 (i.e., 40 ms for "seizing" and "proceed-to-send", 125 ms for all other signals). The packetization interval following the initial report SHOULD be chosen with considerations of reliable transmission given first priority. Note that the receiver must supply its own volume values for converting these events back to tones. Moreover, the receiver MAY extend the playout of "seizing" until it has received the first report of a KP event (see below), so that it has better control of the interval between ending of the seizing signal and start of KP playout.

> The KP has to be sent beginning 80 +/- 20 ms after the SS No. 5 "seizing" signal has stopped.

2.1.2. Signalling System No. 5 Register Signals

No. 5 register signalling uses pairs of tones to convey digits and signals framing them. The tone combinations and corresponding signals are shown in the Table 2. All signals except KP1 and KP2 are sent for a duration of 55 ms. KP1 and KP2 are sent for a duration of 100 ms. Inter-signal pauses are always 55 ms.

Upper Frequency (Hz)

Lower Frequency (Hz)	900	1100	1300	1500	1700
700	Digit 1	Digit 2	Digit 4	Digit 7	Code 11
900		Digit 3	Digit 5	Digit 8	Code 12
1100			Digit 6	Digit 9	KP1
1300				Digit 0	KP2
1500					ST

Table 2: SS No. 5 Register Signals

The KP signals are used to indicate the start of digit signalling. KP1 indicates a call expected to terminate in a national network served by the switch to which the signalling is being sent. KP2 indicates a call that is expected to transit through the switch to which the signalling is being sent, to another international exchange. The end of digit signalling is indicated by the ST signal. Code 11 or Code 12 following a country code (and possibly another digit) indicates a call to be directed to an operator position in the destination country. A Code 12 may be followed by other digits indicating a particular operator to whom the call is to be directed.

Implementations using the telephone-events payload to carry SS No. 5 register signalling MUST use the following events from Table 1 to convey the register signals shown in Table 2:

- o event code 128 to convey Digit 0;
- o event codes 129-137 to convey Digits 1 through 9, respectively;
- o event code 123 to convey Code 11;

- o event code 124 to convey KP1;
- o event code 125 to convey KP2;
- o event code 126 to convey ST;
- o event code 127 to convey Code 12.

The sending implementation SHOULD send an initial event report for the KP signals as soon as they are recognized, and it MUST send an event report for all of these signals as soon as they have completed.

2.2. Signalling System R1 and North American MF

Signalling System R1 is mainly used in North America, as is the more common variant designated simply as "MF". R1 is defined in ITU-T Recommendations Q.310-Q.332 [6], while MF is defined in [9].

Like SS No. 5, R1/MF has both line and register signals. The line signals (not counting Busy and Reorder) are implemented on analog trunks through the application of a 2600 Hz tone, and on digital trunks by using ABCD signalling. Interpretation of the line signals is state-dependent (as with SS No. 5).

2.2.1. Signalling System R1 Line Signals

In accordance with Table 1/Q.311, implementations MAY use the A bit events described in Section 2.4 and shown in Table 1 to propagate R1 line signals. If they do so, they MUST use the following mappings. These mappings are based on an underlying mapping equating A=0 to the presence of a 2600 Hz signal in the indicated direction and A=1 to the absence of that signal.

- o 2600 Hz present: event code 206;
- o no signal present: event code 207.

2.2.2. Signalling System R1 Register Signals

R1 has a signal capacity of 15 codes for forward inter-register signals but no backward inter-register signals. Each code or digit is transmitted by a tone pair from a set of 6 frequencies. The R1 register signals consist of KP, ST, and the digits "0" through "9". The frequencies allotted to the signals are shown in Table 3. Note that these frequencies are the same as those allotted to the similarly named SS No. 5 register signals, except that KP uses the frequency combination corresponding to KP1 in SS No. 5. Table 3 also shows additional signals used in North American practice: KP’, KP2P, KP3P, STP or ST’, ST2P, and ST3P [9].

Upper Frequency (Hz)

Lower Frequency (Hz)	900	1100	1300	1500	1700
700	Digit 1	Digit 2	Digit 4	Digit 7	KP3P or ST3P
900		Digit 3	Digit 5	Digit 8	KP’ or STP
1100			Digit 6	Digit 9	KP
1300				Digit 0	KP2P or ST2P
1500					ST

Table 3: R1/MF Register Signals

Implementations using the telephone-events payload to carry North American R1 register signalling MUST use the following events from Table 1 to convey the register signals shown in Table 3:

o event code 128 to convey Digit 0;

o event codes 129-137 to convey Digits 1 through 9, respectively;

o event code 123 to convey KP3P or ST3P;

o event code 124 to convey KP;

o event code 125 to convey KP2P or ST2P;

o event code 126 to convey ST;

o event code 127 to convey KP’ or STP.

As with the original telephony signals, the receiver interprets codes 123, 125, and 127 as KPx or STx signals based on their position in the signalling sequence.

Unlike SS No. 5, R1 allows a large tolerance for the time of onset of register signalling following the recognition of start-dialling line signal. This means that sending implementations MAY wait to send a KP event report until the KP has completed.

2.3. Signalling System R2

The International Signalling System R2 is described in ITU-T Recommendations Q.400-Q.490 [7], but there are many national variants. R2 line signals are continuous, out-of-band, link by link, and channel associated. R2 (inter)register signals are multi-frequency, compelled, in-band, end-to-end, and also channel associated.

2.3.1. Signalling System R2 Line Signals

R2 line signals may be analog, one-bit digital using the A bit in the 16th channel, or digital using both A and B bits. Implementations MAY use the A bit or AB bit events described in Section 2.4 and shown in Table 1 to propagate these signals. If they do so, they MUST use the following mappings.

1. For the analog R2 line signals shown in Table 1 of ITU-T Recommendation Q.411, implementations MUST map as follows. This mapping is based on an underlying mapping of A bit = 0 when tone is present.

   * event code 206 (Table 1) is used to indicate the Q.411 "tone-on" condition;

   * event code 207 (Table 1), is used to indicate the Q.411 "tone-off" condition.

2. The digital R2 line signals, as described by ITU-T Recommendation Q.421, are carried in two bits, A and B. The mapping between A and B bit values and event codes SHALL be the same in both directions and SHALL follow the principles for A and B bit mapping specified in Section 2.4.

2.3.2. Signalling System R2 Register Signals

In R2 signalling, the signalling sequence is initiated from the outgoing exchange by sending a line "seizing" signal. After the line "seizing" signal (and "seizing acknowledgment" signal in R2D), the signalling sequence continues using MF register signals. ITU-T Recommendation Q.441 classifies the forward MF register signals (upper frequencies) into Groups I and II, the backward MF register signals (lower frequencies) into Groups A and B. These groups are significant with respect both to what sort of information they convey and where they can occur in the signalling sequence.

The tones used in R2 register signalling are combinations of two out of six frequencies. National versions may be reduced to 10 signals (two out of five frequencies) or 6 signals (two out of four frequencies).

R2 register signalling is a compelled tone signalling protocol, meaning that one tone is played until an "acknowledgment or directive for the next tone" is received that indicates that the original tone should cease. A R2 forward register signal is acknowledged by a backward signal. A backward signal is acknowledged by the end of the forward signal. In exceptional circumstances specified in ITU-T Rec. Q.442, the downstream entity may send backward signals autonomously rather than in response to specific forward signals.

In R2 signalling, the signalling sequence is initiated from the outgoing exchange by sending a forward Group I signal. The first forward signal is typically the first digit of the called number. The incoming exchange typically replies with a backward Group A-1 indicating to the outgoing exchange to send the next digit of the called number.

The tones have meaning; however, the meaning varies depending on where the tone occurs in the signalling. The meaning may also depend on the country. Thus, to avoid an unmanageable number of events, this document simply provides means to indicate the 15 forward and 15 backward MF R2 tones (i.e., using event codes 176-190 and 191-205, respectively, as shown in Table 1). The frequency pairs for these tones are shown in Table 4 and Table 5.

Note that a naive strategy for onward relay of R2 inter-register signals may result in unacceptably long call setup times and timeouts when the call passes through several exchanges as well as a gateway before terminating. Several strategies are available for speeding up the transfer of signalling information across a given relay point. In the worst case, the relay point has to act as an exchange, terminating the signalling on one side and reoriginating the call on the other.

Upper Frequency (Hz)

Lower Frequency (Hz)	1500	1620	1740	1860	1980
1380	Fwd 1	Fwd 2	Fwd 4	Fwd 7	Fwd 11
1500		Fwd 3	Fwd 5	Fwd 8	Fwd 12
1620			Fwd 6	Fwd 9	Fwd 13
1740				Fwd 10	Fwd 14
1860					Fwd 15

Table 4: R2 Forward Register Signals

Upper Frequency (Hz)

Lower Frequency (Hz)	1140	1020	900	780	660
1020	Bkwd 1				
900	Bkwd 2	Bkwd 3			
780	Bkwd 4	Bkwd 5	Bkwd 6		
660	Bkwd 7	Bkwd 8	Bkwd 9	Bkwd 10	
540	Bkwd 11	Bkwd 12	Bkwd 13	Bkwd 14	Bkwd 15

Table 5: R2 Backward Register Signals

2.4. ABCD Transitional Signalling for Digital Trunks

ABCD is a 4-bit signalling system used by digital trunks, where A, B, C, and D are the designations of the individual bits. Signalling may be 16-state (all four bits used), 4-state (A and B bits used), or 2-state (A-bit only used). ABCD signalling events are all mutually exclusive states. The most recent state transition determines the current state.

When using Extended Super Frame (ESF) T1 framing, signalling information is sent as robbed bits in frames 6, 12, 18, and 24. A D4 superframe only transmits 4-state signalling with A and B bits. On the Conference of European Postal and Telecommunications (CEPT) E1 frame, all signalling is carried in timeslot 16, and two channels of 16-state (ABCD) signalling are sent per frame. ITU-T Recommendation G.704 [10] gives the details of ABCD bit placement within the various framing arrangements.

The meaning of ABCD signals varies with the application. One example of a specification of ABCD signalling codes is T1.403.02 [16], which reflects North American practice for "loop" signalling as opposed to the trunk signalling discussed in previous sections.

Since ABCD information is a state rather than a changing signal, implementations SHOULD use the following triple-redundancy mechanism, similar to the one specified in ITU-T Rec. I.366.2 [15], Annex L. At the time of a transition, the same ABCD information is sent 3 times at an interval of 5 ms. If another transition occurs during this time, then this continues. After a period of no change, the ABCD information is sent every 5 seconds.

As shown in Table 1, the 16 possible states are represented by event codes 144 to 159, respectively. Implementations using these event codes MUST map them to and from the ABCD information based on the following principles:

1. State numbers are derived from the used subset of ABCD bits by treating them as a single binary number, where the A bit is the high-order bit.

2. State numbers map to event codes by order of increasing value (i.e., state number 0 maps to event code 144, ..., state number 15 maps to event code 159).

If only the A and B bits are being used, then the mapping to event codes shall be as follows:

- A=0, B=0 maps to event code 208;

- A=0, B=1 maps to event code 209;

- A=1, B=0 maps to event code 210;

- A=1, B=1 maps to event code 211;

Finally, if only the A bit is used,

- o A = 0 maps to event code 206;
- o A = 1 maps to event code 207;

Separate event codes are assigned to A-bit and AB-bit signalling because, as indicated in Rec. G.704 [10], when the B, C, and D bits are unused, their default values differ between transmission systems. By specifying codes for only the used bits, this memo allows the receiving gateway to fill in the remaining bits according to local configuration.

2.5. Continuity Tones

Continuity tones are used for testing circuit continuity during call setup. Two basic procedures are used. In international practice, clause 7 of ITU-T Recommendation Q.724 [8] describes a procedure applicable to four-wire trunk circuits, where a single 2000 +/- 20 Hz check-tone is transmitted from the initiating telephone switch. The remote switch sets up a loopback, and the continuity check passes if the sending switch can detect the tone on the return path. Clause 8 of Q.724 describes the procedure for two-wire trunk circuits. The two-wire procedure involves two tones: a 2000 Hz tone sent in the forward direction and a 1780 +/- 20 Hz tone sent in response.

Note that implementations often send a slightly different check-tone, e.g., 2010 Hz, because of undesirable aliasing properties of 2000 Hz.

If implementations use the telephone-events payload type to propagate continuity check-tones, they MUST map these tones to event codes as follows:

- o For four-wire continuity testing, the 2000 Hz check-tone is mapped to event code 121.
- o For two-wire continuity testing, the initial 2000 Hz check-tone Hz tone is mapped to event code 121. The 1780 Hz continuity verify-tone is mapped to event code 122.

2.6. Trunk Unavailable Event

This event indicates that the trunk is unavailable for service. The length of the downtime is indicated in the duration field. The duration field is set to a value that allows adequate granularity in describing downtime. A value of 1 second is RECOMMENDED. When the trunk becomes unavailable, this event is sent with the same timestamp three times at an interval of 20 ms. If the trunk persists in the unavailable state at the end of the indicated duration, then the event is retransmitted, preferably with the same redundancy scheme.

Unavailability of the trunk might result from a failure or an administrative action. This event is used in a stateless manner to synchronize trunk unavailability between equipment connected through provisioned RTP trunks. It avoids the unnecessary consumption of bandwidth in sending a continuous stream of RTP packets with a fixed payload for the duration of the downtime, as would be required in certain E1-based applications. In T1-based applications, trunk conditioning via the ABCD transitional events can be used instead.

2.7. Metering Pulse Event

The metering pulse event may be used to transmit meter pulsing for billing purposes. For background information, one possible reference is http://www.seg.co.uk/telecomm/automat3.htm. Since the metering pulse is a discrete event, each metering pulse event report MUST have both the 'M' and 'E' bits set. Meter pulsing is normally transmitted by out-of-band means while conversation is in progress. Senders MUST therefore be prepared to transmit both the telephone-event and audio payload types simultaneously. Metering pulse events MUST be retransmitted as recommended in Section 2.5.1.4 of RFC 4733 [4]. It is RECOMMENDED that the retransmission interval be the lesser of 50 ms and the pulsing rate but no less than audio packetization rate.

3. Congestion Considerations

The ability to adapt to congestion varies with the signalling system being used and also differs between line and register signals.

With the specific exception of register signalling for S.S. No. 5 and R1/MF, the signals described in this document are fairly tolerant of lengthened durations, should these be necessary. Thus in congested conditions, the sender may adapt by lengthening the reporting interval for the tones concerned. At the receiving end, if a tone is being played out and an under-run occurs due to delayed or lost packets, it is best to continue playing the tone until the next packet arrives. Interrupting a tone prematurely, with or without resumption, can cause the call setup attempt to fail, whereas extended playout just increases the call setup time.

Register signalling for S.S. No. 5 and R1/MF is subject to time constraints. Both the tone signals and the silent periods between them have specified durations and tolerances of the order of 5 to 10 ms. The durations of the individual tones are of the order of two to three packetization intervals (55/68 ms, with the initial KP lasting 100 ms). The critical requirement for transmission of the telephony-event payload is that the receiver knows which signal to play out at a given moment. It is less important that the receiver receive timely notification of the end of each tone. Rather, it should play out the sequence with the durations specified by the signalling standard instead of the actual durations reported.

These considerations suggest that as soon as a register signal has been reliably identified, the sender should emit a report of that tone. It should then provide an update within 5 ms for reliability and no more updates until reporting the end of the tone.

Increasing the playout buffer at the receiver during register signalling will increase reliability. This has to be weighed against the implied increase in call setup time.

4. Security Considerations

The events for which event codes are provided in this document relate directly to the setup, billing, and takedown of telephone calls. As such, they are subject, using the terminology of RFC 3552 [12], to threats to both communications and system security. The attacks of concern are:

- o confidentiality violations (monitoring of calling and called numbers);

- o establishment of unauthorized telephone connections through message insertion;

- o hijacking of telephone connections through message insertion or man-in-the-middle modification of messages;

- o denial of service to individual telephone calls through message insertion, modification, deletion, or delay.

These attacks can be prevented by the use of appropriate confidentiality, authentication, or integrity protection. If confidentiality, authentication, or integrity protection are needed, then Secure Real-time Transport Protocol (SRTP) [3] SHOULD be used with automated key management.

Additional security considerations are described in RFC 4733 [4].

5. IANA Considerations

This document defines the event codes shown in Table 6. These events are additions to the telephone-event registry established by RFC 4733 [4]. The reference for all of them is the present document.

Event Code	Event Name	Reference
121	Continuity check-tone	[RFC5244]
122	Continuity verify-tone	[RFC5244]
123	MF Code 11 (SS No. 5) or KP3P/ST3P (R1)	[RFC5244]
124	MF KP (SS No. 5) or KP1 (R1)	[RFC5244]
125	MF KP2 (SS No. 5) or KP2P/ST2P (R1)	[RFC5244]
126	MF ST (SS No. 5 and R1)	[RFC5244]
127	MF Code 12 (SS No. 5) or KP'/STP (R1)	[RFC5244]
128	SS No. 5 or R1 digit "0"	[RFC5244]
129	SS No. 5 or R1 digit "1"	[RFC5244]
130	SS No. 5 or R1 digit "2"	[RFC5244]
131	SS No. 5 or R1 digit "3"	[RFC5244]
132	SS No. 5 or R1 digit "4"	[RFC5244]
133	SS No. 5 or R1 digit "5"	[RFC5244]
134	SS No. 5 or R1 digit "6"	[RFC5244]
135	SS No. 5 or R1 digit "7"	[RFC5244]
136	SS No. 5 or R1 digit "8"	[RFC5244]
137	SS No. 5 or R1 digit "9"	[RFC5244]
144	ABCD signalling state '0000'	[RFC5244]
145	ABCD signalling state '0001'	[RFC5244]
146	ABCD signalling state '0010'	[RFC5244]

147	ABCD signalling state '0011'	[RFC5244]
148	ABCD signalling state '0100'	[RFC5244]
149	ABCD signalling state '0101'	[RFC5244]
150	ABCD signalling state '0110'	[RFC5244]
151	ABCD signalling state '0111'	[RFC5244]
152	ABCD signalling state '1000'	[RFC5244]
153	ABCD signalling state '1001'	[RFC5244]
154	ABCD signalling state '1010'	[RFC5244]
155	ABCD signalling state '1011'	[RFC5244]
156	ABCD signalling state '1100'	[RFC5244]
157	ABCD signalling state '1101'	[RFC5244]
158	ABCD signalling state '1110'	[RFC5244]
159	ABCD signalling state '1111'	[RFC5244]
174	Metering pulse	[RFC5244]
175	Trunk unavailable	[RFC5244]
176	MFC forward signal 1	[RFC5244]
177	MFC forward signal 2	[RFC5244]
178	MFC forward signal 3	[RFC5244]
179	MFC forward signal 4	[RFC5244]
180	MFC forward signal 5	[RFC5244]
181	MFC forward signal 6	[RFC5244]
182	MFC forward signal 7	[RFC5244]
183	MFC forward signal 8	[RFC5244]
184	MFC forward signal 9	[RFC5244]

185	MFC forward signal 10	[RFC5244]
186	MFC forward signal 11	[RFC5244]
187	MFC forward signal 12	[RFC5244]
188	MFC forward signal 13	[RFC5244]
189	MFC forward signal 14	[RFC5244]
190	MFC forward signal 15	[RFC5244]
191	MFC backward signal 1	[RFC5244]
192	MFC backward signal 2	[RFC5244]
193	MFC backward signal 3	[RFC5244]
194	MFC backward signal 4	[RFC5244]
195	MFC backward signal 5	[RFC5244]
196	MFC backward signal 6	[RFC5244]
197	MFC backward signal 7	[RFC5244]
198	MFC backward signal 8	[RFC5244]
199	MFC backward signal 9	[RFC5244]
200	MFC backward signal 10	[RFC5244]
201	MFC backward signal 11	[RFC5244]
202	MFC backward signal 12	[RFC5244]
203	MFC backward signal 13	[RFC5244]
204	MFC backward signal 14	[RFC5244]
205	MFC backward signal 15	[RFC5244]
206	A bit signalling state ’0’	[RFC5244]
207	A bit signalling state ’1’	[RFC5244]
208	AB bit signalling state ’00’	[RFC5244]

209	AB bit signalling state '01'	[RFC5244]
210	AB bit signalling state '10'	[RFC5244]
211	AB bit signalling state '11'	[RFC5244]

Table 6: Channel-Oriented Signalling Events in the Audio/Telephone-Event Event Code Registry

6. Acknowledgements

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7. References

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Authors' Addresses

Henning Schulzrinne
Columbia U.
Dept. of Computer Science
Columbia University
1214 Amsterdam Avenue
New York, NY 10027
US

EMail: schulzrinne@cs.columbia.edu

Tom Taylor
Nortel
1852 Lorraine Ave
Ottawa, Ontario K1H 6Z8
CA

EMail: tom.taylor@rogers.com

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