

ICS 33.060.99
CCS M 36

YD

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

YD/T 3695-2020

**Vehicle Emergency Alarm System Based on Public
Telecommunication Network Wireless Data Transmission
Technology Requirements
(English Translation)**

Issued on: April 16, 2020

Implemented on: July 1, 2020

**Issued by: Ministry of Industry and Information Technology of the
People's Republic of China**

Table of Contents

Foreword...	3
1 Scope...	5
2 Normative references...	5
3 Terms, definitions and abbreviations...	6
3.1 Terms and definitions...	6
3.2 Abbreviations...	7
4 Overviews...	8
4.1 Overview of eCall system...	8
4.2 eCall system requirements...	8
4.3 eCall in-band modulation architecture...	10
5 Functional description of IVS data modem...	13
5.1 IVS transmitter...	13
5.2 IVS receiver...	21
6 Functional description of data modem...	24
6.1 PSAP transmitter...	24
6.2 PSAP receiver...	29
7 Transport protocols and error handling...	32
7.1 Normal operation...	32
7.2 Abnormal operation...	32
7.3 PSAP and IVS protocol state model...	36

1 Scope

This Standard specifies the technical requirements for communication and data transmission of the vehicle emergency alarm system based on public telecommunication network, namely the overall scheme and algorithm description of eCall in-band modulation, including the IVS modem and PSAP modem that constitute full-duplex transmission.

This Standard applies to vehicle emergency alarm systems based on public telecommunication network.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest

edition of the referenced document (including any amendments) applies.

3GPPTS 22.101, Service aspects; Service principles

3GPP TR 22.967, Transfer of ECall Data

3GPP TS 26.071, AMR speech Codec; General description

3GPP TS 26.094, Mandatory speech codec speech processing functions; Adaptive Multi-Rate (AMR) speech codec; Voice Activity Detector (VAD)

3GPP TS 26.226, Cellular text telephone modem; General description

3GPP TS 26.268, eCall Data Transfer; In-band modem solution· ANSI-C reference code

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.6 MSD data frame

It includes the uplink signal transmission time of one MSD data (after synchronization is established). The duration is 1320 ms. This is equivalent to a total of 10560 samples at 8kHz sampling rate (if a fast modulator is used) or 18560 samples (if a reliable modulator is used).

3.1.7 modulation frame

Symbol transmission time. The duration is 2 ms, equivalent to 16 samples at 8kHz sampling rate (if a fast modulator is used), or 4 ms, equivalent to 32 samples at 8kHz sampling rate (if a reliable modulator is used).

3.1.8 synchronization frame

It includes the signal transmission time of synchronization information. The duration is 260 ms. This is equivalent to 2080 samples at a sampling rate of 8 kHz.

3.2 Abbreviations

The following abbreviations apply to this document.

4.1 Overview of eCall system

Figure 1 gives an overall description of the eCall system.

4.3 eCall in-band modulation architecture

4.3.1 General

The eCall in-band modulation scheme specified in this Standard consists of an IVS data modem and a PSAP data modem. The signal design used allows the signal to pass through the voice vocoder with only moderate distortion and provide sufficient data rate to meet the requirements of transmitting MSD as quickly as possible.

4.3.2 IVS data modem working principle

Figure 3 shows the basic components of an IVS data modem. The MSD information input to the IVS transmitter is first added with CRC check information, and then all bits are input to the HARQ encoder. FEC coding is used to combat transmission errors.

5.1.1 General

The IVS transmitter is used to modulate the MSD data so that it is suitable for in-band transmission over the voice channel to the PSAP. The components of the IVS transmitter are shown in Figure 5.

5.1.3 CRC check code

Each MSD message is preceded by a 28-bit CRC checksum before HARQ FEC encoding.

5.1.4.1 Bit scrambling

Bit scrambling is performed on the MSD information after the CRC check is added (before Turbo encoding).

5.1.4.2 Turbo coding

The Turbo encoder scheme used in eCall intra-band modulation consists of two identical 8-state parallel-concatenated convolutional coding (PCCC) sub-encoders and a Turbo code intra-interleaver. The transfer function of the sub-encoder is.

Table 2 -- MSD data frame format

5.1.7 Synchronization signal and frame format

The synchronization frame is composed of the following two parts in series.

5.2.6 Message processing

This function activates the corresponding function of the IVS modem according to the received message. After synchronization lock, once a START message is received, the IVS transmitter is activated for MSD transmission.

6.1.1 General

The PSAP transmitter generates downlink transmission signals. These downlink signals are used to control the transmission of uplink MSD. The PSAP transmitter is shown in

Figure 15.

6.1.2 Message encoding

According to the design, the PSAP transmitter can send a total of 16 different link layer messages to the IVS. The following three are currently used.

6.1.3 BCH coding

The link layer feedback uses a truncated (60, 4) BCH block code. This code is generated from the (63, 7) BCH block code. See Table 4 for different messages and their encoding methods.

6.1.5.2 High-level confirmation feedback message

The feedback frame in the high-level feedback message (see 5.1.7) needs to be inverted (i.e. all samples are multiplied by -1). Its frame structure contains two DL-Data fields and a silent interval.

6.1.5.3 Downlink message processing

Before detecting the uplink synchronization frame, the PSAP transmitter sends/retransmits the START message multiple times.

6.1.6 Synchronization

The PSAP synchronization signal is similar to that described in 5.1.7, except that the

PN sequence pulse amplitude is increased by 5000, that is, its pulse amplitude is 25000 and -15000, and the original zero is replaced by a sample with an amplitude of 12000.

For high-level confirmation messages, the above synchronization frame needs to be inverted, that is, each sample is multiplied by -1.

6.2.1 General

The PSAP receiver demodulates the MSD message from the IVS and checks the integrity of the received MSD through CRC check. The block diagram of the PSAP receiver is shown in Figure 17.