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SIM5360_ECALL_Application Note_V0.01



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Version History

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2014-06-11	V0.01	New version	

Scope

This document presents the AT commands of ECALL operation and application examples. This document can apply to SIMCom 3G modules, including SIM536 series modules.

1. Introduction

eCall refers to an interoperable in-vehicle emergency call service which is envisioned to be introduced and operated across Europe in 2010. The European Commission has brought together standardization bodies, the automotive industry, mobile telecommunication industry, public emergency authorities and others in the eSafety Forum initiative [1] which has identified high-level requirements, recommendations and guidelines for this eCall service [2].

The introduction and use of in-vehicle eCall for deployment of emergency assistance is expected to save many lives and reduce social burden by improving the notification of road accidents and speeding up emergency service response [3].

In the event of a collision, the intended solution can automatically or manually establish an emergency voice call (E112) via the cellular network to the local emergency agencies, i.e., the Public-Safety Answering Point (PSAP), as illustrated in Figure 1. Aside from enabling two-way speech communication between the motorist and the PSAP operator, eCall also allows transfer of a data message from the In-Vehicle System (IVS) over the cellular network to the PSAP which is denoted as eCall Minimum Set of Data (MSD). The MSD includes vehicle location information, time stamp, and number of passengers, Vehicle Identification Number (VIN), and other relevant information.

As part of the eSafety initiative, ETSI MSG and the 3rd Generation Partnership Project (3GPP) were requested to standardize the eCall service.

For eCall data transfer, an in-band modem solution has been identified as the most suitable technology that fulfills all eCall requirements [6]. With this solution the MSD is transmitted “in-band” over the voice channel. This supports quick deployment of an end-to-end eCall solution in both vehicles and PSAPs.

2. References

- [1] eSafety Forum: http://www.esafetysupport.org/en/esafety_activities/esafety_forum
- [2] eSafety Forum eCall Driving Group, “European Memorandum of Understanding for Realization of Interoperable In-Vehicle eCall”, May 2004.
- [3] eSafety Forum, ”Clarification Paper – EG.2 , High level requirements for a eCall in-vehicle system, Supplier perspective”, March 2006, Version 1.0.
- [4] eSafety Forum, ”Recommendations of the DG eCall for the introduction of the pan-European eCall “, April 2006, Version 2.0.
- [5] 3GPP TS 22.101 V9.0.0 “Service aspects; Service principles”.
- [6] 3GPP TR 26.967 V8.0.1 “eCall Data Transfer; In-band modem solution”.

3. Terms

ACK Acknowledgement

ARQ – Automatic Repeat-reQuest. An error control mechanism for data transmission where the receiver requests retransmission of data that has not been correctly received.

BTS – Base Transceiver Station

HACK High Layer ACK

IVS – The in-vehicle system which includes the eCall data modem, collision detectors, position location (e.g. GPS) function.

IVS data modem – The eCall data modem located in the IVS used to transmit the MSD information to the PSAP and receive feedback from the PSAP.

LACK Link Layer ACK

MSD – Minimum Set of Data to be sent from the IVS to the PSAP. This includes the location information of the vehicle, direction of travel, number of passengers with fastened seat belts, vehicle information, and other information deemed relevant for the emergency service agencies.

MO Mobile Originated

MT Mobile Terminated

PLMN – Public Land Mobile Network

PSAP – Public-Safety Answering Point.

PSAP data modem – The eCall data modem located in the PSAP used to receive MSD information from the IVS data transmitter and transmit feedback to the IVS.

PSTN/GSTN – Public Switched Telephone Network/General Switched Telephone Network

SF Synchronization Frame

TRAU – Transcoder and Rate Adaptation Unit

4. Overview

eCall is defined as a manually or automatically initiated emergency call from a vehicle. It is supplemented with a minimum set of emergency related data (MSD), and compatible with the EU Commission's eSafety initiative. eCall can be depicted by the figure below.

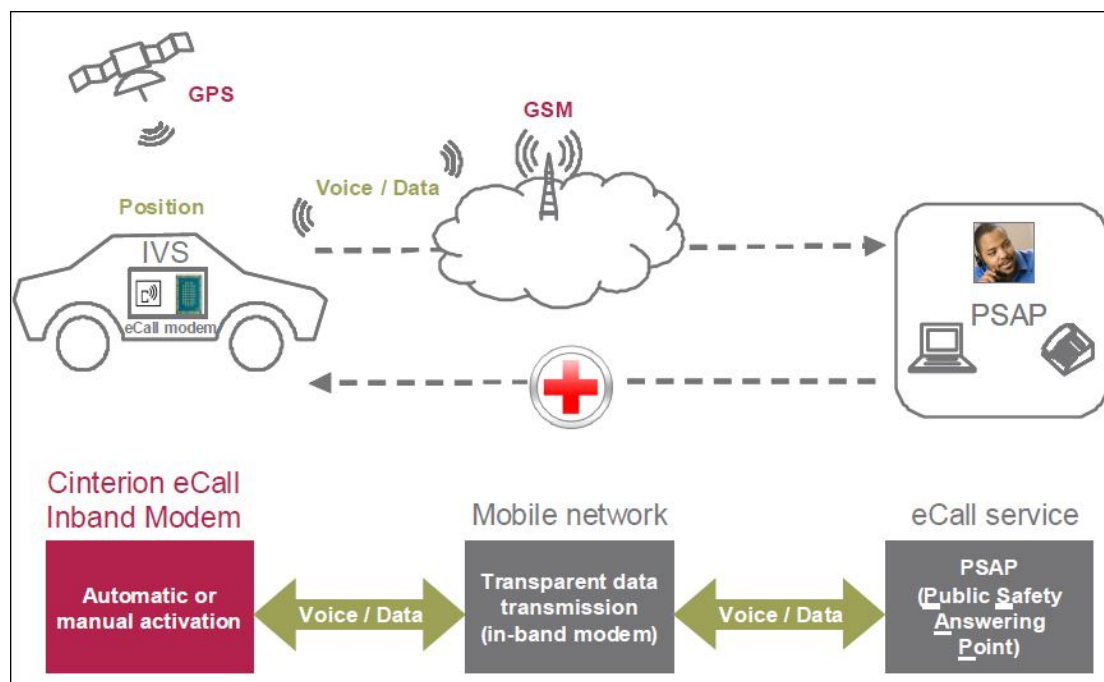
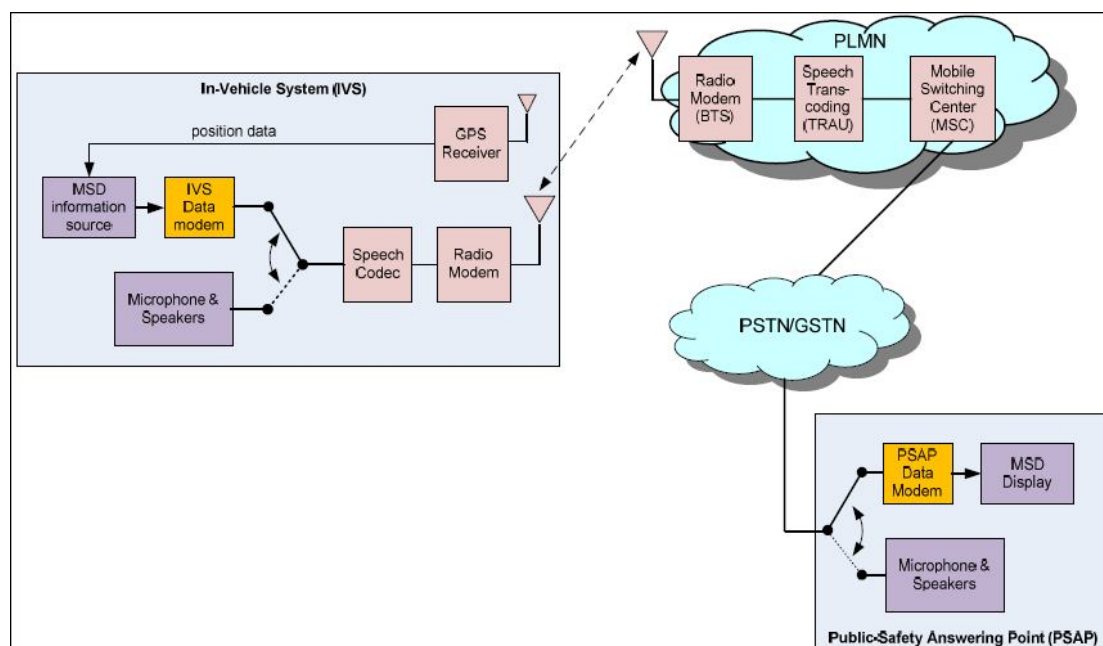


Figure 1: Overview of eCall System

The eCall System: Figure illustrates parts of the eCall system. When a collision is detected by the IVS sensors in the vehicle, the IVS can be prompted by the user, or automatically, initiate an E112 emergency voice call. The emergency voice call is routed to the appropriate PSAP using the existing emergency routing procedures for voice E112 calls.



When triggered by a request from the PSAP operator through the PSAP modem, the in-band IVS data modem is used to transmit the relevant information (MSD) through the voice path established to the PSAP. Transmitting the MSD information through this voice path enables the system to use

the E112 routing protocols deployed in existing networks.

The PSAP has a corresponding data modem to receive the transmission from the IVS and display the data to the PSAP operator.

The eCall system uses an in-band data modem to transmit the MSD information over the voice path to the PSAP. This approach enables the eCall solution to be quickly deployed end-to-end in vehicle IVS's and PSAPs without modifications to the existing cellular and wireline infrastructure.

5. Ecall flow

Sim5360 module supports both push mode and pull mode. Push mode is realized by a request from the IVS to the PSAP to push the MSD; pull mode is realized by PSAP actively requiring MSD from IVS.

The flow charts of these two modes are described as follows.

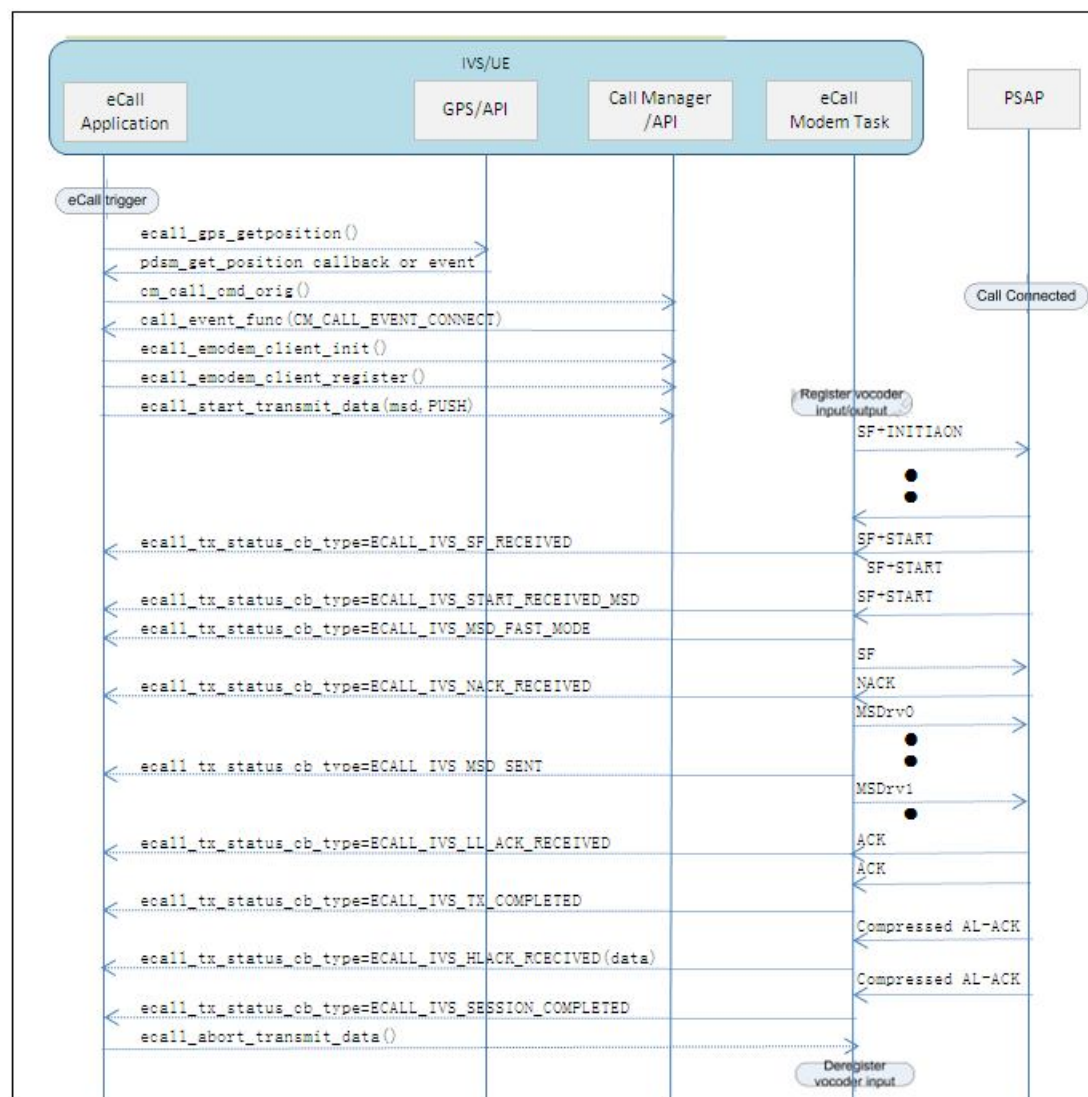
You can establish eCall by AT+CECALLS command. When eCall is established successfully, it will transmit MSD in push mode automatically. If MSD transmission is finished, you can do voice talk ; or PSAP can request MSD and then IVS transfers MSD in pull mode.

If PSAP terminates the eCall, the MT eCall on the IVS side will be valid in 12 hours.,and The incoming call number must be same the MO call last time. When MT eCall is coming, you should use ATA command to answer the eCall, and then IVS will transfer MSD in push mode automatically.

5.1 eCall Flow Chart in Push Mode

For MO eCall on the IVS, when eCall is established successfully, it will automatically transmit MSD in push mode. If MSD transmission is finished, and the param of num_times_to_loop is n (n !=0, num_times_to_loop is in PSAP side,it could be configured in ecall_psap_efs.txt file in psap side), IVS will transmit n times MSD in push mode. The following figure shows the detailed procedure in push mode.

Figure 5-1 illustrates the call flow a mobile-originated eCall



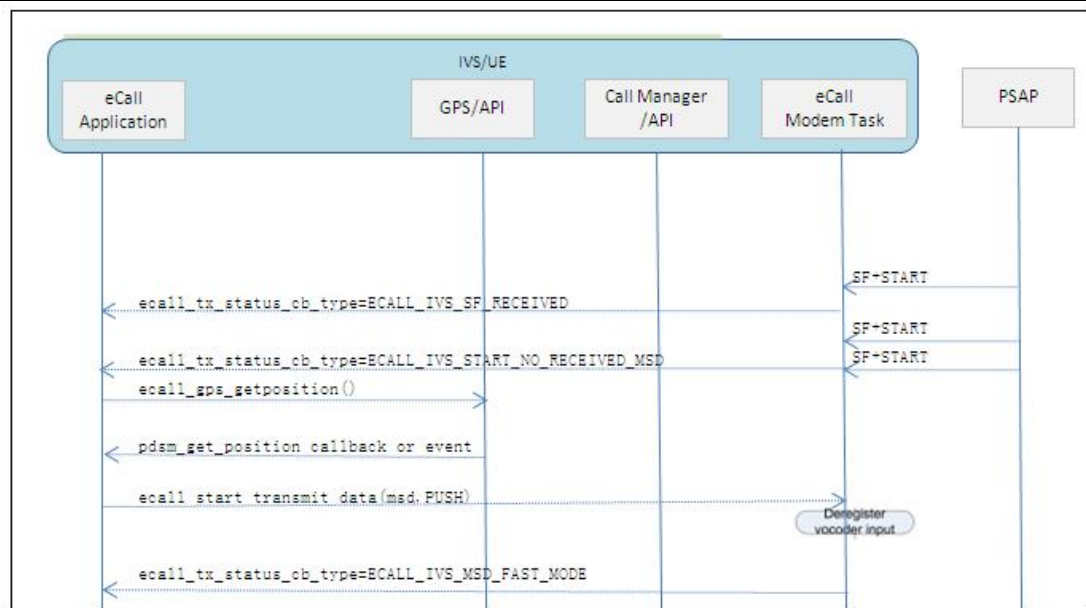
5.2 Additional Data Request

This call flow illustrates how the IVS receives an additional data request from the PSAP and transmits the MSD successfully. The flow needs some preconditions.

Preconditions

- . The call is still connected.
- . The eCall application has registered the callback from the eCall modem task using the `ecall_start_transmit_data()` API.

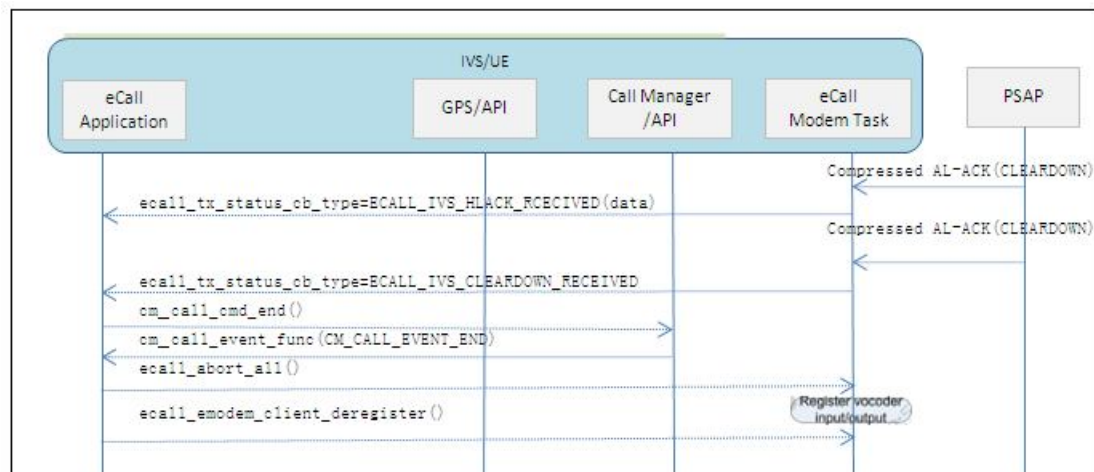
Figure 5-2 illustrates the call flow for an additional data request.



5.3 Call Release

This call flow illustrates how the IVS/UE receives notification from the Call Manager that a call has ended. It can be optionally triggered by an event that the eCall modem has received an AL-ACK message with clear-down status.

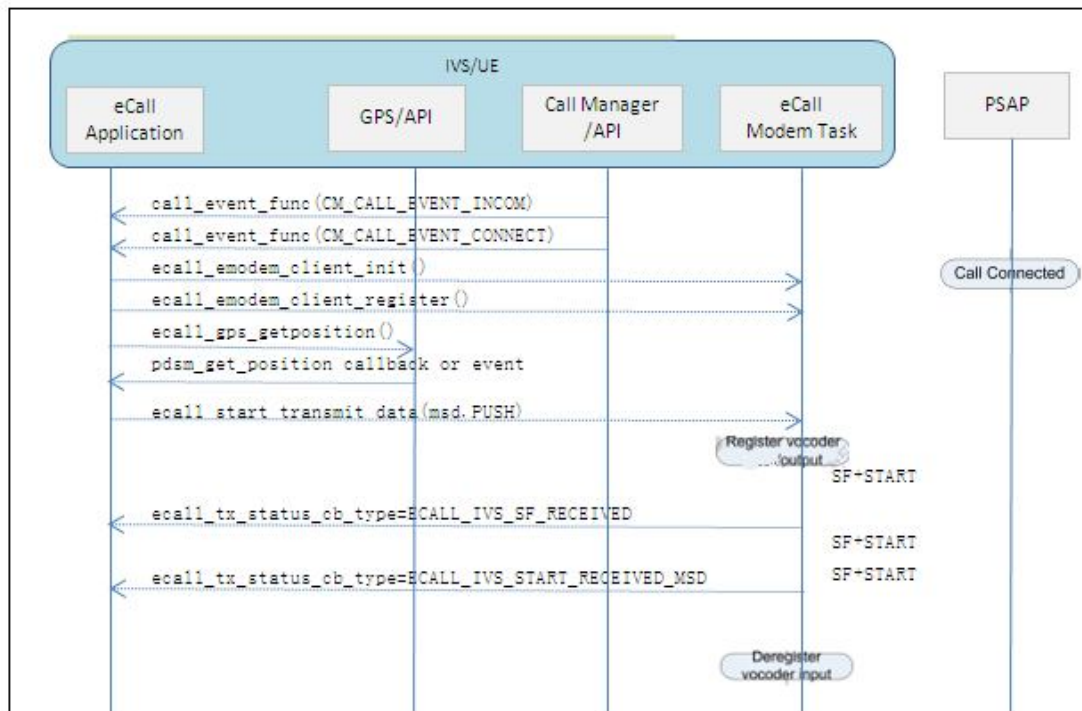
Figure 5-3 illustrates the call flow for an additional data request.



5.4 eCall Flow Chart in Pull Mode

When MT eCall on the IVS has been established, MSD can be transmitted in pull mode. The following figure shows the detailed procedure in pull mode.

Figure 5-4 illustrates the call flow for a mobile-terminated eCall.



6. SIM module eCall operate

6.1 eCall AT commands

AT+CECALLFMT: set MSD packing format (this command must set to 1 for Europe ecall test)

AT+CECALLCFG: Configure vehicle information

AT+CECALLPOS: Set longitude and latitude

AT+CECALLTIME: Set time stamp

(The above settings will be saved in config file, do not need to set again.)

AT+CECALLS: Make an ecall and send the MSD information once automatically

AT+CECALLE: Hang up ecall

6.2 Description of URC

URCs of SIM5360 eCall AT commands will be reported to the host by the type of “+ECALL:”. It contains failed eCall , Establish ECALL_MO_CALL successfully, Succeed to transmit MSD as well as Establish ECALL_MT_CALL successfully

URC of Failed eCall:

+ECALL:Read canned msd from config file failed!

+ECALL:ECALL_APP_CALL_CLEARDOWN_TIMER EXPIRE

+ECALL:Can not get real GPS data in 80 seconds

+ECALL:ECALL_APP_RETRY_TIMER EXPIRE

+ECALL:Session did not complete in 20 seconds

+ECALL:ECALL_APP_AL_ACK_TIMER EXPIRE

After executing **AT+CECALLS** command, and PSAP answer the call, UE will report the message “+ECALL: Establish ECALL_MO_CALL successfully”. When MSD is transmitted successfully in push mode , +ECALL: Succeed to transmit MSD will be reported.

When ECALL_APP_STATE is ECALL_APP_IDLE_ALLOW_MT_ECALL, and PSAP execute **ATD** command during ECALL_CALLBACK_TIMEOUT, IVS will answer the call **automotive**. +ECALL: ECALL_MT_CALL successfully will be reported. When MSD is transmitted successfully in pull mode , +ECALL: Succeed to transmit MSD will be reported.

6.3 MSD configure

At present, the MSD inclusive information: Vehicle type, Propulsion storage, Number of passenger, Vehicle id number, Longitude and Latitude of current position.

Vehicle type:

- 1 — Passenger vehicle class M1
- 2 — Buses and coaches class M2
- 3 — Buses and coaches class M3
- 4 — Light commercial vehicles class N1
- 5 — Heavy duty vehicles class N2
- 6 — Heavy duty vehicles class N3
- 7 — Motorcycles class L1e
- 8 — Motorcycles class L2e
- 9 — Motorcycles class L3e
- 10 — Motorcycles class L4e
- 11 — Motorcycles class L5e
- 12 — Motorcycles class L6e
- 13 — Motorcycles class L7e

Propulsion storage:

- 1 — Hydrogen storage
- 2 — Electric energy storage
- 4 — Liquid propane gas
- 8 — Compressed natural gas
- 16 — Diesel tank present
- 32 — Gas online tank present

Number of passenger:

Refer to actual environment

Vehicle id number:

Refer to actual environment

Longitude and Latitude of current position:

Use canned GPS information or use real GPS information.

6.4 Do the eCall test in push mode

For MO eCall, when eCall is established, MSD will be transferred automatically in push mode.

If test the eCall function, it should test in a test call or an emergency call.

Step1: Set MSD packing format

AT+CECALLFMT=1

Follow the Europe standard prEN_15722, this command must set for Europe ecall test before ecall connecting

Step2: Configure vehicle information

AT+CECALLCFG=5,18,8,"WMJVDSVDSYA123456",14,10,-10,20,-2

Use the real GPS information, the position information can be set any value.

Step3: Set longitude and latitude

AT+CECALLPOS="121.354138","31.221938"

Step4: Set time stamp

AT+CECALLTIME=1,2011,10,20,15,30,30

Setp5: Make an eCall.

Real GPS: AT+CECALLS=112,1,0

Canned GPS: AT+CECALLS=112,1,1

Use the real GPS information, the module will fix position first, then make a call to target number. The GPS information can be monitored by NMEA port.

Use the canned GPS information, the module will make a call to target at once.

Setp6: Hang up eCall.

AT+CECALLE

Demo for a test call in push mode:

AT+CECALLFMT=1

OK

AT+CECALLCFG=5,18,8,"WMJVDSVDSYA012345",14,10,-10,20,-20

OK

AT+CECALLPOS="121.354138","31.221938"

OK

AT+CECALLTIME=1,2011,10,20,15,30,30

OK

AT+CECALLS=18601695257,0,1

OK

+ECALL:Establish ECALL_MO_CALL successfully

VOICE CALL: BEGIN

+ECALL:Succeed to transmit MSD

at+cecalle

OK

VOICE CALL: END: 000032

6.5 Do the eCall test in pull mode

When eCall has established and PSAP terminates the eCall, MT eCall will be valid in 12 hours. For MT eCall, when eCall is established, MSD can be transferred in pull mode. If

+ECALL:Succeed to transmit MSD is reported, it indicates MSD has been transmitted in pull mode. The following example shows the transmission in pull mode:

RING

+ECALL:Establish ECALL_MT_CALL successfully

VOICE CALL: BEGIN

+ECALL:Succeed to transmit MSD

VOICE CALL: END: 000024

6.6 The timer in eCall

GPS fix timeout is 80000 milliseconds.

GPS fix in call timeout is 5000 milliseconds.

ECALL_CALLBACK_TIMEOUT is 12 hours.

ECALL_CALL_CLEARDOWN_TIMEOUT is 1 hour.

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