

Pan-European eCall

Product Requirement Document – v1.2

Carl, James (J.R.) and Dougherty, Garrett (G.M.) – CV&S

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Acronyms

AHU	Audio Head Unit
CAN	Controller Area Network
CHR	Connected HMI Radio
eCall	Emergency Call
EGNOS	European Geostationary Navigation Overlay Service
ENS	Event Notification Signal
EU	European Union
GLONASS	GLOBAL NAVigation Satellite System
GNSS	Global Navigation Satellite System
GSM	Global System for Mobile Communications
eCall IVS	eCall In-vehicle System
NAD	Network Access Device
PSAP	Public Safety Answering Point
RCM	Restraints Control Module
TCU	Telecommunication Control Unit
UMTS	Universal Mobile Telecommunications System (3G – 3rd Generation)

2 Scope

The purpose of this document is to give a high level overview of Ford's Pan-European eCall requirements that shall be implemented on all Ford new type vehicles after March 31st 2018 as mandated by EU Commission. This document is targeted for the FNV2 architecture.

3 Overview

eCall is a European Commission initiative which mandates (per *Regulation EU 2015/758*) all vehicles be equipped with an in-vehicle system that calls 112 in the event of a serious road accident or by manual activation. Upon activation of an eCall, the in-vehicle system will connect to a public cellular network and initiate a call to 112. Upon connection to 112, the in-vehicle system will send a minimum set of data which is a data package that includes information about the vehicle and its location. Once the minimum set of data has been transmitted, communication is opened up between the in-vehicle occupants and the public safety answering point using the vehicle's audio system.

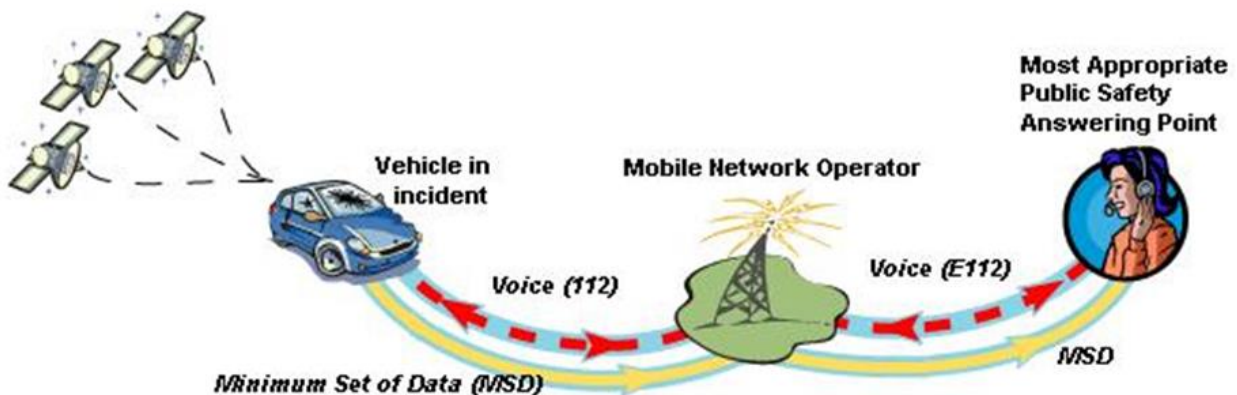


Diagram provided by EU Commission

4 European Union eCall Regulations:

4.1 eCall Justification

"The scale of death and injury on roads in Europe needs to be fully comprehended to understand the need for 'Emergency Call' (eCall). In 2008 there were 38 900 fatalities in EU-27. The figure for 2009 is around 34 500 fatalities. The trend 2001 to 2008 is around 5 % reduction annually. Road accident injuries are in the region of 1,7 million (2008). Roads remain unsafe and further efforts are needed. The pan-European in-vehicle emergency call, eCall, is estimated to have the potential to save up to 2 500 fatalities annually in EU-28 when fully deployed and furthermore to reduce the severity of injuries, to bring significant savings to the society in and to reduce human suffering."

Above an excerpt from EN16072-2015 – Introduction

4.2 Regulation Overview

The regulation mandating the implementation of eCall is *Regulation EU 2015/758*, which amends *Directive 2007/46/EC*. This regulation was finalized on April 29th 2015. In addition, the EU released further regulation documentation including the *Commission Implementing Regulation EU 2017/78* on July 15th 2016 and *Commission Delegated Regulation EU 2017/79* on September 12th 2016. These regulations include the high level eCall requirements, and reference additional legislation consisting of more technical requirements. Below is a list of the supplemental eCall legislation:

- EN 16072 – Pan-European eCall operating requirements
- EN 16062 – eCall high level application requirements
- EN 15722 – eCall minimum set of data
- EN 16454 – eCall end to end conformance testing
- EN 16102 – Operating requirements for third party support
- ETSI TS 122 101 – eCall requirements for data transmission
- ETSI TS 124 008 – eCall discriminator table
- ETSI TS 126 267 – eCall data transfer description
- ETSI TS 126 268 – eCall data transfer reference C code
- ETSI TS 126 269 – eCall data transfer conformance testing
- ETSI TS 126 969 – eCall data transfer technical report

4.3 Additional Applicable Markets

The eCall feature is required by *Regulation EU 2015/758* and is therefore applicable to the European Union market that includes 28 countries. The feature also applies to an additional 20 markets/regions in Europe existing outside of the European Union. Additionally, the feature is applicable for implementation within markets of Israel, United Arab Emirates and Malaysia.

5 Key eCall Functions:

5.1 Manual Activation

EU legislation requires that there shall be an option to trigger an eCall manually. To achieve this, the eCall in-vehicle system will include a button which is hardwired to the TCU. This button will be located in a place which is in reach and visible to the vehicle occupants. Upon pressing the button, the customer will be informed that the feature has been activated and allow the customer to cancel the eCall. If not cancelled, the eCall will continue with the call process.

5.2 Automatic Activation

EU legislation requires that an eCall shall be triggered if a serious accident is detected by the vehicle. The RCM will be responsible for determining if a crash event is a serious accident and then notifying the TCU. An accident will be classified as serious if it requires an airbag deployment or fuel pump cutoff. Note pretensioner or knee airbag deployment only events will not be considered serious and therefore will not result in an eCall.

5.3 Emergency Call

Upon activation of an eCall (via automatic or manual trigger), the in-vehicle system shall call the European emergency number, 112, via public cellular networks. The TCU shall be compatible with GSM/UMTS technology and be capable of properly connecting, via the public cellular networks, to the local public safety answering point using the proper identifiers to route the call appropriately.

5.4 Minimum Set of Data:

During the initial moments of a connected eCall, the in-vehicle system shall provide the PSAP with vehicle data via an in-band modem. This data is called the minimum set of data and includes the following:

- Automatic or manual trigger
- Test or emergency call
- Vehicle location
- Vehicle class
- VIN
- Propulsion type
- Timestamp
- Direction of travel

Vehicle location will be determined using the EGNOS and Galileo navigational systems. Therefore vehicle GNSS chipset compatibility with these two systems is required by EU legislation.

5.5 Voice Communication

After the minimum set of data is sent to PSAP, two way voice communication shall be established between the in-vehicle occupants and the PSAP operator. The eCall system shall use the in-vehicle microphone and speakers to allow for voice communication.

5.6 User Experience

What the eCall feature is and how it works shall be clear to the customer. To achieve this, the customer will be provided with material in the owner's manual explaining the feature. The eCall system will also incorporate various HMI elements to indicate to the customer the status of an eCall or if an eCall system malfunction is detected. HMI will be provided to the customer via an LED (packaged with the eCall button), voice prompts, and overlays on the infotainment system if equipped.

5.7 Crash Survivability

EU legislation requires that the eCall system is designed to survive the R94 and R95 crash tests. These regulatory crash tests consist of a 56kph frontal (R94) and 50kph side (R95). In order to meet the crash survivability requirements, the eCall system shall be packaged in locations that will survive the crash and shall have redundant connections between key components. Such redundancies include having two connections (ENS and CAN) between the RCM and TCU for communication of the automatic crash

trigger. In addition, to ensure the eCall system is unaffected by power losses after the crash, a backup battery shall be fitted to the TCU to provide sufficient power to complete an eCall. The following components shall survive the R94 and R95 crash tests:

- TCU
- RCM
- Speakers
- Microphone
- Manual eCall button
- Wiring
- Cellular Antenna
- GNSS Antenna
- GNSS Receiver

5.8 Feature Availability

All new type vehicles in the European Union and other applicable markets after March 31st 2018 must be equipped with the eCall feature at no additional cost to the customer. Customers shall have the option to opt out of having the feature active on their vehicle.

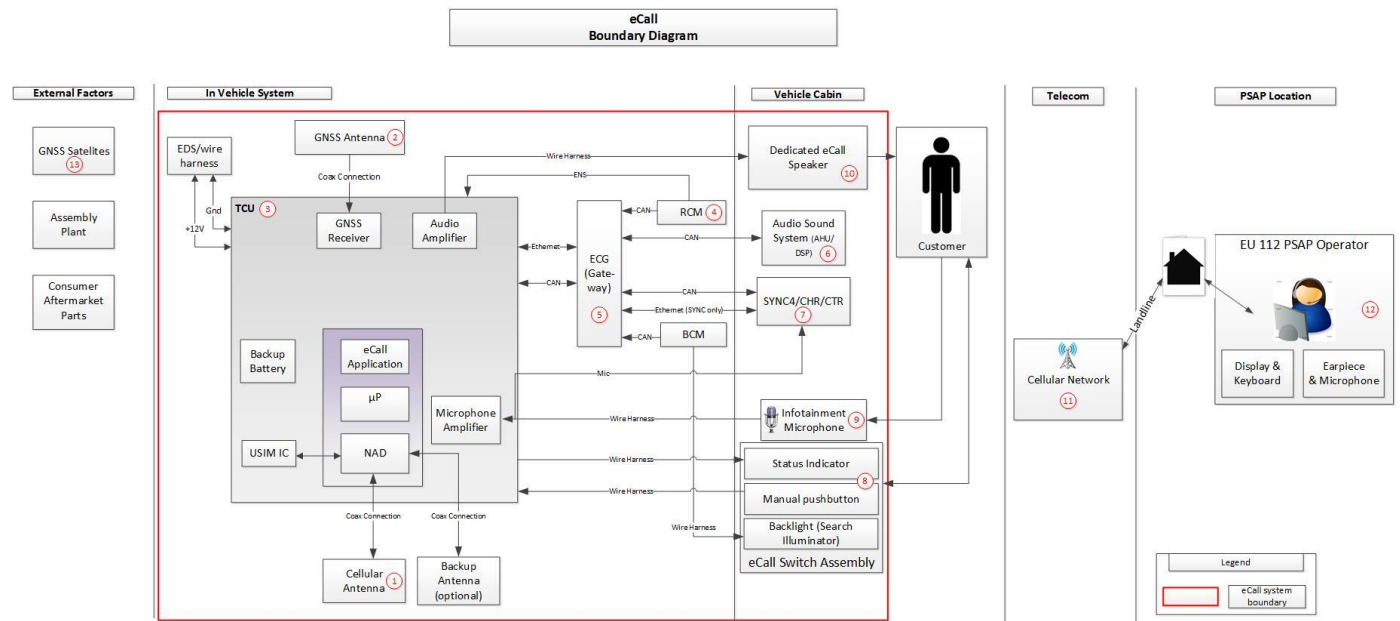
5.9 Privacy

Privacy is of utmost importance to EU Commission. EU legislation requires that no eCall data is shared between the eCall system and other features/services in the vehicle. Special consideration shall be taken when offering additional telematics services in Europe to ensure that eCall data (Vehicle position, crash events) is not broadcasted outside of the vehicle. The customer will be given the option of using eCall only mode in which the telematics will only register to the network during an eCall event for the purpose of privacy.

5.10 eCall Malfunctions

The eCall system shall be capable of determining when there is a malfunction that would hinder or prevent the system from functioning. The system shall be capable of detecting malfunctions on the following hardware: TCU hardware/software, cellular antenna, network access device, GNSS antenna, GNSS receiver, RCM, CAN bus, SIM card/IC, backup battery, microphone, speakers, manual eCall button, status indicator LED, SYNC/CHR. The system shall perform a check every ignition cycle to determine if there is an eCall malfunction. Upon detection of a malfunction, the customer shall be notified by three HMI elements, the LED status indicator, a voice prompt, and a visual overlay on the infotainment system.

6 Boundary Diagram



7 System Components

7.1 Cellular Antenna (1)

7.1.1 Overview:

The TCU uses a cellular antenna which is typically external to the vehicle to allow for better reception. The cellular antenna and the TCU connect via a coax cable.

7.1.2 eCall Function:

The eCall feature uses the cellular antenna to connect to a cellular network during an eCall. The antenna is also used periodically to assess the cellular network coverage to reduce setup time during an eCall event.

7.2 GNSS Antenna (2)

7.2.1 Overview:

The GNSS antenna used to receive navigational signals from the various GNS Systems. To improve GNSS performance, the antenna is usually placed outside the vehicle. The GNSS antenna is sometimes bundled with other antennas, such as the radio and cellular antenna.

7.2.2 eCall Function:

The navigational signals received by the antenna will be used by the GNSS receiver to determine the vehicle's location and provide it to PSAP, via MSD transmittal, in the event of an eCall. At a minimum the antenna shall be used to receive signals from the Galileo and EGNOS navigational systems for the eCall feature, but additional systems such as GLONASS and GPS can also be used by the eCall feature and other vehicle features.

7.3 Telecommunication Control Unit (TCU - 3)

7.3.1 Overview

The TCU is the Network Access Device (NAD) used to connect the vehicle with cellular networks. The TCU could be dedicated to eCall or could include additional telematics services.

7.3.2 eCall Function

The eCall application software shall reside in the TCU. The TCU shall make a 112 call when an eCall is triggered. During the call, the TCU shall send the MSD and open up voice communication. The in-vehicle speakers and the microphone used for eCall shall be directly wired to the TCU so the TCU can play voice prompts and open up voice communication. There shall also be direct wiring between the TCU and the RCM, manual button and status indicator. The TCU shall connect to the cellular and GNSS antennas and be equipped with a GNSS receiver that is compatible with EGNOS and Galileo. In case of vehicle power loss, the TCU shall have a power reserve that is sufficient to complete the call.

7.4 Restraint Control Module (RCM - 4)

7.4.1 Overview

The Restraint Control Module is the safety system within the vehicle that uses sensors to determine when an accident has occurred. The RCM is responsible for deploying airbags and notifying other modules when a vehicle collision has occurred.

7.4.2 eCall Function

If a serious accident is detected where there is an airbag deployment or a fuel pump cutoff, the RCM shall notify the TCU of the accident so the TCU can make an eCall. The RCM shall send the crash signal via the CAN network and the ENS line.

7.5 SYNC/Connected HMI Radio (CHR/CTR - 5)

7.5.1 Overview

The SYNC and Connected HMI Radio are the infotainment systems for the vehicle.

7.5.2 eCall Function

The SYNC system and Connected HMI Radio shall provide visual HMI to the user indicating the status of the eCall and also inform the customer of an eCall malfunction.

7.6 Audio Head Unit (6)

7.6.1 Overview

The AHU provides amplified audio to the in-vehicle speakers.

7.6.2 eCall Function

During an eCall or if a malfunction is detected by the TCU, the TCU will play voice prompts through the in-vehicle speakers. In order to ensure there is a smooth transition when switching audio sources, the TCU shall command the AHU to mute via CAN.

7.7 Manual pushbutton/Status indicator (8)

7.7.1 Overview

The manual pushbutton is a hardware button that is dedicated to the eCall feature to allow for manual activation of an eCall. The eCall status indicator is an LED that illuminates and flashes to indicate status of the eCall feature to the in-vehicle occupants. Both the button switch and status indicator shall be directly wired to the TCU. The button will be backlit via the backlight (search illuminator) in order to be visible to the customer at night.

7.7.2 eCall Function

The button shall be standardized button which is clearly marked and placed in a location that is accessible to the in-vehicle occupants. Steps shall be taken to reduce accidental manual eCall triggers. The status indicator shall remain on if an eCall malfunction is detected by the TCU. The status indicator shall flash at different rates to indicate different stages in an eCall.

7.8 Microphone (9)

7.8.1 Overview

The microphone is used by the infotainment system and TCU for voice commands and hands free communication during phone calls

7.8.2 eCall Function

During an eCall, the TCU will take the incoming audio from the microphone and transmit it on the outgoing voice channel during an eCall for voice communication between the in-vehicle occupants and the PSAP operator.

7.9 Dedicated eCall Speaker (10)

7.9.1 Overview

A speaker dedicated to be used exclusively by the eCall system during an eCall event will be installed in the vehicle and will utilize the TCU to provide audio to the vehicle cabin.

7.9.2 eCall Function

The speaker shall be used by the eCall system to provide the in-vehicle occupants with voice prompts and audio from the PSAP operator for voice communication. The speaker shall be

directly wired to the TCU. The TCU has a built-in audio amplifier and will serve as the source of the eCall audio.

7.10 Cellular Network (11)

7.10.1 Overview

The cellular network consists of the many public European GSM/UMTS cellular service networks.

7.10.2 eCall Function

The TCU shall be capable of registering on these networks. If the TCU is already registered on a network when an eCall is triggered, that network shall be used to place the eCall. Otherwise the eCall system shall register to the available cellular network with the best signal. The eCall shall be set-up in the proper way to insure the call is identified as an eCall, through the eCall flag, and routed to the appropriate PSAP location.

7.11 PSAP Operator - Public Safety Answering Point (12)

7.11.1 Overview

The PSAP operator will accept incoming eCalls, communicate with the in-vehicle occupants and use the eCall Minimum Set of Data (MSD) to determine the vehicle location and description.

7.11.2 eCall Function

During the eCall, the PSAP operator will have the capability of requesting updated MSD data and the in-vehicle system shall retransmit this data upon request. The PSAP operator will also be responsible for ending the eCall. If the PSAP operator wishes to contact the in-vehicle occupants again after the eCall has been ended, the PSAP operator may dial back to the eCall system. The system shall remain registered to the cellular network for at least one hour and accept an incoming call.

7.12 GNSS Satellites (13)

7.12.1 Overview

The GNSS Satellites consist of the Galileo constellation, Global Positioning System (GPS) constellation and the European Geostationary Navigation Overlay Service (EGNOS) augmentation system which transmit navigational signals to the TCU/SYNC/CHR.

7.12.2 eCall Function

The data received from the GNS Systems will be used to determine the location of the vehicle and the direction of travel. This data will be provided to the PSAP operator in the MSD during an ongoing eCall.

8 Hardware Components

