

Driver's Abnormal Condition Response  
System (Deceleration Stop Type)  
Basic Design Document

March 2016

ASV (Advanced Safety Vehicle)  
Promotion Study Group,  
Road Transport Bureau,  
Ministry of Land, Infrastructure,  
Transport and Tourism

## Table of Contents

1. Introduction.....	1
1.1 Positioning of the Basic Design Document.....	1
1.2 Functions of the Driver’s Abnormal Condition Response System of Deceleration Stop Type.....	1
1.3 Scope .....	1
1.4 Definition of Terms .....	2
2. Overview of the Functions .....	4
2.1 Functions of the System .....	4
2.1.1 Main Switch .....	6
2.2 Function to Detect Driver’s Abnormal Conditions .....	6
2.2.1 Abnormal Condition Automatic Detection Type .....	6
2.2.2 Driver Pushbutton Type .....	7
2.2.3 Passenger Pushbutton Type .....	7
2.3 Function to Decelerate and Stop the Vehicle .....	7
2.3.1 Control Start Timing.....	7
2.3.2 Control Method .....	8
2.3.3 Process after Stop.....	9
2.3.4 Assistance by Steering .....	9
2.3.5 Driver Override during Control.....	10
2.4 Function to Give an Alarm Concerning the Condition of the System	11
2.4.1 Alarm to the Driver.....	11
2.4.1.1 Activation Start Alarm .....	11
2.4.1.2 Control Activation Alarm .....	12
2.4.2 Alarm to Passengers .....	12
2.4.2.1 Activation Start Alarm .....	12
2.4.2.2 Reminder Alarm .....	13
2.4.2.3 Control Activation Alarm .....	13
2.4.3 Alarm to Road Users Outside the Vehicle.....	14
2.4.3.1 Reminder Alarm .....	14
2.4.3.2 Control Activation Alarm .....	15
2.5 Cancellation of Activation .....	18
2.6 Design When More Than One Detection Method for Driver’s Abnormal Conditions is Used.....	19
2.7 Measures to be Taken When the System Fails .....	19
2.8 Order of Priorities for the System and Other Driving Assistance Control Systems.....	20

2.8.1 Control System that Stabilizes Vehicle Behavior .....	20
2.8.2 Control System for the Purpose of Avoiding or Mitigating a Collision .....	21
2.8.3 Control System not for the Purpose of Avoiding or Mitigating a Collision .....	21
3. Special Instructions .....	22
3.1 Items to be Known to the Driver.....	22
3.2 Items to be Known to Passengers .....	23
3.3 Items to be Known to the Society (Campaigns, etc.).....	24

## 1. Introduction

### 1.1 Positioning of the Basic Design Document

This Basic Design Document provides for technical requirements to be met, matters to be taken into consideration, etc. when designing a driver's abnormal condition response system of deceleration stop type.

### 1.2 Functions of the Driver's Abnormal Condition Response System of Deceleration Stop Type

The System stops the vehicle in place of the driver as an emergency measure when it suddenly becomes difficult for the driver to continue driving safely due to sudden changes, etc. in his/her physical condition. Those capable of preventing deviation from the vehicle lane or road until the vehicle is stopped are included, but those capable of pulling over the vehicle on the shoulder, etc. are excluded.

#### Explanatory Note:

This system is not intended to operate assuming any human error of the driver in normal conditions but to operate as an emergency measure at the time of sudden changes, etc. in the driver's physical condition.

The System is intended to prevent the runaway of the vehicle (out-of-control situation) when the driver's physical condition suddenly changes, and keep the driver, passengers, and other road users away from any danger resulting from a vehicle collision.

This design document does not apply to any systems that do not stop the vehicle. It means that this document is not applicable to any systems based on the assumption that the vehicle will eventually stop as a result of collision or that a passenger will operate the brake or steering wheel to stop the vehicle in place of the driver.

### 1.3 Scope

#### (1) Driver's Abnormal Conditions Applicable in this Document

The "driver's abnormal condition" applicable in this document refers to sudden vascular brain disease, cardiac disease, digestive system disease, fainting and other sudden changes in the driver's physical condition that are difficult for the driver him/herself to predict in advance.

Predictable poor physical conditions or abnormalities due to drinking alcohol, poor management of physical conditions, fatigue, sickness, drugs, etc. are not applicable in this document. However, such predictable poor physical conditions or abnormalities are not precluded.

Explanatory Note:

Article 65 of the Road Traffic Act stipulates that “It is prohibited for any person to drive a vehicle or streetcar while under the influence of alcohol,” and Article 66 of the Act stipulates that “It is prohibited for any person to drive a vehicle or streetcar while in a state in which overwork, illness, the influence of drugs, or any other circumstances is likely to make the person unable to drive safely.”

Drivers are required to properly take care of themselves under their own responsibility and are expected to keep themselves in good physical conditions before they drive a vehicle.

Since it is technically difficult to distinguish predictable poor physical conditions or abnormalities and unpredictable sudden changes in physical conditions, the sentence that “However, such predictable poor physical conditions or abnormalities are not precluded” has been added.

(2) Vehicles

This document applies to motor vehicles (excluding two-wheel motor vehicles).

Explanatory Note:

This document is not applicable to two-wheel motor vehicles (including motorbikes) because the System may not function effectively due to their rollover.

Since a driver’s abnormal condition has occurred both on highways and general roads, this Basic Design Document describes a system as being applicable to any road types.

**1.4 Definition of Terms**

(1) “Driver’s abnormal condition” means a sudden change in one’s physical condition that is difficult to predict in advance. The driver’s abnormal conditions do not include predictable poor physical conditions or abnormalities.

(2) “Driver’s abnormal condition response system” means a system capable of detecting a driver’s abnormal condition and stopping the vehicle in place of the driver.

(3) “Control” means to automatically adjust the movement of the motor vehicle by braking alone or by braking and steering.

(4) “Passenger” means an occupant other than the driver. It includes crew and passengers.

**Explanatory Note:**

For this System, occupants in a private vehicle and passengers in a business-use vehicle are not distinguished. They all together are referred to as “passengers.”

(5) “Passenger pushbutton type” means a type that detects a driver’s abnormal condition when a passenger pushes a button. A “pushbutton” is not limited to a pushbutton to be pushed by using a finger or by using a hand, but includes general switches.

(6) “Driver pushbutton type” means a type that detects a driver’s abnormal condition when the driver pushes a button. A “pushbutton” is not limited to a pushbutton to be pushed by using a finger or by using a hand, but includes general switches.

(7) “Abnormal condition automatic detection type” means a type that automatically detects driver’s abnormal conditions by the System.

(8) “Deceleration stop type” means a type that controls the deceleration and stopping of the motor vehicle when a driver’s abnormal condition is detected. Those capable of controlling steering to prevent deviation from the vehicle lane or road are also included.

**Explanatory Note:**

Those capable of controlling steering to change lanes, pull over the vehicle on the shoulder, or turn right or left are not included. The System does not necessarily determine whether or not the place where it is going to stop the vehicle is appropriate for stoppage.

(9) “Main switch” means a switch that turns the function of the System on and off.

(10) “Activation” means that the alarm or the control is activated.

- (11) “Activation switch” means a switch that generates a trigger signal for the alarm or the control to be activated. A pushbutton of the passenger or driver pushbutton type is an activation switch.
- (12) “Cancellation switch” means a switch for the driver to stop the alarm or the control.
- (13) “Alarm” means to make known to persons affected by the System control the status of the System. Alarm is provided visually, audibly or by the sense of touch (vibrations of the steering wheel, light braking, etc.).
- (14) “Road users outside the vehicle” means persons around the motor vehicle provided with the System. They include pedestrians, cyclists, those riding on other motor vehicles near the vehicle with the System, etc.
- (15) “Activation start alarm” means an alarm that makes known to the driver or the passenger who pushed the activation switch that the activation of the System has begun, and that urges the driver to push the cancellation switch when the control is not necessary.
- (16) “Reminder alarm” means an alarm that calls the attention of the passengers and road users outside the vehicle to the control that begins its operation after the lapse of a certain period of time.
- (17) “Control activation alarm” means an alarm that makes known to the driver, passengers and road users outside the vehicle that the control is being carried out (including the stopped state due to the control activation).
- (18) “Driver override” means that the driver performs the adjustment of the control, driving or steering in priority to the System.

## **2. Overview of the Functions**

### **2.1 Functions of the System**

The System consists of the following functions:

- A function to detect driver’s abnormal conditions;
- A function to decelerate and stop the vehicle; and
- A function to give an alarm concerning the condition of the System.

The function to detect driver's abnormal conditions has the following types:

- Abnormal condition automatic detection type;
- Driver pushbutton type; and
- Passenger pushbutton type.

These shall be configured independently or in combination with others.

The function to give an alarm concerning the condition of the System has the following alarms:

- Alarm to the driver;
- Alarm to passengers; and
- Alarm to road users outside the vehicle.

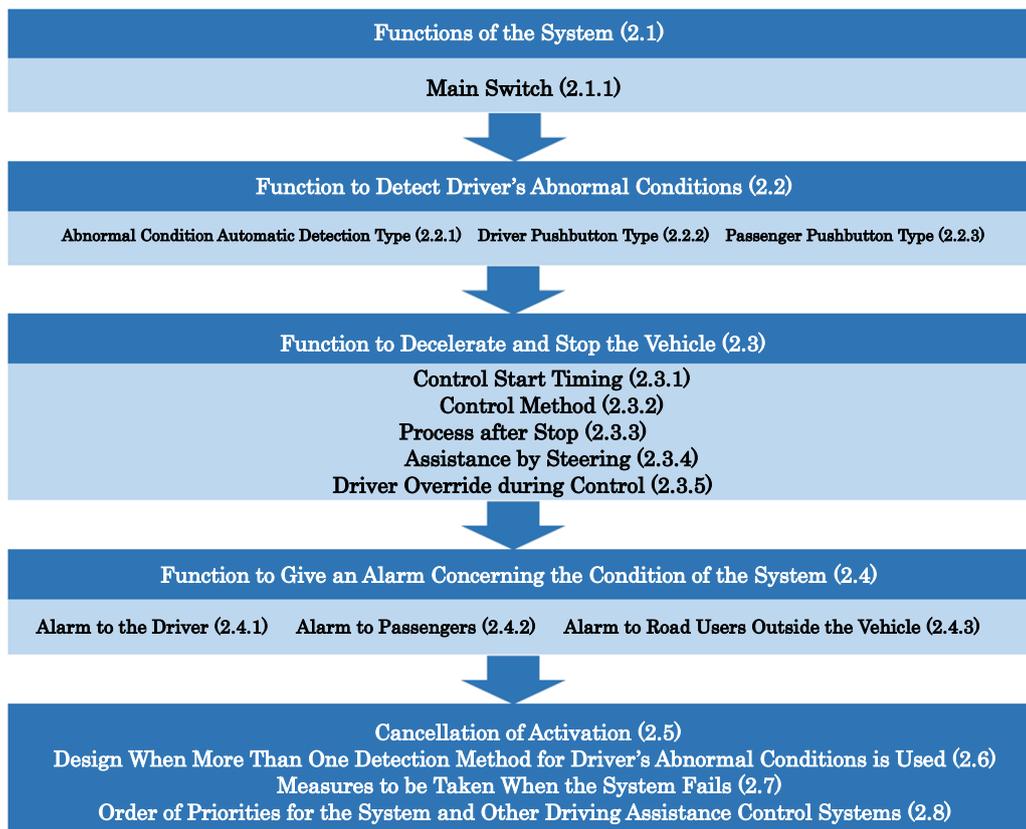


Figure 2-1 Structure of this Chapter

### **2.1.1 Main Switch**

The System may be equipped with a main switch for the driver to turn on or off the functions of the System. When the main switch is provided, the functions of the System shall be turned on when the engine is started.

#### **Explanatory Note:**

As the same as other driving assistance systems, the driver should be able to turn on or off on his/her will.

“When the engine is started” refers to a situation where the vehicle is ready to drive, such as when the engine is activated, or when the motor system for driving the electric vehicle is activated.

Consideration shall be given so that the main switch shall not be turned off mistakenly. This shall be achieved by operation methods, design of the installation place, etc., or, for example, the main switch can be turned off only when it is pushed and hold for a while or pushed twice.

## **2.2 Function to Detect Driver’s Abnormal Conditions**

### **2.2.1 Abnormal Condition Automatic Detection Type**

The System shall be able to automatically detect the abnormal conditions of the driver. Abnormal conditions may be detected based on (1) vehicle behavior, (2) driving behavior, or (3) driver’s conditions. For (1), detection is made by observing wavering, out-of-control driving, contacts, etc. of the motor vehicle. For (2), detection is made by observing abnormal accelerator operations, operations not made over a certain period of time, etc. For (3), detection is made by observing changes in the driver’s driving posture, facial expressions (coma, etc.) and biological signals (heart rate, pulse, changes in body temperature, etc.).

#### **Explanatory Note:**

For the detection method based on biological signals, the Pharmaceutical and Medical Device Act (former Pharmaceutical Affairs Act) should be taken into consideration.

Since various detection methods are expected to be developed thanks to technological advancement in the future, descriptions in this Basic Design Documents have been carefully considered in order not to limit the introduction of new technology. It is hoped that technological advancement would make quick and accurate detection possible regardless of individual differences in drivers.

### **2.2.2 Driver Pushbutton Type**

Abnormal conditions shall be detected by the System when the activation switch is pushed by the driver.

#### **Explanatory Note:**

It is based on the assumption that the driver notices his/her own abnormal condition and pushes the activation switch while he/she gradually loses consciousness. If the driver suddenly loses consciousness, he/she may not be able to push the activation switch.

### **2.2.3 Passenger Pushbutton Type**

Abnormal conditions shall be detected by the System when the activation switch is pushed by a passenger who notices any driver's abnormal condition.

#### **Explanatory Note:**

It is based on the assumption that a passenger notices any driver's abnormal condition and pushes the activation switch to notify the System even if the driver cannot push the switch at his/her discretion. This type is applicable to not only buses but also other motor vehicles such as private vehicles and taxis, excluding two-wheel vehicles.

## **2.3 Function to Decelerate and Stop the Vehicle**

The System shall be able to brake and stop the vehicle in place of the driver when it detects any driver's abnormal condition.

### **2.3.1 Control Start Timing**

After any driver's abnormal condition is detected, the control shall begin if there is no response from the driver for a certain period of time. In principle, that period shall be at least 3.2 seconds.

However, this time setting is not required for cases where the driver pushes the activation switch.

#### **Explanatory Note:**

Considering the possibility of misdetection of the driver's abnormal conditions, it has been determined that abnormal condition detection is confirmed when there is no response from the driver for a certain period of time after detection, and then the control

begins. If the driver is in normal conditions, he/she can push the cancellation switch in response to the activation start alarm to deactivate the control start by the System (as mentioned in Paragraph 2.5).

In principle, the period of time to respond to alarm shall be at least 3.2 seconds (as defined in ASV phase 4). It is preferable to set this period of time in consideration of the response time by the driver (the period of time during which the driver can push the cancellation switch in response to activation start alarm) under various driving conditions. This period of time may vary depending on the driving conditions such as driving on a highway and turning right or left at an intersection

If the driver is able to push the cancellation switch within less than 3.2 seconds after alarm through sufficient training, or other reasons, this period of time may be shortened.

Since it is preferable for the driver to be able to cancel before activation starts when a passenger mistakenly pushes the activation switch, or when the abnormal condition automatic detection function misdetects an abnormal condition, the setting of this time period shall be mandatory for the passenger pushbutton and abnormal condition automatic detection types.

For the driver pushbutton type, the setting of this period of time shall be optional because the driver him/herself intentionally pushes the activation switch, and therefore misdetection should not be necessarily taken into consideration. However, the setting of this period of time may be provided even to the driver pushbutton type in consideration of cases where the driver mistakenly pushes the activation switch.

### **2.3.2 Control Method**

The deceleration by braking shall be  $2.45 \text{ m/s}^2$  ( $4.00 \text{ m/s}^2$  in the case of motor vehicles used exclusively for carriage of passengers with a passenger capacity of less than 10 persons) or less. However, in the case of motor vehicles such as fixed route buses in which there is a standing space for passengers (vehicles where passengers may also keep standing), the deceleration shall be set by taking into consideration the possibility that standing passengers may fall down.

#### **Explanatory Note:**

The braking method shall be set forth based on the basic concept of providing the maximum effect of preventing accidents and mitigating damage within the scope of ASV's driving assistance concept of "not compromising safety." As the consideration of collision with the following vehicle, the deceleration shall be  $2.45 \text{ m/s}^2$  ( $4.00 \text{ m/s}^2$  for passenger vehicles) or less as permitted under the technical guideline for the full speed

range adaptive cruise control system with brake control. As the consideration of passengers on vehicles with a passenger standing space such as fixed route buses, the deceleration shall be set by taking into consideration the possibility that standing passengers may fall down.

To exclude deceleration due to engine stall, the phrase “by braking” has been added to the text. Since engine stall should occur at a timing with a sufficient time allowance after giving an alarm to those inside and outside the vehicle (immediately before the vehicle stops) so that the following vehicle, passengers, etc. can act to avoid an accident, deceleration due to engine stall shall be excluded because risk of causing an accident is low.

For a method to increase braking in stages, its effectiveness is not recognized at the present moment as there is a consideration that it may shorten the distance from the following vehicle (consideration by the National Traffic Safety and Environment Laboratory using a driving simulator).

By providing technical measures to reduce the risk of secondary accidents, such as the control method set forth in Paragraph 2.3.2 and the alarm to road users outside the vehicle set forth in Paragraph 2.4.3, even a system that does not consider where to stop the vehicle after deceleration should become socially acceptable.

But inside a level crossing, since the alarm to road users outside the vehicle does not always function effectively, it is preferable to give consideration so that the vehicle is stopped in a place other than level crossings. However, at the present moment, the technology to detect that the vehicle is inside a level crossing has not yet reached a practical level, it is expected that comprehensive efforts will be made in the future, including railway infrastructure, etc. that automatically detects a vehicle stopped inside a level crossing and brings the train to an emergency stop.

### **2.3.3 Process after Stop**

The motor vehicle shall remain in a stopped state to the extent possible until the cancellation switch is pushed.

Explanatory Note:

The motor vehicle may sometimes cannot remain in a stopped state due to battery runout or brake air pressure drop, it is permissible for the System not to ensure that the vehicle remains in a stopped state permanently.

### **2.3.4 Assistance by Steering**

Until the motor vehicle comes to a stop, the System is permitted to

control the steering operation, in place of the driver, in order to prevent deviation from the vehicle lane or road.

**Explanatory Note:**

This assistance by steering is expected to reduce the possibility that the vehicle comes in contact with an obstacle outside the vehicle, running vehicle on the adjacent lane, pedestrians on the shoulder, etc.

This assistance by steering function is not necessarily based on the assumption that the driver is driving a motor vehicle, unlike driving assistance systems such as those for preventing deviation from the vehicle lane or road, which are based on the assumption that the driver is in normal conditions. For example, the control may be continued without any input by the driver, or assistance by steering with a steering force combined with the force input by the driver may be performed.

The System is permitted to control the steering operation, including those intended to prevent deviation from the vehicle lane or road using a difference in braking force between the right and left sides of the motor vehicle.

### **2.3.5 Driver Override during Control**

At the time of the execution of the control, the accelerator operation by the driver shall be nullified.

**Explanatory Note:**

According to an analysis on accidents caused by driver's abnormal conditions (ITARDA report "Study on occurrence of traffic accidents due to an attack or other sudden illness of the driver driving a four-wheel vehicle"), some accidents seemed to have been caused by the driver pressing the accelerator pedal when his/her posture collapsed. Therefore, the accelerator operation by the driver shall be nullified during the execution of the control.

When the braking force generated by the brake operation by the driver exceeds the braking force of the System, the brake operation by the driver shall take priority.

**Explanatory Note:**

Since there may be cases where the driver tries to stop the vehicle to avoid collision with an obstacle while he/she is losing consciousness, driver override shall be permitted for brake operation.

For driver override for steering operation, no provision is set forth at the present moment because whether it is effective or not depends on the situation.

Driver override for steering operation is effective if the driver him/herself operates steering while he/she is losing consciousness, or if a passenger operates steering in place of the driver when collision with an obstacle should be avoided by steering. On the other hand, it is not effective when, for example, the steering operation is performed unintentionally in a way that drives the vehicle outward from the road due the driver's collapsed posture.

## **2.4 Function to Give an Alarm Concerning the Condition of the System**

An alarm shall be given to the driver, passengers and road users outside the vehicle.

There are three types of alarm: activation start, reminder, and control activation alarms.

### **Explanatory Note:**

An alarm to passengers is expected to inform them of the occurrence of an emergency and urge them to act to protect their safety (such as to hold on a handrail in the bus, sit on a seat, and check the seatbelt).

An alarm to road users outside the vehicle is intended to inform them of the occurrence of an emergency and urge them to act to keep themselves away from the vehicle.

### **2.4.1 Alarm to the Driver**

#### **2.4.1.1 Activation Start Alarm**

An activation start alarm shall begin when any abnormal condition is detected in the driver, and it shall stop when the cancellation switch is pushed or a control activation alarm begins.

An activation start alarm shall be given visually in combination with at least either an audible alarm or an alarm by the sense of touch.

An activation start alarm shall be optional in cases where the driver pushes the activation switch.

### **Explanatory Note:**

If the driver is in normal conditions, he/she can push the cancellation switch in

response to the activation start alarm to deactivate the control start by the System (see Paragraph 2.3.1 “Control Start Timing”).

How to give an alarm may be changed during the process. For example, at the time when a reminder alarm to passengers starts (Paragraph 2.4.2.2), an audible alarm may be changed to an alarm given in the same way as that alarm to passengers.

Hereinafter, an alarm by the sense of touch may be given, for example, through the vibration of steering. Other methods to give an alarm, such as through a slight deceleration, are not excluded.

#### **2.4.1.2 Control Activation Alarm**

A control activation alarm shall begin when the System begins its control, and it shall stop when the cancellation switch is pushed.

A control activation alarm shall be given visually in combination with at least either an audible alarm or an alarm by the sense of touch.

Explanatory Note:

A method to give an alarm after the vehicle is stopped may be changed from that before the vehicle is stopped (during deceleration).

### **2.4.2 Alarm to Passengers**

#### **2.4.2.1 Activation Start Alarm**

In the case of the passenger pushbutton type, an activation start alarm may be given for the purpose of informing the passenger who pushed the button that the System is activated.

An activation start alarm shall begin when a passenger pushes the activation switch and it shall stop when the cancellation switch is pushed, a reminder alarm is set off, or a control activation alarm is set off.

An alarm may be given in any ways.

Explanatory Note:

For example, an activation start alarm to passengers may be given by turning on the lamp of the activation switch to inform them that the System has accepted the operation by the passenger.

An activation start alarm to passengers may be given in the same way as the

activation start alarm given to the driver.

#### **2.4.2.2 Reminder Alarm**

When a reminder alarm is given, it shall begin before the System starts its control.

It shall stop when the cancellation switch is pushed or a control activation alarm begins.

A reminder alarm to passengers is optional, but it shall be mandatory for motor vehicles in which a standing space is provided for passengers, except when they are in a stopped state. The reminder alarm, if provided, shall be given audibly, preferably in combination with an optional visual alarm particularly for motor vehicles with a passenger standing space.

#### **Explanatory Note:**

This alarm is intended to call the attention of passengers to the start of deceleration. Since the deceleration of the vehicle is in the normal range of deceleration (as mentioned in Paragraph 2.3.2), a reminder alarm before braking is not necessarily required. However, for motor vehicles with a passenger standing space, a reminder alarm is required in order to reduce the risk that passengers may fall down, expect when such vehicle is in a stopped state because passengers do not have to prepare themselves for deceleration. Therefore, a text to exclude such cases has been added.

In cases where a reminder alarm is given when the driver pushes the button, the alarm may start after a certain period has elapsed to allow the driver to cancel it (assuming that the driver may mistakenly push the button), or immediately after the driver pushes the button.

Consideration should be given so that an audible alarm to passengers, regardless it is a reminder alarm or control activation alarm (Paragraph 2.4.2.3), can be heard by all passengers on the vehicle (at the same level as train announcement). Meanwhile, for a visual alarm, it is not necessarily required to ensure that it is visible from anywhere.

A reminder alarm to passengers may be given in the same way as the activation start alarm given to the driver.

#### **2.4.2.3 Control Activation Alarm**

A control activation alarm shall begin when the System starts its control, and it shall stop when the cancellation switch is pushed.

The control activation alarm shall be given audibly, preferably in combination with an optional visual alarm particularly for motor vehicles with a passenger standing space.

**Explanatory Note:**

A control activation alarm to passengers may be given in the same way as the control activation alarm given to the driver.

A method to give an alarm after the vehicle is stopped may be changed from that before the vehicle is stopped.

### **2.4.3 Alarm to Road Users Outside the Vehicle**

#### **2.4.3.1 Reminder Alarm**

When a reminder alarm is given, it shall begin before the System starts its control.

It shall stop when the cancellation switch is pushed or a control activation alarm begins.

When a reminder alarm is given, it is permissible to use the hazard warning lamps, an audible alarm by means of the horn, etc. and a visual alarm by the indication of a text, etc. for the alarm.

A reminder alarm to road users outside the vehicle is optional.

**Explanatory Note:**

A reminder alarm is not mandatory because it is given after the driver's abnormal condition is detected and before such abnormal condition is confirmed. However, from a standpoint of safety precaution, considering that giving an alarm to road users outside the vehicle at an early stage where any abnormal condition is not yet confirmed is socially acceptable, a reminder alarm has been made optional.

An alarm to road users outside the vehicle is intended to inform them of the occurrence of an emergency and urge them to act to keep themselves away from the vehicle. It is permissible to use the hazard warning lamps, an audible alarm by means of the horn, etc.

In fiscal 2014, a study was conducted by the National Traffic Safety and Environment Laboratory using a driving simulator on the impact of the duration of a reminder alarm

on the driving behavior of the driver on the following vehicle. The results of the study showed that the likelihood of rear-end collision with the following vehicle does not decline even if the duration of a reminder alarm is made longer. Some cases were observed where the following vehicle started to decelerate but again accelerated when the duration of the alarm was too long.

#### **2.4.3.2 Control Activation Alarm**

The control activation alarm shall begin when the System starts its control, and it shall stop when the cancellation switch is pushed.

It is necessary to use the hazard warning lamps, an audible alarm by means of the horn, etc. and the stop lamps at the time of braking for the alarm. A visual alarm by the indication of a text, etc. may also be used in combination.

##### **Explanatory Note:**

The stop lamps at the time of braking are mandatory in order to avoid rear-end collision with the following vehicle. It is also necessary to use the hazard warning lamps and an audible alarm by means of the horn, etc. in order to inform road users outside the vehicle of the occurrence of an emergency and urge them to act to keep themselves away from the vehicle where the System is in operation.

A method to give an alarm after the vehicle is stopped may be changed from that before the vehicle is stopped (during deceleration).

Figures 2-2, 2-3, and 2-4 summarize how the alarms described in Paragraphs 2.4.1 to 2.4.3 are given over time in a form of timing chart for the abnormal condition automatic detection, driver pushbutton, and passenger pushbutton types, respectively.

## Abnormal condition automatic detection type

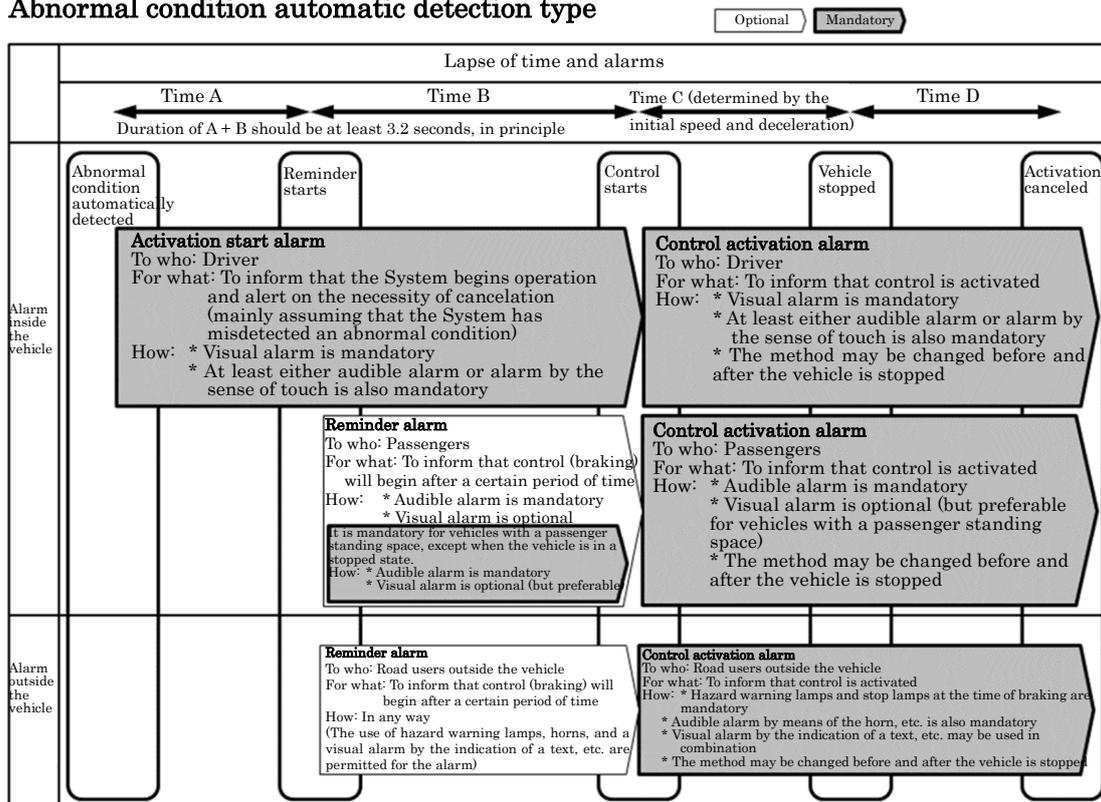


Figure 2-2 Alarm Timing Chart for the Abnormal Condition Automatic Detection Type

# Driver pushbutton type

Optional Mandatory

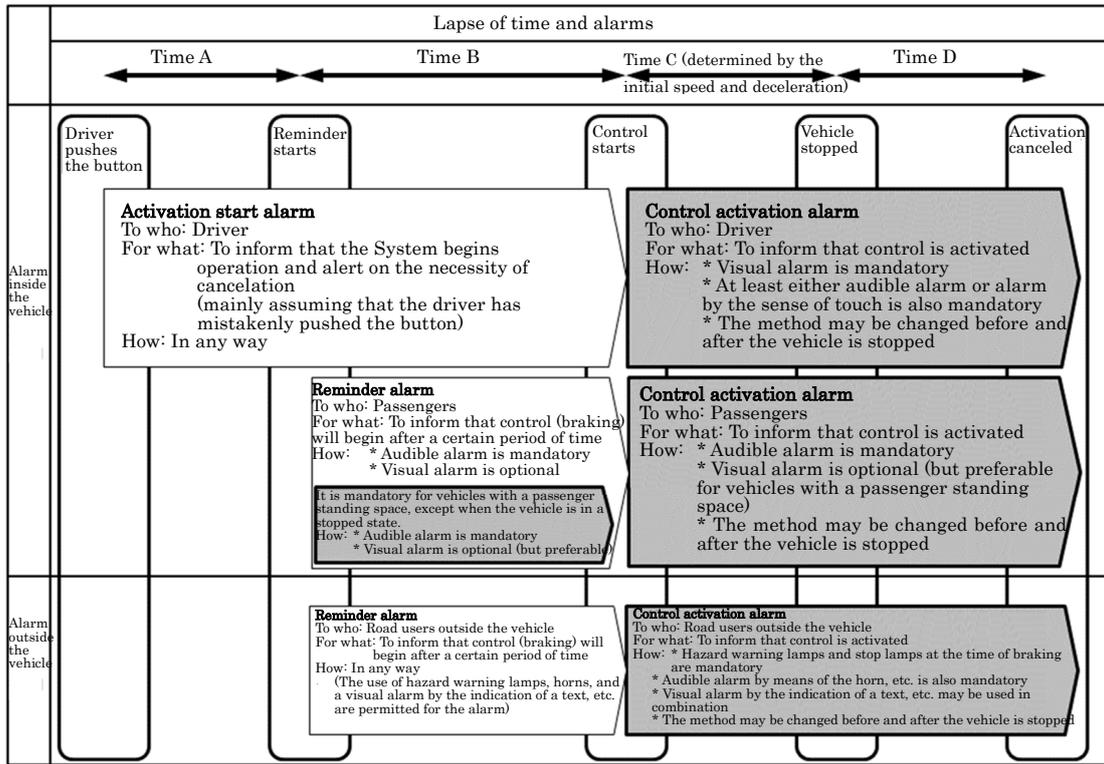


Figure 2-3 Alarm Timing Chart for the Driver Pushbutton Type

## Passenger pushbutton type

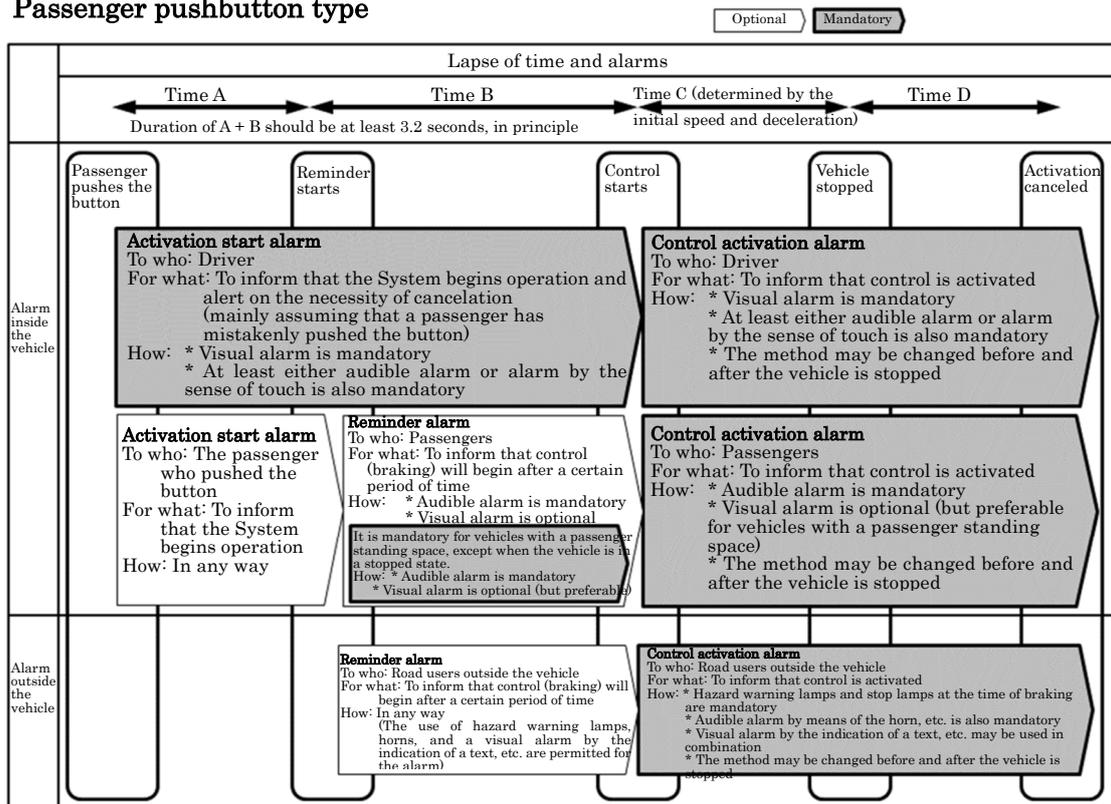


Figure 2-4 Alarm Timing Chart for the Passenger Pushbutton Type

## 2.5 Cancellation of Activation

The System shall be provided with a cancellation switch capable of stopping the operation of the System.

### Explanatory Note:

Assuming that the cancellation switch is pushed by the driver in normal conditions or a rescuer, consideration shall be given to the following points:

- 1) The cancellation switch should be easy to be recognized and can be operated without interfering driving;
- 2) Cancellation should not be made easily by the driver in abnormal conditions or a passenger; and
- 3) The cancellation switch should be recognizable by rescuers.

The cancellation switch may also be used as the main switch.

Depending on the System, the cancellation of the System operation may allow the vehicle to start to move.

The System shall not stop its operation until the cancellation switch is pushed.

**Explanatory Note:**

However, the System may automatically stop its operation when the continuous operation of the System becomes impossible due to the damage to the vehicle because of collision, fuel shortage, battery runout, etc.

The vehicle may be kept in a stopped state even when the System automatically stops its operation by, for example, automatically applying the handbrake or parking brake.

At the present moment, only the driver is allowed to stop the operation of the System during driving, but in the future, when it becomes possible for the System to determine whether or not the driver is in normal conditions thanks to technological advancement, automatic cancellation by the System may become possible.

## **2.6 Design When More Than One Detection Method for Driver's Abnormal Conditions is Used**

In the case of motor vehicles provided with more than one detection method for driver's abnormal conditions (the abnormal condition automatic detection, driver pushbutton and passenger pushbutton types), more than one abnormal condition of the driver may be detected at almost the same time. In this case, an alarm and the control shall be executed according to the type that starts its control first among these three types where control start timing is preset separately.

**Explanatory Note:**

For motor vehicles provided with all the methods to detect driver's abnormal conditions (abnormal condition automatic detection, driver pushbutton and passenger pushbutton types), for example, when any abnormal condition of the driver occurs, the System may automatically detect it, and at the same time, a passenger may push the button if he/she notices it, and the driver may also push the button. In this case, in order to stop the vehicle as quickly as possible, an alarm and the control shall be executed according to the type that starts its control first.

## **2.7 Measures to Be Taken When the System Fails**

The System shall have measures to make the driver aware of any System malfunction detected by the System.

Even when the System encounters a malfunction, the motor vehicle shall maintain its original functions.

In the case of motor vehicles provided with more than one detection method for driver's abnormal conditions, when a malfunction of only part of the detecting methods is detected, other driver's abnormal condition detecting methods that are not malfunctioning shall be able to keep the System functioning.

**Explanatory Note:**

The detection of a failure by the System through self-diagnosis is not required due to technological difficulties.

Even when the System fails, the functions of a vehicle without this System (braking, driving, and steering) shall remain operational.

In the case of motor vehicles provided with more than one method to detect driver's abnormal conditions, these three types (abnormal condition automatic detection, driver pushbutton, and passenger pushbutton types) may be used simultaneously. In this case, even when a malfunction in the abnormal condition automatic detection method is detected, the System shall remain functional through the other two detection methods.

## **2.8 Order of Priorities for the System and Other Driving Assistance Control Systems**

When alarms and controls compete against each other because the System and other driving assistance control systems are operating at the same time, the following order of priorities shall apply.

### **2.8.1 Control System that Stabilizes Vehicle Behavior**

The anti-lock brake system, electronic stability control and other control systems that stabilize vehicle behavior shall operate, regardless of the operational condition of the System.

**Explanatory Note:**

Even during the control by the System, the function to stabilize vehicle behavior shall operate. For example, even when the control is performed by the System on a slippery road such as a snow surface, the anti-lock brake system is expected to enable the System to perform control in a stable manner.

### **2.8.2 Control System for the Purpose of Avoiding or Mitigating a Collision**

When the advanced emergency braking system (AEBS) is activated at the same time, the alarm and control of the AEBS shall be given priority. After completion of the operation by the AEBS, the operation by the System shall be given priority.

#### **Explanatory Note:**

AEBS which evaluates urgency in relation to collision shall be given priority over the System that does not do so. AEBS is a control system that detects an impending risk of collision and respond to it. Meanwhile, the System detects driver's abnormal conditions but does not evaluate urgency in relation to collision based on the vehicle's driving environment.

Even if a System to avoid collision by steering at the time of emergency is commercialized in the future, emergency avoidance of collision by steering shall be given priority over the System, but this should be examined after such system is brought into shape.

### **2.8.3 Control System Not for the Purpose of Avoiding or Mitigating a Collision**

During the System control, the accelerator control by another driving assistance control system shall be cancelled.

For braking control, either the braking by the System or the braking by another driving assistance control system, whichever generates a greater braking force, shall be given priority.

For steering control, when the System is provided with assistance by steering (Paragraph 2.3.4), the steering by the System shall be given priority.

#### **Explanatory Note:**

During the System control, the accelerator control by a cruise control (CC) or adaptive cruise control (ACC) system shall be cancelled. During the period of an activation start or reminder alarm, which is before the control by the System begins, no specific provision is made on the cancellation of accelerator control in order to avoid confusion to the driver in normal conditions because it is before the driver's abnormal condition is confirmed.

It is preferable to continue the braking by ACC in order to avoid the vehicle from approaching the preceding vehicle even during the period of an activation start or reminder alarm. During the System control, a system that generates a larger braking force shall take priority for safety purposes.

It is also preferable to continue assistance by steering by other driving assistance control systems to prevent deviation from the vehicle lane or road even during the period of an activation start or reminder alarm. During the System control, assistance by steering provided by the System not based on driver's input shall be given priority as steering to prevent deviation from the vehicle lane or road. Assistance by steering provided by the System shall include those intended to prevent deviation from the vehicle lane or road using a difference in braking force between the right and left sides of the motor vehicle.

Various driving assistance control systems may be commercialized in the future. Depending on their individual purpose, detailed requirements, etc., priority in relation to the System will be examined and changed as necessary.

### **3. Special Instructions**

Matters that require consideration other than those related to technology are described below.

#### **Explanatory Note:**

For these special instructions, it is preferable that various sectors related to the prevention of accidents attributable to driver's abnormal conditions make comprehensive efforts.

#### **3.1 Items to Be Known to the Driver**

The following items shall be made known to the driver appropriately by means of the instruction manual, indication, etc.:

- (1) Purpose, kind and effects of the System;
- (2) Conditions for activating the System and conditions for not activating the System;
- (3) The System's sound and indication as well as their meaning;
- (4) Limit of the System's function;
- (5) Where the responsibility lies in connection with the System operation; and

- (6) Other instructions for use.

**Explanatory Note:**

The above items to be known to the driver are listed as the information necessary for the driver to understand and use the System correctly. Documenting the fact that an adequate explanation was given to the driver or the vehicle operator, etc. is significant to a certain degree as an evidence that accountability has been fulfilled.

The “kind of the System” refers to the abnormal condition automatic detection or pushbutton type of the System, the System with or without assistance by steering, etc. When a System that can change the vehicle lane by steering is realized in the future, whether it is the deceleration stop type or vehicle lane change by steering type, etc. should also be indicated.

### **3.2 Items to Be Known to Passengers**

Consideration shall be given so that the following items become understandable to passengers by means of the indication, etc.:

- (1) Purpose, kind and effects of the System;
- (2) How to use the System;
- (3) The System’s sound and indication as well as their meaning;
- (4) Limit of the System’s function;
- (5) Where the responsibility lies in connection with the System operation; and
- (6) Other instructions for use.

**Explanatory Note:**

Indication to make these items to be known, etc. shall be placed on a location on the vehicle where it is easy to see. For example, indication may be placed in front of the passenger seats, or advertisement space may be used on vehicles such as fixed route buses.

Methods other than indication may include the use of display inside fixed route buses, etc. For long distance buses, a movie manual which is usually shown on an airplane before takeoff may also be effective.

It is also preferable to use places outside of vehicles, such as advertisements or websites that may be seen by general public.

- (1) “This System allows for a passenger to stop the vehicle by pushing the button when the driver is in abnormal conditions” may be indicated.

(2) “Push the button if you notice any abnormal condition of the driver” may be indicated.

(3) Meaning of the sound, indication, etc., or actions to be taken when they are perceived may be indicated.

(4) As necessary, “the braking of the vehicle does not start immediately after a passenger pushes the activation switch so that the System may not be able to avoid all accidents” may be indicated.

(5) Caution may be shown in order to prevent people from pushing the button as a mischief.

A person who pushes the button shall not take any responsibility in connection with the operation of the System as long as he/she uses it correctly. An act of pushing the button by a passenger to avoid danger when any abnormal condition of the driver occurs can be interpreted as not being held responsible according to Article 698 of the Civil Code (Urgent Management of Business). Consent by other passengers on the vehicle for pushing the button does not always need to be obtained.

### **3.3 Items to Be Known to the Society (Campaigns, etc.)**

With respect to the following items, consideration shall be given so that all road users will correctly understand them:

- (1) Purpose of the driver’s abnormal condition response system;
- (2) How to distinguish motor vehicles in which the System is activated;  
and
- (3) How to act when a motor vehicle in which the System is activated is seen.

#### **Explanatory Note:**

These items can also be made known to children and senior people through school education, etc. as well as awareness raising activities or advertisement using fliers, etc.