CRUISE CONTROL

software requirements

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**Summary:**

This document defines requirements of a cruise control system for an automatic transmission car.

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# Introduction

The Cruise control is a system to automatically control the speed of a car. The driver sets the speed and the system will take over the throttle of the car to maintain the same speed.

# Cruise Control Requirements

## Interface

The Cruise Control (CC) should connect to the system using the following inputs.

CC\_HLR\_IN\_01

On: Enable the CC

CC\_HLR\_IN\_02

Off: Disable the CC

CC\_HLR\_IN\_03

Resume: Resume the CC after a braking

CC\_HLR\_IN\_04

Set: Set the current speed as the new cruise speed

CC\_HLR\_IN\_05

QuickDecel: Decrease the cruise speed

CC\_HLR\_IN\_06

QuickAccel: Increase the cruise speed

CC\_HLR\_IN\_07

Accel: Accelerator pedal sensor

CC\_HLR\_IN\_08

Brake: Brake pedal sensor

CC\_HLR\_IN\_09

Speed: Car speed sensor

And the CC should deliver the followings outputs.

CC\_HLR\_OUT\_01

CruiseSpeed: Cruise speed value

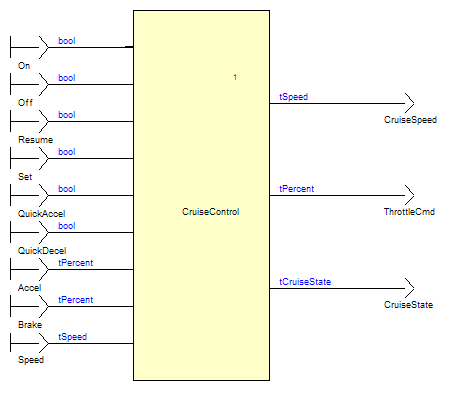
CC\_HLR\_OUT\_02

ThrottleCmd: Throttle command

CC\_HLR\_OUT\_03

CruiseState: this is the state of the CC. It can be OFF, ON, STDBY, INT.

The following diagram resumes the CC interface:



## Cruise Control behavior

CC\_HLR\_CCB\_01

When the driver starts the car, the CC shall be off.

The output CruiseState should be set to OFF

CC\_HLR\_CCB\_02

The CC shall be set on when the driver push the on button.

CC\_HLR\_CCB\_03

The CC shall automatically go off when the off button is pressed.

CC\_HLR\_CCB\_04

If the car speed is in the speed limit and the accelerator pedal is not pressed, the CC shall be on and regulate the car speed.

The output CruiseState shall be set to ON.

CC\_HLR\_CCB\_05

The CC system shall be automatically disabled when the accelerator pedal is pressed, or the car speed is outside the speed limit.

The output CruiseState shall be set to STDBY.

CC\_HLR\_CCB\_06

The system shall return to the ON state when both the accelerator pedal is not pressed, and the car speed is inside the speed limit.

The last set cruise speed shall be re-used.

CC\_HLR\_CCB\_07

The CC shall be immediately interrupted when the brake is pressed.

The output CruiseState shall be set to INT.

CC\_HLR\_CCB\_08

The system shall resume either to the ON or STDBY states, depending on the Accelerator pedal and the Speed value when the resume button is pressed. The last set cruise speed shall be re-used.

## Car driving control

CC\_HLR\_CDC\_01

When the CC is off, the car speed shall be driven using the accelerator pedal.

CC\_HLR\_CDC\_02

When the CC is on, the car speed shall be automatically regulated.

CC\_HLR\_CDC\_03

The regulation shall be done using a proportional and integral algorithm, with Kp and Ki factors.

CC\_HLR\_CDC\_04

The regulation algorithm shall be protected against the overshoot of its integral part: the integral action shall be reset when the CC is going on, and frozen when the throttle output is saturated.

CC\_HLR\_CDC\_05

The throttle command shall be saturated at ThrottleSatMax when automatically regulating, in order to limit the car acceleration for the comfort.

## Cruise speed management

CC\_HLR\_CSM\_01

The Cruise Speed shall be managed only when the cruise control is enabled, meaning ON, STDBY, or INT states.

CC\_HLR\_CSM\_02

The cruise speed shall be set to the current speed when the set button is pressed.

CC\_HLR\_CSM\_03

The cruise speed shall be increased of SpeedInc km/h when the QUICKACCEL button is pressed.

only if this new value of the cruise speed is still lower than the maximal speed SpeedMax km/h.

CC\_HLR\_CSM\_04

The cruise speed shall be decreased of SpeedInc km/h when the QUICKDECEL button is pressed.

CC\_HLR\_CSM\_05

The Cruise Speed shall be maintained between SpeedMin and SpeedMax km/h values.

## Pedals pressed detection

CC\_HLR\_PPD\_01

The accelerator pedal shall be detected as pressed when its value is above PedalsMin.

CC\_HLR\_PPD\_02

The Brake pedal shall be detected as pressed when its value is above PedalsMin.

## Cruise Control parameters

CC\_HLR\_CCP\_01

SpeedMin: 30.0 Km/h

CC\_HLR\_CCP\_02

SpeedMax: 150.0 Km/h

CC\_HLR\_CCP\_03

SpeedInc: 2.5 Km/h

CC\_HLR\_CCP\_04

Kp: 8.113

CC\_HLR\_CCP\_05

Ki: 0.5

CC\_HLR\_CCP\_06

ThrottleSatMax: 45.0 percent

CC\_HLR\_CCP\_07

PedalsMin: 3.0 percent.