

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – Ambient Lighting & IVI Welcome Animation Subsystem Part Specific Specification (SPSS)**

Draft Version 3.0

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**Version Date: Oct 12th, 2021**

**FORD CONFIDENTIALF**

# Functional Definition

## Ambient Lighting Dynamic illumination& IVI Welcome animation work in coordination

### Definition

Welcome stage:

When unlock the vehicle and open any door, the front and rear door panel ambient lightings shall work with IVI Welcome animation and start dynamic illumination and the APIM\_CIM animation and Ambient lighting dynamic illumination shall continue when close any door.

Farewell stage:

When Ignition off, and open any front door, the front door/rear door Ambient Lightings start dynamic illumination and work with IVI farewell animation. And Ambient lighting dynamic illumination and IVI farewell animation shall continue when close any door.

### Use Cases

#### VS-UC-REQ-340548/A-Ambient lightings dynamic illumination work with IVI welcome animation.

|  |  |  |
| --- | --- | --- |
| **Actors** |  | User |
| **Pre-conditions** |  | Vehicle is locked and ignition is off |
| **Main flow** | M1 | vehicle is unlocked using either a Key-Fob, PAAK. Door Keypad code, or any other means from the exterior of the vehicle while the ignition is OFF. |
| M2 | Open any door |
| M3 | IVI starts playing welcome animation |
| M4 | When IVI welcome animation arrive to 135th frame, front door/rear door Ambient lightings start fluent illumination over a period of xxs seconds and then keep breathe illumination. |
| M5 | IVI display turn off and front door/rear door Ambient lightings fade off form current intensity over a maximum period of 4s after door ajar 25s. |
| M6 | Close all door |
| M7 | IVI display remain off and front door/rear Ambient lightings fade on from 0 to 100% intensity over a period of 3s. |
| M8 | IVI display remain off and front door/rear Ambient lightings fade off from 100% to 0 intensity over period of 4s after all door closed 25s. |
| M9 | Ignition on/start, IVI display turn on and front door/rear Ambient lightings fade on from 0 to the intensity saved by customer or SDM color over a period of 3s |
| **Alternative Flow 1** | A3.1 | Close all door within 25s after door ajar |
| A4.1 | Continue from M3 or M4 |
| A5.1 | IVI display turn off and front door/rear door Ambient lightings fade off from current intensity to 0 intensity over the maximum period of 4s after door closed 25s. |
|  | A6.1 | Ignition on/start, IVI display turn on and IP/front door/rear Ambient lightings fade on from 0 to the intensity saved by customer or SDM color over a period of 3s |

#### VS-UC-REQ-340548/A-Ambient lightings dynamic illumination work with IVI farewell animation.

|  |  |  |
| --- | --- | --- |
| **Actors** |  | User |
| **Pre-conditions** |  | All door closed and ignition on |
| **Main flow** | M1 | Ignition transitioned to off |
| M2 | Ambient lighting fade on to 10% intensity |
| M2 | Open any front door |
| M3 | Ambient Lighting start dynamic illumination |
| M4 | When Ambient Lighting fade on the first LED bar in front door, IVI start farewell animation. |
| M5 | Ambient Lighting fade off after the dynamic illumination and IVI is off after farewell animation |
| M6 | Close all door after door ajar 25s |
| M7 | Ambient Lighting remain off and IVI remain off |
| M8 | Ambient Lighting remain off and IVI remain off after door closed 25s |
| M9 | Lock vehicle |
| M10 | Ambient Lighting remain off and IVI remain off |
| **Alternative Flow 1** | A3.1 | Close all door within 25s after door ajar |
| A4.1 | Continue from M3 ,M4,M5 |
| A5.1 | Ambient Lighting remain off and IVI remain off after door closed 25s |
|  | A6.1 | Lock vehicle |
|  | A7.1 | Ambient Lighting remain off and IVI remain off |
| Alternative Flow 2 | B3.1 | Close all door within 25s after door ajar |
| B4.1 | Continue from M3 ,M4,M5 |
| B5.1 | Lock vehicle within 25s after close all door |
| B6.1 | Ambient Lighting fade off, IVI gets off |

### Interface Requirements

#### AmbientLgt\_Dyn\_Rq

Message Type: Request

Source Network: private CAN

Signal Transmit Strategy: cyclic

Signal Transmit Cycle 50ms, need to add new message

Note1: Request signal from APIM\_CIM to AUX.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| AmbientLgt\_Dyn\_Rq | Null | 0x0 | Default value. |
| Type1 | 0x1 | The first trigger to start Ambient lighting dynamic illumination |
| Type2 | 0x2 | The second trigger to start Ambient lighting dynamic illumination |
| Type3 | 0x3 | NotUsed\_1 |

#### APIM\_FW\_Animation\_Rq

Message Type: Request

Source Network: private CAN

Signal Transmit Strategy: cyclic

Signal Transmit Cycle Time:50ms

Note1: Request signal from AUX to APIM\_CIM

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| APIM\_FW\_Animation\_Rq | Null | 0x0 | Default value. |
| Type1 | 0x1 | The trigger to start IVI farewell animation |
| Type2 | 0x2 | NotUsed\_1 |
| Type3 | 0x3 | NotUsed\_2 |

#### AUX\_AmbientLgt\_Dyn\_Rq

Message Type:Request

Source Network: LIN

Signal Transmit Strategy: Periodic

Signal Transmit Cycle Time:50ms

Note: request signal from AUX to Ambient Lighting

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| AUX\_AmbientLgt\_Dyn\_Rq | Null | 0x0 | Default value. |
| Type1 | 0x1 | The first trigger to start Ambient lighting dynamic illumination |
| Type2 | 0x2 | The second trigger to start Ambient lighting dynamic illumination |
| Type3 | 0x3 | NotUsed\_1 |

#### AUX\_APIM\_FW\_Animation\_Rq

Message Type:Request

Source Network: LIN

Signal Transmit Strategy: Periodic

Signal Transmit Cycle Time: 150ms---confirmed with Qiming

Note: request signal from Ambient Lighting to AUX

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| AUX\_ APIM\_FW\_Animation \_Rq | Null | 0x0 | Default value. |
| Type1 | 0x1 | The trigger to start IVI farewell animation |
| Type2 | 0x2 | NotUsed\_1 |
| Type3 | 0x3 | NotUsed\_2 |

### Requirements

#### IVI welcome animation & Ambient lightings dynamic illumination functional requirement

The AmbientLgt\_Dyn\_Rq is transferred by private CA+N from APIM\_CIM to AUX, and AUX convert the signal to LIN signal: AUX\_AmbientLgt\_Dyn\_Rq to Ambient lighting modules. Ambient light modules include front door, rear door ambient lighting modules.

The AUX\_APIM\_FW\_Animation \_Rq is transferred by LIN from Ambient Lightings to AUX, and AUX convert the signal to private CAN signal: APIM\_FW\_Animation \_Rq to APIM\_CIM.

#### APIM\_CIM requirements

Welcome stage:

APIM\_CIM would send “AmbientLgt\_Dyn\_Rq” with value 0x1 for synchronization with front door/rear door ambient lightings’ dynamic illumination when IVI welcome animation arrive to 135th frame.

Note: when arrive to 135th frame, APIM\_CIM shall send out the signal with value 0x1(keep 150mills), then the value of this signal will return to default value 0x0.

APIM\_CIM shall define a configuration bit of xxxx which is called “Ambient Lighting coordination”.

The value of 0x1 indicate to enable “AmbientLgt\_Dyn\_Rq” signal. The value of 0x0 indicates to disable the signal.

When the configuration of “Ambient Lighting coordination” is 0x1, the default value of “AmbientLgt\_Dyn\_Rq” would be 0x0.

Ambient lighting trigger frame1:

Default: 135th frame

Ambient lighting trigger frame2:

Default: xx frame

Farewell stage:

When APIM\_CIM receive the signal APIM\_FW\_Animation \_Rq with value 0x1 from AUX, APIM\_CIM delay xxs to start farewell animation.

Note1：when door transitioned to ajar in farewell stage and APIM\_CIM does not receive the signal APIM\_FW\_Animation \_Rq with value 0x1 over Timer1 xxs, APIM\_CIM shall start farewell animation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | LE\_WF\_Welcome/Farewell Display |
| VehWlcmFrwl\_D\_Stat | VehWlcmFrwlMde\_D\_Stat | APIM\_FW\_Animation \_Rq | Timer1 | Welcome/Farewell Animation Request |
| WELCOME | APPROACH | Don’t care | Don’t care | OFF(but Wake-up display) |
| ILLUMINATEDENTRY | Don’t care | Don’t care | OFF - But Wake-up Display (Or Stay Awake, If Already Awake) |
| COURTESYLIGHTINGALL | Don’t care | Don’t care | ON - Start Welcome Animation |
| COURTESYLIGHTINGDELAYALL | Don’t care | Don’t care | ON - (And Continue Welcome Animation Until End) |
| COURTESYLIGHTINGEXTENDED | Don’t care | Don’t care | Off (stay awake) |
| COURTESYLIGHTINGDELAYEXT | Don’t care | Don’t care | Off (stay awake) |
| NULL | Don’t care | Don’t care | Off (stay awake) |
| RUNSTART |  | Don’t care | Don’t care | ON |
| FAREWELL | ILLUMINATEDEXIT | Don’t care | Don’t care | ON |
| COURTESYLIGHTINGALL | 0x0 | <=xxs | ON |
| 0x0 | >xxs | Start Farewell animation |
| 0x0🡪0x1 | <=xxs | Start Farewell animation until end |
| Others | | Continue farewell animation or remain off |
| COURTESYLIGHTINGDELAYALL | 0x0 | <=xxs | ON |
| 0x0 | >xxs | Start Farewell animation |
| 0x0🡪0x1 | <=xxs | Start Farewell animation |
| Others | | Continue farewell animation or remain off |
| COURTESYLIGHTINGEXTENDED | Don’t care | Don’t care | Off (Sleep) |
| COURTESYLIGHTINGDELAYEXT | Don’t care | Don’t care | Off (Sleep) |
| NULL | Don’t care | Don’t care | Off (Sleep) |
| NULL | NULL | Don’t care | Don’t care | Off (Sleep) |

#### AUX requirements

Welcome stage:

When AUX receive the “AmbientLgt\_Dyn\_Rq” signal, shall convert the CAN signal to LIN signal to Ambient lightings. And corresponding relationship is as below.

|  |  |
| --- | --- |
| CAN signal | LIN signal |
| AmbientLgt\_Dyn\_Rq | AUX\_AmbientLgt\_Dyn\_Rq |
| 0x0 | 0x0 |
| 0x01 | 0x01 |
| 0x02 | 0x02 |

Note: When AUX does not receive the signal: AmbientLgt\_Dyn\_Rq over xxs( follow AUX message requirements), AUX shall send out the corresponding LIN signal with the last value received rather than the default value 0x0. When AUX wake up from sleeping and does not receive the signal over xxs, the AUX will send out the default value 0x0.

Farewell stage:

When AUX receive the “AUX\_APIM\_FW\_Animation \_Rq” signal, shall convert the LIN signal to private CAN signal to APIM\_CIM. And corresponding relationship is as below.

|  |  |
| --- | --- |
| LIN signal | Private CAN signal |
| AUX\_APIM\_FW\_Animation \_Rq | APIM\_FW\_Animation \_Rq |
| 0x0 | 0x0 |
| 0x01 | 0x01 |
| 0x02 | 0x02 |

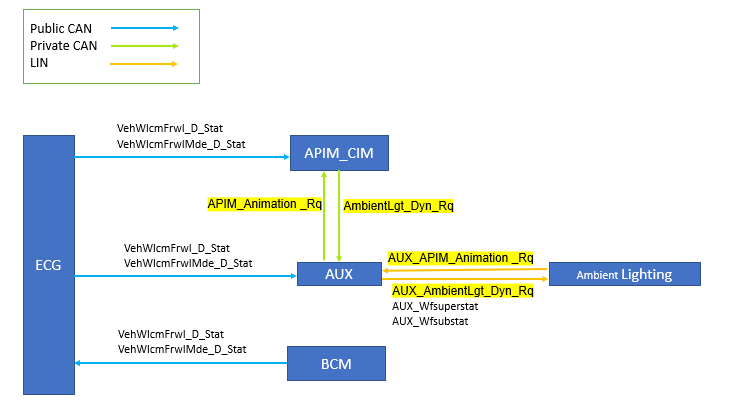
#### Ambient lighting requirements

Front door/rear door Ambient Lighting shall follow below requirements.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LIN Signals** | | | | | | **front door/rear door Ambient Lightings behavior** |
| **AUX\_Wfsupertate** | **Values** | **AUX\_WFsubstate** | **Values** | **Description** | **AUX\_AmbientLgt\_Dyn\_Rq** |  |
| WELCOME | 0x1 | Approach | 0x1 | Vehicle approach was detected | Don’t care | Off |
| IllumEntry | 0x2 | Vehicle was unlocked from outside | Don’t care | Off |
| COURTESYLIGHTINGALL | 0x3 | Vehicle doors transitioned to ajar | 0x0 | Waiting for trigger or keep dynamic illumination |
| COURTESYLIGHTINGALL | 0x3 | Vehicle doors transitioned to ajar | 0x0🡪0x1 | Start Dynamic illumination |
| COURTESYLIGHTINGALL | 0x3 | Vehicle doors transitioned to ajar | 0x1🡪0x0 | Keep Dynamic illumination |
| COURTESYLIGHTINGDELAYALL | 0x4 | Vehicle doors transitioned from ajar to all close within door ajar 25s | 0x0 | Waiting for trigger or keep dynamic illumination |
| COURTESYLIGHTINGDELAYALL | 0x4 | Vehicle doors transitioned from ajar to all close within door ajar 25s | 0x0🡪0x1 | Start dynamic illumination |
| COURTESYLIGHTINGDELAYALL | 0x4 | Vehicle doors transitioned from ajar to all close within door ajar 25s | 0x1🡪0x0 | Keep dynamic illumination |
| COURTESYLIGHTINGEXTENDED | 0x5 | Vehicle doors transitioned to ajar above 25s | Don’t care | Fade Off or off |
| COURTESYlLIGHTINGDELAYEXT | 0x6 | Vehicle doors transitioned from ajar to all close after door ajar 25s | Don’t care | Fade on or on |
| Null | 0x0 | Time out | Don’t care | Fade off or off |
| RUNSTART | 0x3 | Don’t care | Don’t care | Ignition not off | Don’t care | In-drive setting/SDM |
| FAREWELL | 0x2 | ILLUMINATEDEXIT | 0x7 | Ignition has transitioned to off | Don’t care | Fade on or on(10%) |
| COURTESYLIGHTINGALL | 0x3 | Vehicle doors transitioned to ajar | Dynamic illumination then fade off |
| COURTESYLIGHTINGDELAYALL | 0x4 | Vehicle doors transitioned from ajar to all close within door ajar 25s | Continue Dynamic illumination then off or off |
| COURTESYLIGHTINGEXTENDED | 0x5 | Vehicle doors transitioned to ajar above 25s | Remain off |
| COURTESYlLIGHTINGDELAYEXT | 0x6 | Vehicle doors transitioned from ajar to all close after door ajar 25s | Remain off |
| Null | 0x0 | Time out | off |
| Null | 0x0 | Null | 0x0 | Vehicle locked | Don’t care | off |

### Block Diagram

The block diagram could be referred to as below.



### Sequence Diagram

