Lincoln Embrace / Ford Welcome-Farewell

Feature Specification

Fomoco2

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# INTRODUCTION

## Purpose

This document specifies the electrical system function requirements for the determination of welcome/farewell states and the desired response(s) from different vehicle lighting elements during those states.

## Scope

The following set of features from the [Global Feature & Function List](https://www.vsemweb.ford.com:443/tc/launchapp?-attach=true&-s=226TCSession&-o=ZmZNi0JHx3NrTDAAAAAAAAAAAAA) is described in this FD.

|  |  |  |
| --- | --- | --- |
| **Feature ID** | **Feature Name** | **Owner** |
| F000416/A | Approach Detection | Elton Jamoua (EESE) |
| F000308/A | Welcome Mat | Ahmet Cinar (EESE) |
| F000309/A | Illuminated Door Handle Pockets | Elton Jamoua (EESE) |
| F000148/C | Auto Fold Mirrors | Ahmet Cinar (EESE) |
| Fn001857/J | Center Stack Animation/Graphic | Nicholar Frazier (SYNC) |
| Fn00335/C | Instrument Cluster Animation/Graphic - Needle | Scott Watkins (EESE) |
| F000317/A | Tail Lamp Static Fade | Terrence Wilson (Ext Lighting) |
| F000317/A | Rear Corner Lamp/Rear Side Marker Fade | Terrence Wilson (Ext Lighting) |
| F000315/A | Dynamic (Sequential) Signature DRL's | Terrence Wilson (Ext Lighting) |
| F000315/A | Fog/Fascia Lamp Static Fade | Terrence Wilson (Ext Lighting) |
| F000061/D | Pulsing Push to Start Switch | TBD |
| F000063/C | Static Sequential Ambient Lighting | Steven Antilla (Int Lighting) |
| F000061/D | Door Switch Backlighting | John Ricks (EESE) |
| F000059/C | Courtesy Lamps | Steven Antilla (Int Lighting) |
| F000061/D | I/P and Overhead Console Button Backlighting | Steven Antilla (Int Lighting) |
| F000061/D | Sync & Radio Control Button Backlighting | Dinh Tran (SYNC) |
| F000061/D | Headlamp Switch Backlighting | Steven Antilla (Int Lighting) |
| F000061/D | Instrument Cluster Backlighting | Scott Watkins (EESE) |
| F000059/C | Illuminated Scuff Plates | Steven Antilla (Int Lighting) |
| Fn003250/B | aHUD Animation | Aneesh Mathai (EESE) |
| F000315/A | Lit Lincoln Star | Farhan Ehsan (EESE) |
| F000317/A | Illuminated Deployable Runningboards | Farhan Ehsan (EESE) |
| F000316/A | Illuminated Seatbelt Buckles | Matt Majkowski (Int Lighting) |
| Fn000335/C | Instrument Cluster Animation/Graphic - Starfield | Scott Watkins (EESE) |
| F001002/A | Ford Welcome/Farewell | Farhan Ehsan (EESE) |
| F001003/A | Lincoln Welcome/Farewell | Farhan Ehsan (EESE) |
| F001004/A | Ford Signature Light | Frank Aust |
| F001005/A | Lincoln Signature Light | John Barrs (EESE) |
| F000052/C | Courtesy Lighting | John Barrs (EESE) |
| F000053/B | Courtesy Lighting Delay | John Barrs (EESE) |
| F000054/B | Illuminated Entry/Exit | John Barrs (EESE) |

1. : Features described in this FD

## Reference Specifications

|  |  |
| --- | --- |
| Sub-system | Specification |
| aHUD welcome farewell | HUD\_Welcome\_Goodbye\_Strategy\_-\_CGEA1.3\_v1.10 |
| Gen 1M Body Control Module FS | FS-LU5T-14B476-AA\* |
| Gen 2 Body Control Module FS | FS-JU5T-14B476-AA\* |
| cHUD welcome farewell | cHUD\_Welcome\_Goodbye\_Strategy\_-\_CGEA1.3\_v1.2 |
| Cluster welcome farewell | Welcome-Goodbye Strategy - CGEA1.3\_vX.X |
| Ford Welcome Farewell ARL | RQT-002004-021878 DNA WELCOME-FAREWELL STRATEGY REV. 1 |
| Lincoln Embrace ARL | RQT-002004-022094 LINCOLN EMBRACE WELCOME AND FAREWELL BEHAVIOR REV. 1 |
| SYNC welcome farewell | H22g\_SYNC3\_Welcome\_Power\_Modes\_RELEASED\_v2\_20 |
| Auto-fold mirrors | Mirror fold and door lock strategy.pptx |
| Approach Detection Functional Spec | Approach Detection ReqSTD-2013-04-11-16-09 |

1. : Reference Specification

# Feature Description

## Theory of Operation

**Ford Welcome Farewell**

The vehicle’s Exterior, Interior lights, and Displays shall respond by either fading ON/OFF or turning ON/OFF based on user interaction with the vehicle – Approaching it with a valid PK, locking or unlocking a vehicle, opening or closing vehicle doors, and cycling the ignition between OFF and RUN/Start.

**Lincoln Embrace**

A variant of Ford Welcome Farewell which was adapted for Lincoln vehicles, with aesthetic level differences and the total number of lighting/display elements being impacted.

Feature Context Diagram



1. : Welcome Farewell Feature Context Diagram

# Feature Requirements

## Feature Level Requirements

### Feature Requirements

The feature is intended to be able to either “Welcome” or bid “Farewell” to the Driver based off how he/she interacts with the vehicle. The manner in which the vehicle shall interact with the Driver is by controlling the Exterior Lights, Interior Lights, or Vehicle Displays (turn then ON or OFF)

* The feature shall require Exterior Illumination, Interior Illumination and Vehicle Display’s for Ford specific vehicles to Fade ON, Fade OFF, Turn On or Turn OFF based off of the state tables in ARL “RQT-002004-021878 DNA WELCOME-FAREWELL STRATEGY REV. XX”
* The feature shall require Exterior Illumination, Interior Illumination and Vehicle Display’s for Lincoln specific vehicles to Fade ON, Fade OFF, Turn On or Turn OFF based off of the state tables in ARL “RQT-002004-022094 LINCOLN EMBRACE WELCOME AND FAREWELL BEHAVIOR REV. XX”
* The feature shall be partitioned into three specific portions: “Welcome”, “In-Drive”, and “Farewell”; which exhibit unique behaviors for Exterior Illumination, Interior Illumination, and Vehicle Displays as per the previously mentioned ARL documents
* The feature’s “Welcome” portion shall include the following states:
  + Approach Detection (if equipped): Detects if a Keyfob or Phone-as-a-key (PaaK) Device is within a certain distance away from the vehicle while the ignition is OFF
  + Illuminated Entry: The 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
  + Courtesy Lighting: A vehicle entry door has transitioned to Ajar while the ignition is OFF
  + Courtesy Lighting Delay: All vehicle entry doors have transitioned to Closed while the ignition is OFF
* During the “In-Drive”, the feature shall not require any unique behavior for Exterior Lighting, Interior Lighting, and In-vehicle displays by allowing them to transition to their legislative/Drive specific behavior.
* The feature’s “Farewell” portion shall include the following states:
  + Illuminated Exit: The vehicle transmission has transitioned from non-OFF to OFF (with all vehicle entry doors closed)
  + Courtesy Lighting: A vehicle entry door has transitioned to Ajar after the ignition transitioned to OFF
  + Courtesy Lighting Delay: All vehicle entry doors have transitioned to Closed after the ignition transitioned to OFF
  + Vehicle Locking: The vehicle is locked using either a Key-Fob, PaaK. Door Keypad code, or any other means from the exterior of the vehicle while the ignition is OFF
* The feature shall also monitor the vehicle’s driver selected “Drive Mode” and use it as an input to drive unique Exterior Illumination, Interior Illumination and Vehicle Display behavior during the “Welcome” and “Farewell” portions
* The feature shall require the Exterior Illumination and Interior Illumination to reverse Fade On or Fade Off illumination behavior instantaneously at the time a new request is received without having to complete the previous Fade request
* The feature shall require all vehicle illumination to not flicker during its “Welcome” and “Farewell” portions.
* The feature shall allow the following features to over-ride or inhibit Exterior Lighting, Interior Lighting, and Vehicle Display behavior if they are active during the “Welcome” or “Farewell” portions:
  + Remote Start (override for specific Exterior Lighting)
  + Delayed Accessory (override for Interior Lighting)
  + Extended Play (override for Vehicle Displays)
  + Perimeter Alarm Mode (override for Exterior Lighting and Interior Lighting)
  + Silent Mode (override for Exterior Lighting, Interior Lighting and Vehicle Displays)
  + Key-Off-Load Mode (override for Exterior Lighting, Interior Lighting and Vehicle Displays)
  + Post-Crash Alert (override for Exterior Lighting, Interior Lighting and Vehicle Displays)

#### Host Vehicle State required for Feature operation

The feature is expected to have functionality across all Power Modes and Vehicle Modes that would qualify under “normal” operation of vehicle – Vehicle isn’t in an error, error recovery, diagnostic, or any related state which would inhibit normal function of the vehicle.

## Quality Requirements

### Reliability Requirements

No additional reliability requirements for the intended implementation.

### Performance Requirements

* The lighting elements controlled by this feature while it is active shall be steady burning (no flickering) when illuminated
* By default, if a lighting element is required to “Fade ON”, it shall take 3 seconds to ramp up its illumination level from “OFF” level to the desired “ON” level – “ON” illumination level shall be specified by Vehicle Harmony group.
* By default, if a lighting element is required to “Fade OFF”, it shall take 5 seconds to complete when starting at “ON” illumination level
* If a lighting element is required to “Fade ON” or “Fade OFF”, it shall continuously ramp ON or OFF to its “ON” level - shall not “flicker” as defined by the Interior Harmony Group, identified during vehicle walk-around
* Exterior Lighting elements required to “Fade ON” or “Fade OFF” shall follow ramp in either direction following Stevens’ Power Law curve until the illumination reaches the desired “ON” or “OFF” level respectively
* Interior Lighting elements required to “Fade ON” or “Fade OFF” shall transition in either direction following “Smooth Dimming” until the illumination reaches the desired “ON” or “OFF” level
* Exterior Lighting elements required to “Snap ON” or “Snap OFF” shall step up or down their illumination level to the desired “ON” or “OFF” level following a step function
* Interior Lighting elements required to “Snap ON” or “Snap OFF” shall step up or down their illumination level to the desired “ON” or “OFF” level following a step function
* Interior Lighting elements required to “Pulse” shall ramp up to their “ON” illumination level and then immediately transition between their “ON” and configurable illumination level (10% of “ON” illumination level by default) at a configurable frequency (set to 1Hz by default) – point back BCM FS

#### Performance Latency Requirements

* The feature shall require the system to respond to a user specific interaction within 250ms

### Safety Requirements

The following requirements refer to the safety requirements as defined and managed by the ASO office. Each requirement points to a specific “Regulation Records” (RRs) as they’re listed in FSMS, which in turn refer to sections from the applicable Regulation.

Links to RRs are used instead of pointing to the specific language that applies within the larger Regulatory document to protect against continual updates/re-interpretations – link to RR won’t change, but content within RR shall/might eventually change. It is also strongly advised that the listed “RR” Author” be contacted to assure that the content within the RR is being interpreted correctly.

#### NAFTA Requirements to abide by (or not violate)

|  |  |  |  |
| --- | --- | --- | --- |
| **RR ID/ Revision** | **Country/ Vehicle area** | **Regulation Number and Title** | **RR Author** |
| [CAN-004804/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=SlSVUVgwIJ_leA) | Canada/ Exterior Lighting | SCHEDULE IV Part II(CMVSS 108 and 108.1)/LIGHTING SYSTEM, RETRO-REFLECTIVE DEVICES and HEADLAMP CONCEALMENT DEVICES | Adams-Campos, Kelley-KADAMSCA (kadamsca) |
| [CAN-004804/3](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=QHaZihoBIJ_leA) | Canada/ Exterior Lighting | CMVSS 108/LIGHTING SYSTEM, RETRO-REFLECTIVE DEVICES and HEADLAMP CONCEALMENT DEVICES | Adams-Campos, Kelley-KADAMSCA (kadamsca) |
| [CAN-004911/3](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=_cbVUp%245IJ_leA) | Canada/ Interior Lighting | CMVSS 101/SCHEDULE IV PART II 101 (CMVSS 101) Controls and Displays | Laesch,Renu-RLAESCH1 (rlaesch1) |
| [MEX-006134/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=r2aVUZYqIJ_leA) | Mexico/ Vehicle Display | MEX SECOFI-25/INSTRUMENT CLUSTER. | Arellano-Belloc,Hector-HARELLAN (harellan) |
| [USA-006741/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=CmRVUZqBIJ_leA) | US / Exterior Lighting | USA - STATE - ALL/EXTERIOR LIGHTING - GENERAL | Adams-Campos, Kelley-KADAMSCA (kadamsca) |
| [USA-008716/3](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=iRZZdqG9IJ_leA) | US / Interior Lighting & Vehicle Displays | FMVSS 101/FMVSS 101 Controls and Displays | Laesch,Renu-RLAESCH1 (rlaesch1) |
| [USA-008732/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=_YfVUliiIJ_leA) | US / Interior Lighting & Vehicle Displays | /NHTSA Visual-Manual Guidelines for In-Vehicle Electronic Devices | Leigh,Michael-MLEIGH (mleigh) |
| [USA-009169/2](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=acSVUtPDIJ_leA) | US / Exterior Lighting | USA - STATE - SEVERAL/HEADLAMPS (LOW-BEAMS) | Adams-Campos, Kelley-KADAMSCA (kadamsca) |
| [USA-011127/2](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=xcaZOgKzIJ_leA) | US / Exterior Lighting, Interior Lighting & Vehicle Display | /2019MY U.S. NHTSA New Car Assessment Program (NCAP) | Buckman, Jennifer-JBARNARD (jbarnard) |

#### ECE Requirements to abide by (or not violate)

|  |  |  |  |
| --- | --- | --- | --- |
| **RR ID/ Revision** | **Country/ Vehicle area** | **Regulation Number and Title** | **RR Author** |
| [ECE-008757/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=QaeVUlz8IJ_leA) | ECE / Vehicle Displays & Interior Lighting | RE3 ANNEX 16./ON-BOARD COMMUNICATION AND INFORMATION SYSTEMS. | Abraham,James-JABRAH11 (jabrah11) |
| [ECE-004951/10](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=B4Qdj7VGIJ_leA) | ECE / Vehicle Display | ECE-39/SPEEDOMETER | Sanchez,Greg-GSANCHE1 (gsanche1) |
| [ECE-005073/16](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=VtddUL_BIJ_leA) | ECE / Interior Lighting & Vehicle Displays | ECE-121.01/Identification of Hand Controls, Tell-Tales and Indicators | Mueller,Joachim-JMUELLE6 (jmuelle6) |
| [ECE-005009/12](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=CwXdUL_BIJ_leA) | ECE / Exterior Lighting | ECE-26.02/Exterior Projections | Mueller,Joachim-JMUELLE6 (jmuelle6) |

#### China Requirements to abide by (or not violate)

|  |  |  |  |
| --- | --- | --- | --- |
| **RR ID/Revision** | **Country** | **Regulation Number and Title** | **RR Author** |
| [XCT-011075/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=BhQZnwM8IJ_leA) | Cross Country Topics / Vehicle Display | CROSS COUNTRY SPEEDOMETER MATRIX/CROSS COUNTRY MATRIX FOR SPEEDOMETER AND ODOMETER | Laesch,Renu-RLAESCH1 (rlaesch1) |
| [CHN-005444/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=UtUVUZnjIJ_leA) | China / Exterior Lighting & Interior Lighting | GB 17509-2008/CHINA: DIRECTION INDOCATORS | Zhang,Yue-YZHAN256 (yzhan256) |
| [CHN-008524/1](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=BqQVUliiIJ_leA) | China / Exterior Lighting | GB 11566-2009/CHINA: EXTERIOR PROJECTIONS | Zhang,Yue-YZHAN256 (yzhan256) |
| [CHN-004436/16](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=xgdZ5mJXIJ_leA) | China / Exterior Lighting, Interior Lighting & Vehicle Display | GB 7258/CHINA: CCC VEHICLE APPROVAL | Zhang,Yue-YZHAN256 (yzhan256) |
| [CHN-004329/5](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=h4aZ2P6hIJ_leA) | China / Interior Lighting & Vehicle Displays | GB 4094/CHINA: SYMBOLS FOR CONTROLS, INDICATORS, AND TELL-TALES | Zhang,Yue-YZHAN256 (yzhan256) |
| [CHN-004330/5](http://www.fsms-portal.ford.com/regulationRecordReportAction.do?actionId=generateRRText&uid=iWeZpbirIJ_leA) | China / Interior Lighting & Vehicle Display | GB 15082/CHINA: SPEEDOMETERS FOR MOTOR VEHICLE | Zhang,Yue-YZHAN256 (yzhan256) |

\***NOTE** – China market regulatory requirements are close to ECE market requirements with very few exceptions.

\***NOTE** – Consult ASO team for any markets not specified.

### Security Requirements

N/A – No unique security requirements are required by this feature.

# Functional Decomposition

## List of Functions

|  |  |  |
| --- | --- | --- |
| **Section #** | **Function Name** | **Function Description** |
| 5.2.1 | Welcome Farewell State and Sub-state Determination | Algorithm within the controlling module which shall accept input signals to then determine the specific state and sub-state of Welcome Farewell |
| 5.2.2 | LE\_WF\_ Illumination Requestor | Function that will transmit the expected response (i.e. “Fade On”) to all illumination controlling smart modules, based on the output it receives out of the Welcome Farewell State Determination function. |
| 5.2.3 | LE\_WF\_ Illumination Response | Function that will accept the expected response output from the “LE\_WF\_ Illumination Requestor” function to then drive the actual illumination for a given light assembly or display to meet the expected final output as per “RQT-002004-021878 DNA WELCOME-FAREWELL STRATEGY REV. XX” for Ford vehicles or “RQT-002004-022094 LINCOLN EMBRACE WELCOME AND FAREWELL BEHAVIOR REV. XX” for Lincoln vehicles |
| 5.2.4 | LE\_WF\_Welcome/ Farewell Display | Function that will accept a combination of outputs from the “Welcome Farewell State Determination” and “LE\_WF\_ Illumination Requestor” functions to then drive the “Welcome” and “Farewell” animations for a given display to meet the expected final output as per “RQT-002004-021878 DNA WELCOME-FAREWELL STRATEGY REV. XX” for Ford vehicles or “RQT-002004-022094 LINCOLN EMBRACE WELCOME AND FAREWELL BEHAVIOR REV. XX” for Lincoln vehicles |

# Function Requirement

## Power Modes of each Function

|  |  |
| --- | --- |
| Function Name | Power Mode |
| Welcome Farewell State Determination | (Ignition States: OFF, ACCY, RUN and START) OR (Vehicle Bus: Awake) OR (Local Sleep Inhibition: Active) |
| LE\_WF\_ Illumination Requestor | (Ignition States: OFF, ACCY, RUN and START) OR (Vehicle Bus: Awake) OR (Local Sleep Inhibition: Active) |
| LE\_WF\_ Illumination Response | (Ignition States: OFF, ACCY, RUN and START) OR (Vehicle Bus: Awake) OR (Local Sleep Inhibition: Active) |
| LE\_WF\_Welcome/ Farewell Display | (Ignition States: OFF, ACCY, RUN and START) OR (Vehicle Bus: Awake) OR (Local Sleep Inhibition: Active) |

## Welcome/Farewell State and Sub-state determination

Function that the Centralized Welcome/Farewell controlling module will use to determine and transmit the specific Welcome/Farewell State and Welcome/Farewell Sub-state to the receiving modules and systems.

**Inputs used for Welcome/Farewell State and Sub-state Determination**

The Welcome Farewell State and Sub-state Determination Function requires the following set of inputs:

* Approach Detected/Not-Detected: PK position relative to vehicle, either within or outside “Approach” zone.
* Vehicle Entry Door Ajar Status: Front Driver and Passenger Door, Rear Driver and Passenger Door
* Vehicle Lock vs Unlock Status
* Vehicle Lock vs Unlock Requestor: Key-fob/PK, Door Keypad, or Interior Door Trim switch
* Vehicle Ignition Status: Off, Accessory (if applicable), Run, or Start.

**Welcome/Farewell State Determination Definitions**

**Welcome:** State that shall be active as a vehicle user is entering the vehicle until either the ignition is started (transition to “Ignition Run/Start” state), vehicle bus goes to sleep (“Null” sub-state) or the vehicle is locked from the exterior (“Vehicle Locking” sub-state).

**Ignition Run/Start:** State that shall be active from the time ignition is in Run/Start (includes accessory) until the ignition transitions to OFF (“Illuminated Exit” sub-state)

**Farewell:** State that shall be active as the vehicle user is leaving the vehicle after transitioning the ignition to OFF (“Illuminated Exit” sub-state) until either the ignition is re-started (transitioning back to “Ignition Run/Start” state), vehicle bus goes to sleep (“Null” sub-state) or the vehicle is locked from the exterior (“Vehicle Locking” sub-state).

**Null:** Null state from where the Welcome/Farewell State Determination initialize and transition to due to time-outs or when the state determination function is no longer active.

**Welcome/Farewell Sub-State Determination Definitions**

**Approach Detection:** Keyfob or Phone-as-a-key (PaaK) Device is within detection zone around vehicle (currently set to 2.5m)

**Illuminated Entry:** Vehicle 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

**Courtesy Lighting - All:** A vehicle entry door transitioning to Ajar while the ignition is OFF, applicable to both Exterior and Interior lighting elements

**Courtesy Lighting Delay- All:** All vehicle entry door equaling closed after an ajar door(s) transitioned to closed, applicable to both Exterior and Interior lighting elements

**Courtesy Lighting - Extended:** A vehicle entry door transitioning to Ajar while the ignition is OFF, applicable to just Interior lighting elements

**Courtesy Lighting Delay- Extended:** **All:** All vehicle entry door equaling closed after an ajar door(s) transitioned to closed, applicable to just Interior lighting elements

**Ignition Run/Start:** Vehicle Ignition is in Run or Start state

**Illuminated Exit:** The vehicle transmission has transitioned from non-OFF to OFF

**Vehicle Locking:** The vehicle was locked using either a Key-Fob, PaaK. Door Keypad code or any other means from the exterior of the vehicle while the ignition is OFF

**Null:** Null state

**Welcome/Farewell Sub-State Determination flow diagram**

\***NOTE** – Even though the diagram above has two separate “Null” states called out, they are referring to the same “Null” state.

|  |  |
| --- | --- |
|  | D -> A.1: “Approach” timer initialized. Timer set to 25 seconds by default  Transition as written applied to “Unlocked” configurable variant of Approach Detection. For “Locked” variant of Approach Detection, vehicle must have been locked using an exterior means.  **Welcome/Farewell State:** Don’t care -> Welcome |
|  | A -> D.2: “Approach” timer expired. Timer set to 25 seconds by default  **Welcome/Farewell state:** Don’t care -> Null |
|  | A -> B.3: “Courtesy Lighting” timer initialized. Timer set to 25 seconds by default. “Approach” timer terminated.  **Welcome/Farewell state:** Don’t care -> Welcome |
|  | A -> I.4: Terminate any active timers  **Welcome/Farewell state:** Don’t care -> Welcome |
|  | A -> E.5: “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Don’t care -> Welcome |
|  | A -> D.35: “Approach” timer terminated on transition to “Null”. PK range and detection speed varies depending on number of antennas on vehicle and antenna scan sequence/rate  **Welcome/Farewell state:** Don’t care -> Null |
|  | B -> A.6: “Approach” timer re-initialized. “Courtesy Lighting” timer terminated.  Transition as written applied to “Unlocked” configurable variant of Approach Detection. Shall not occur for “Locked” variant of Approach Detection  **Welcome/Farewell state:** Don’t care -> Welcome |
|  | B -> E.7: “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Don’t care -> Welcome |
|  | B -> I.8: Terminate any active timers  **Welcome/Farewell state:** Don’t care -> Farewell |
|  | B -> D.9: “Courtesy Lighting” timer expired. Timer set to 25 seconds by default  **Welcome/Farewell state:** Don’t care -> Null |
|  | C -> J.25: Any active timers terminated. Vehicle behavior must follow legislative in-drive requirements.  **Welcome/Farewell state:** Farewell -> Ignition Run/Start |
|  | C -> E.26 “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** remain in Farewell if interior door handle used to open driver door. Farewell -> Welcome if exterior door handle used to open door |
|  | C -> I.27 Terminate any active timers  **Welcome/Farewell state:** remain in Farewell |
|  | C -> D.28 “Courtesy Lighting” timer expired. Timer set to 25 seconds by default  **Welcome/Farewell state:** Farewell -> Null |
|  | D -> B.31 Courtesy Lighting” timer initialized. Timer set to 25 seconds by default. “Approach” timer terminated.  **Welcome/Farewell state:** Null -> Welcome |
|  | D -> E.32 “Courtesy Lighting” timer started at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Null -> Welcome |
|  | D -> H.33 “Courtesy Lighting” timer started after all ajar vehicle entry doors transition to closed.  **Welcome/Farewell state:** Null -> Welcome |
|  | D -> J.34 Vehicle behavior must follow legislative in-drive requirements.  **Welcome/Farewell state:** Null -> Ignition Run/Start |
|  | E -> F.10: “Courtesy Lighting” timer restarted after all ajar vehicle entry doors transition to closed.  “Extended Courtesy Lighting” timer terminated.  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | E -> G.11: “Courtesy Lighting” timer expired. Timer set to 25 seconds by default  Transition has no impact on active “Extended Courtesy Lighting” timer (continue counting down)  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | E -> J.12: Any active timers terminated. Vehicle behavior must follow legislative in-drive requirements.  **Welcome/Farewell state:** Don’t care -> Ignition Run/Start |
|  | E -> E.36: “Extended Courtesy Lighting” timer reset with each additional door ajar transition.  “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | F -> J.13: Any active timers terminated. Vehicle behavior must follow legislative in-drive requirements.  **Welcome/Farewell state:** Don’t care -> Ignition Run/Start |
|  | F -> E.14 “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | F -> I.15 Terminate any active timers  **Welcome/Farewell state:** Don’t care -> Farewell |
|  | F -> D.16 “Courtesy Lighting” timer expired. Timer set to 25 seconds by default  **Welcome/Farewell state:** Don’t care -> Null |
|  | G -> H.17 “Courtesy Lighting” timer restarted after all ajar vehicle entry doors transition to closed.  “Extended Courtesy Lighting” timer terminated.  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | G -> J.18 Any active timers terminated. Vehicle behavior must follow legislative in-drive requirements.  Welcome/Farewell state: Don’t care -> Ignition Run/Start |
|  | G -> I.19 Terminate any active timers  **Welcome/Farewell state:** Don’t care -> Farewell |
|  | G -> D.20 “Extended Courtesy Lighting” timer expired. Timer set to 10 minutes by default |
|  | G -> G.30 “Extended Courtesy Lighting” timer reset with each additional door ajar transition |
|  | H -> J.21 Any active timers terminated. Vehicle behavior must follow legislative in-drive requirements.  Welcome/Farewell state: Don’t care -> Ignition Run/Start |
|  | H -> I.22 Terminate any active timers  **Welcome/Farewell state:** Don’t care -> Farewell |
|  | H -> D.23 “Courtesy Lighting” timer expired. Timer set to 25 seconds by default  **Welcome/Farewell state:** Don’t care -> Null |
|  | H -> E.24 “Courtesy Lighting” timer restarted at first door ajar transition. Shall not reset with each additional door ajar thereafter.  “Extended Courtesy Lighting” timer initialized at first door ajar transition. Timer set to 10 minutes by default. Shall reset with each additional door ajar thereafter.  **Welcome/Farewell state:** Keep previous state (Welcome or Farewell) |
|  | I -> D.29 Transition occurs after vehicle lock is confirmed  **Welcome/Farewell state:** Don’t care -> Null |

## LE\_WF\_ Illumination Requestor

Function that will accept outputs from the “Welcome Farewell State and Sub-state Determination” function, to determine the appropriate illumination response and transmit the appropriate control signal i.e. Ramp up, Ramp Down, Snap On, Snap Off etc.; as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

### Control Signal Definitions & Configurability

RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, requires the following four categories of responses in order to satisfy their requirements.

* **“Fade On”**: Request that requires the target lighting element to ramp up their illumination level along as perceived linear curve. The default duration shall be 3 seconds, with a minimum configurable value of 40ms, a maximum configurable value of 5 seconds, and configurable over 40ms steps.
* **“Fade Off”**: Request that requires the target lighting element to ramp down their illumination level along as perceived linear curve. The default duration shall be 5 seconds, with a minimum configurable value of 40ms, a maximum configurable value of 5 seconds, and configurable over 40ms steps.
* **“Snap On”**: Request that requires the target lighting element to step up their illumination level from an OFF level to a non-OFF level. The default duration shall be not exceed than 40ms with no additional configurability.
* **“Snap Off”**: Request that requires the target lighting element to step down their illumination level from a non-OFF level to an OFF level. The default duration shall be not exceed than 40ms with no additional configurability.

### Control Signal Value Targets

The Control Signals tied to the target vehicle’s illumination element shall ramp or snap along the aforementioned curves until they reach a target value that’s defined as either “ON/Embrace” or “OFF” under “RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ARL call-out** | **Target Control Signal value** | **Minimum value** | **Maximum value** | **Config. Steps** |
| “ON/Embrace” | 80% PWM | 20% PWM | 100% PWM | 1% |
| “OFF” | <= 15% PWM | 0% PWM | 15% PWM | 1% |

### Control Signal response transitions based on changes in Welcome/Farewell state and sub-state transitions to meet call-outs in RQTs



1. : Illumination Control Signal transitions based on ARL requests.

|  |  |
| --- | --- |
|  | A -> A.1: No action, remain OFF |
|  | A -> D.2: Illuminate to “ON/Embrace Level”, step function |
|  | A ->C.3: Start “Fade ON” sequence (3 seconds by default) |
|  | C ->A.4: De-illuminate to “OFF” level, step function |
|  | D ->B.5: Start “Fade OFF” sequence (5 seconds by default) |
|  | D ->D.6: Remain at “ON/Embrace” level, reset state time-out timer |
|  | C ->A.7: Interrupt “Fade ON” sequence, de-illuminate to “OFF” level, step function |
|  | C ->B.8: Interrupt “Fade ON” sequence, begin “Fade OFF” sequence. Start “Fade OFF” from same point/level “Fade ON” reached at time of interruption. “Fade OFF” time = % Fade ON complete \* Fade OFF total time. |
|  | C ->C.9: Start “Fade ON” sequence after first request. Do not reset “Fade ON” sequence with each new request. |
|  | C ->D.10: “Fade ON” complete. Start state time-out timer. |
|  | C ->D.11: Interrupt “Fade ON” sequence, illuminate to “ON/ Embrace” level, step function |
|  | B ->B.12: Start “Fade OFF” sequence after first request. Do not reset “Fade OFF” sequence with each new request. |
|  | B ->A.13: “Fade OFF” complete. Remain OFF for duration of state. |
|  | B ->A.14: Interrupt “Fade OFF” sequence, de-illuminate to “OFF” level, step function |
|  | B ->D.15: Interrupt “Fade OFF” sequence, illuminate to “ON/ Embrace” level, step function |
|  | B ->C.16: Interrupt “Fade OFF” sequence, begin “Fade ON” sequence. Start “Fade ON” from same point/level “Fade OFF” reached at time of interruption. “Fade ON” time = % Fade OFF complete \* Fade ON total time. |

**NOTE**: 1. Additional requirements called out under section 5.3.1.2 Control Signal Definitions and Configurability in satisfying behavior listed under “Control signal response”

### Additional requirements

* Conflicting requests sent mid illumination ramping (Fade ON -> Fade OFF before Fade ON complete, or Fade OFF -> Fade ON before Fade OFF complete): New Fade request shall be honored starting at illumination level that was reached by previous request while maintaining specified ramp rate (shall complete in lesser time). No time delay required before acting on new Fade request.
* Ignition transitions from OFF to RUN/Start: Front Illumination shall follow legislative requirements on Illumination behavior (can forego “Fade ON” or “Fade OFF” behavior/delays if in conflict legislative requirements)

### Illumination Algorithm inhibits and overrides

* LE\_WF\_ Illumination Requestor shall be given the least priority over competing algorithms that control Illumination
* Activating “Perimeter Alarm Mode” or “Panic Alarm” feature as per BCM FS shall inhibit the LE\_WF\_ Illumination Requestor while feature is active
* Activating “Silent Mode” feature as per BCM FS shall inhibit LE\_WF\_ Illumination Requestor while feature is active
* Activating “Key-Off-Load Mode” feature as per BCM FS shall inhibit LE\_WF\_ Illumination Requestor while feature is active
* Activating “Post-Crash Alert” feature as per BCM FS shall inhibit LE\_WF\_ Illumination Requestor while feature is active.

## LE\_WF\_ Illumination Response

Function that will accept outputs from the “LE\_WF\_ Illumination Requestor “ to then have the lighting element(s) in the vehicle respond by illuminating to satisfy the requirements in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

* Vehicle Illumination shall illuminate in response to control signal ramping up
* Vehicle Illumination shall de-illuminate in response to control signal ramping down
* Vehicle Illumination shall consistently illuminate to the same illumination level at a given duty cycle.
* Specific “ON”, “ON/Embrace”, “Snap ON” illumination level for each individual lighting element shall be specified by Vehicle Harmony Group.
* Vehicle Illumination shall meet the requirements specified in section 3.2.2 “Performance Requirements” unless otherwise specified by SME or Vehicle Harmony Group
* Vehicle Illumination shall meet (or not violate) all applicable requirements in section 3.2 “Quality”.
* When the control signal reaches 0% duty cycle the desired Vehicle Illumination element’s intensity level shall equal 0 (go to “OFF”)
* During control signal “Fade ON” sequence, the Vehicle Illumination element shall Fade ON smoothly – no observable flickering.
* During control signal “Fade OFF” sequence, the Vehicle Illumination element shall Fade OFF smoothly – no observable flickering.
* During control signal “Snap ON” sequence, the Vehicle Illumination element shall Snap ON without flickering.
* During control signal “Snap OFF” sequence, the Vehicle Illumination element shall Snap OFF without flickering.
* Vehicle Illumination response to ramping control signals shall not be inhibited if any of the individual Vehicle Illumination lighting elements are malfunctioning/burnout.
* If the Control Signal, Power, or Ground to a specific Vehicle Illumination element is corrupted/disconnects, that specific lighting element shall default to “OFF” (de-illuminated)

## LE\_WF\_Welcome/ Farewell Display

Vehicles equipped with customer facing displays or display devices i.e. heads-up-displays, shall be required to display combination of “Welcome” or “Farewell” screens based on the outputs from the Welcome/Farewell State and Sub-state determination function. These displays or display devices include but aren’t limited to:

* Center-stack Welcome/Farewell Display (Sync Screen)
* Cluster Welcome/Farewell Display (TFT/Digital portion)
* Heads-up displays (aHUD)

|  |  |  |
| --- | --- | --- |
| **Inputs** | | **Output** |
| **Welcome/Farewell State** | **Welcome/Farewell Sub-state** | **Welcome/Farewell Animation Request** |
| Don’t Care1 | Approach Detection | Wake-up display |
| Don’t Care1 | Illumination Entry | Wake-up display (stay awake) |
| Welcome | Courtesy Lighting – All | Welcome Animation3 |
| Welcome | Courtesy Lighting Delay – All | Welcome Animation3 |
| Welcome | Courtesy Lighting – Extended | Off (stay awake) |
| Welcome | Courtesy Lighting Delay – Extended | Off (stay awake) |
| Welcome | Null | Off (Sleep) |
| Ignition Run/Start | Don’t Care | Vehicle Start Animation3 then transition to in-drive display |
| Don’t Care2 | Illuminated Exit | Farewell animation3 or ON |
| Farewell | Courtesy Lighting – All | Farewell animation3 |
| Farewell | Courtesy Lighting Delay – All | Off (Sleep) |
| Farewell | Courtesy Lighting – Extended | Off (Sleep) |
| Farewell | Courtesy Lighting Delay – Extended | Off (Sleep) |
| Farewell | Null | Off (Sleep) |
| Null | Null | Off (Sleep) |

Note 1: State is only possible when “Welcome/Farewell State” = Welcome.

Note 2: State is only possible when “Welcome/Farewell State” = Farewell

Note 3: Specific animation owned by HMI and Studio group.

# Feature Variant Design Architecture

## Electrical Architecture – FNV3

Please note that the feature does not require specific modules (except the BCM) to be present on a vehicle and is instead tailored to the content of the vehicle. The following section is a generic starting point to show how functions are allocated based off vehicle content and desired functionality.

### Electrical Topology

Applicable for Lincoln and Ford vehicles on the FNV2 architecture

### Common Requirements

#### Participating ECUs

Generic list of participating ECUs provided in table below. Functionality along with Publisher and Subscriber requirements will change based on vehicle content.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ECU** | **Network** | **CAN** | | **LIN** | | **Private CAN** | |
| **Publisher** | **Subscriber** | **Publisher** | **Subscriber** | **Publisher** | **Subscriber** |
| **BCM** | HS-1 | X |  | X |  |  |  |
| **HCM** | FD-3 | X | X |  |  |  |  |
| **LDM** |  |  |  |  |  |  | X |
| **ALCM** | HS-3 | X | X |  |  |  |  |
| **OHC** |  |  |  |  | X |  |  |
| **Mini-ICP** |  |  |  |  | X |  |  |
| **SCCM** | HS-2 |  | X |  |  |  |  |
| **APIM\_CIM** | HS-3 | X | X |  |  |  |  |
| **APIM\_CDC** | HS-3 | X | X |  |  |  |  |
| **RACM** | HS-3 |  | X |  |  |  |  |
| **DDM** | MS-1 |  | X |  |  |  |  |
| **PDM** | MS-1 |  | X |  |  |  |  |
| **ECG** | G/W | X | X |  |  |  |  |

#### Signal Requirements

The following section lists all of the signals required to complete the desired behaviors required by the Feature. It links the logical data-flows used within this document to the actual CAN OR LIN signals which shall actually be used by the modules.

##### CAN Signal Requirements

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | VehWlcmFrwl\_D\_Stat |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | FD1 CAN |
| Signal refresh rate | 500 ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to Null, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-Null value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | FD1 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | VehWlcmFrwlMde\_D\_Stat |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | FD1 CAN |
| Signal refresh rate | 500 ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to Null, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-Null value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | FD1 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Dimming\_Lvl |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | FD1 CAN |
| Signal refresh rate | 500 ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | FD1 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Litval |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | FD1 CAN |
| Signal refresh rate | 500 ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | FD1 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | HMI\_HMIMode\_St |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | HS3 CAN |
| Signal refresh rate | 500 ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | HS3 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | APIM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Ignition\_Status |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | FD1 CAN |
| Signal refresh rate | 500ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | FD1 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | ExtLghtAnmtn\_D\_Rq |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | HS3 CAN |
| Signal refresh rate | 500ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | HS3 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | APIM\_CIM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | TailLghtAnmtn\_D\_Stat |
| Functional Voltage Range (Min,Max) | 6-16v |
| Performance Voltage Range (Min,Max) | 9-16v |
| Source Network | HS3 CAN |
| Signal refresh rate | 500ms |
| Publishing Interval (ms) | <= 40ms |
| Publisher Latency Requirements | If microprocessor is awake: <= 51ms |
| If microprocessor is asleep: <=121ms |
| Publishing Network Sleep Inhibitor | If signal is not equal to OFF, then allow for network sleep but not for local sleep |
| Updates Signal while asleep | Updates on change |
| Network Wake Up | Wake up network on signal change to non-OFF value |
| Max latency before signal is valid on Network wakeup | <= 50ms |
| Max latency before signal is valid on reset | <= 120ms |
| CAN Node Type | HS3 |
| Signal Domain | Refer to data dictionary |
| Signal Transmit Strategy | Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | 500 ms |
| End-to-End Latency Requirements | <=250 ms |
| Publishing ECU | HCM |

3 types of ambient lighting animation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal name | Description | Encoding | Transmitter | Receiver |
| IVI\_ALCM\_WFTheme\_Rq | From IVI to ALCM to select WF ambient lighting theme | null 0x0 Theme1 0x1 Theme2 0x2 Theme3 0x3 Theme4 0x4 Theme5 0x5 Theme6 0x6 Theme7 0x7 Theme8 0x8 | APIM | ALCM |
| IVI\_User\_OnOff\_WF\_Rq | From IVI to set enable/disable WF mode | Disable 0x0 Enable 0x1 | APIM | ALCM |
| ALCM\_User\_OnOff\_WF\_Stat | From ALCM to show status of On/Off of WF | Disable 0x0 Enable 0x1 | ALCM | APIM |
| ALCM\_WFTheme\_Num\_FB | From ALCM to show status WF number. Cycle 500ms Event | null 0x0 Theme1 0x1 Theme2 0x2 Theme3 0x3 Theme4 0x4 Theme5 0x5 Theme6 0x6 Theme7 0x7 Theme8 0x8 | ALCM | APIM |

3 types of lit grille animation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal name | Description | Encoding | Transmitter | Receiver |
| GrilleAnmtn\_IVI\_Rq | From IVI to HCM to select WF lit grille animaiton | * 0x00: Null * 0x01: welcome/farewell preset type1 * 0x02: welcome/farewell preset type2 * 0x03: welcome/farewell preset type3 * 0x04: welcome/farewell download type 1 * 0x05: welcome/farewell download type 2 * 0x06: welcome/farewell download type 3 * 0x07: Reserved * … * 0x0E: Reserved   0x0F: Reserved | APIM | HCM |
| GrilleAnmtn\_IVI\_Stat | From HCM to IVI to feedback which grille animation selected | * 0x00: Null * 0x01: welcome/farewell preset type1 * 0x02: welcome/farewell preset type2 * 0x03: welcome/farewell preset type3 * 0x04: welcome/farewell download type 1 * 0x05: welcome/farewell download type 2 * 0x06: welcome/farewell download type 3 * 0x07: Reserved * … * 0x0E: Reserved   0x0F: Reserved | APIM | HCM |

##### Local Sleep Inhibition while Illumination is active

The illumination master ECU (BCM) might initiate a network sleep in low power modes (Ignition\_Status < (Run and Start) to minimize battery drainage. At the same time it might be necessary to keep the illumination active ( > OFF) in some cases. All components receiving illumination signals shall maintain the last valid illumination signal value > OFF if a valid network sleep is initiated and the last received illumination signal is != OFF. The dimming master (BCM) shall wake-up and distribute the illumination signals = OFF if the condition, which requires illumination, does not exist anymore. Otherwise, illumination is required to stay ON indefinitely.

##### CAN Error Handling for Interior Illumination Specific Signals

If a Signal gateway message or Frame gateway message containing either Dimming\_Lvl, or HMI\_HMIMode\_St signal has an update bit which shows “not updated” (signal went “missing”) for less than a period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall continue using last known value of those signals.

If a Signal gateway message or Frame gateway message containing Dimming\_Lvl, or HMI\_HMIMode\_St signal has an update bit which shows “not updated” (signal went missing) for greater than a period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall follow the following logic:

|  |  |  |
| --- | --- | --- |
| **CAN Input Signals** | | **Output for Dimming Algorithm** |
| **Dimming\_lvl** | **Ignition\_Status** | **Dimming\_lvl** |
| Off / missing / unused / invalid | Not-OFF | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Off/ unused / invalid / missing (on reset) | OFF | OFF |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Input Signals** | | | **Internal Illumination Handling** |
| **Ignition\_Status** | **HMI\_HMIMode\_St** | **Dimming\_Lvl** | **Dimming\_Lvl** |
| Run, Start | Don’t care | 0x0 to 0x12 | 0x0 to 0x12 |
| Not (Run, Start) | Don’t care | 0x1 to 0x12 | 0x1 to 0x12 |
| Not (Run, Start) | On | 0x0 (OFF) / missing / invalid | Last received value in range (0x1 to 0x12) 1) |
| Not (Run, Start) | OFF | missing / invalid | Last received value in range (0x0 to 0x12) 2) |
| Not (Run, Start) | Off | 0x0 (OFF) | OFF |

1. 0xC if last received value in range 0x1 to 0x12Dimming\_Lvl cannot be retrieved, only on battery re-connect or ECU reset.
2. 0xC if last received value in range 0x1 to 0x12Dimming\_Lvl cannot be retrieved (only on battery re-connect or ECU reset.

##### CAN Error Handling for remaining (non-Interior Illumination) Signals

* If a Signal gateway or Frame gateway message containing the transmitted signal has an update bit which shows “not updated” for less than as period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall continue using last known value of the signal
* If a Signal gateway or Frame gateway message containing the transmitted signal has an update bit which shows “not updated” for greater than as period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall use the signal’s default value as listed in the data dictionary

##### CAN Error Handling for Signal Gateway Messages

* If a Signal gateway message containing the transmitted signal has an update bit which shows “not updated” for less than as period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall continue using last known value of the signal
* If a Signal gateway message containing the transmitted signal has an update bit which shows “not updated” for greater than as period of time as per “Diagnostic Fault Coverage and DTC Numbers Design Consideration” (typically 5 seconds). Then the subscriber shall use the signal’s default value as listed in the data dictionary

##### LIN Signal Requirements

It should be noted that the following section does not cover the level of details included under the previous “CAN Signal Requirements”, since that level of details is owned and controlled by the LIN module owner, and contained within the LDFs.

The intention of this section is to list the required LIN signals to ensure that they are not discarded due to any future LDF updates.

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Dimming\_lvl |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Litval |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Wfsuperstate |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Wfsubstate |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | WelcomeFarewell\_State |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | WelcomeFarewell\_Substate |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Customer\_Color |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Customer\_Intensity |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

|  |  |
| --- | --- |
| **Signal Database Detail** | **Value** |
| Signal Name | Ignition\_Status |
| Source Network | LIN |
| Signal refresh rate | <=40ms |
| Signal Domain | Refer to Data Dictionary |
| Signal Transmit Strategy | <=40ms Event Periodic |
| Signal Send Type | OnChange |
| Signal Transmit Cycle Time | <=40ms Event Periodic |
| Publishing ECU | BCM |

### ECU specific requirements

All illumination-controlling modules are expected to meet or not violate all the applicable requirements listed within section 3.2

#### Body Control Module (BCM) Requirements

The BCM shall meet the requirements listed within section 3.2 “Welcome/Farewell State and Sub-state determination” section/function and transmit the appropriate State and Sub-state over CAN and LIN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Logical Data-flows & Vehicle Harmony RQT call-outs** | | **CAN Signals** | | **LIN Signals** | | | | **CAN/LIN Signals** |
| **Welcome/ Farewell State** | **Welcome/ Farewell Substate** | **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** | **Wfsuperstate** | **WFsubstate** | **WelcomeFarewell \_State** | **WelcomeFarewell \_SubState** | **Dimming\_lvl** |
| Welcome | Approach Detection | WELCOME | APPROACH | WELCOME | Approach | WELCOME | APPROACH | Off |
| Welcome | Illuminated Entry | WELCOME | ILLUMINATEDENTRY | WELCOME | IllumEntry | WELCOME | ENTRY | Off |
| Welcome | Courtesy Lighting - All | WELCOME | COURTESYLIGHTINGALL | WELCOME | DoorAjar CourtesyLight | WELCOME | DOOR | Non-OFF |
| Welcome | Courtesy Lighting Delay - All | WELCOME | COURTESYLIGHTINGDELAYALL | WELCOME | Courtesy LightDelay | WELCOME | DELAY | Non-OFF |
| Welcome | Courtesy Lighting - Extended | WELCOME | COURTESYLIGHTINGEXTENDED | Don’t Care | NULL | Don’t Care | NULL | Off |
| Welcome | Courtesy Lighting Delay - Extended | WELCOME | COURTESYLIGHTINGDELAYEXT | Don’t Care | NULL | Don’t Care | NULL | Off |
| Welcome | NULL | WELCOME | NULL | WELCOME | NULL | WELCOME | NULL | Off |
| Ignition  Run/Start | Don’t care | RUNSTART | Don’t care | RUNSTART | Don’t care | RUN\_START | Don’t’ Care | Non-OFF |
| Farewell | Illuminated Exit | FAREWELL | ILLUMINATEDEXIT | FAREWELL | IllumExit | FAREWELL | EXIT | Non-OFF |
| Farewell | Courtesy Lighting - All | FAREWELL | COURTESYLIGHTINGALL | FAREWELL | DoorAjar CourtesyLight | FAREWELL | DOOR | Non-OFF |
| Farewell | Courtesy Lighting Delay - All | FAREWELL | COURTESYLIGHTINGDELAYALL | FAREWELL | Courtesy LightDelay | FAREWELL | DELAY | Non-OFF |
| Farewell | Courtesy Lighting - Extended | FAREWELL | COURTESYLIGHTINGEXTENDED | Don’t Care | NULL | Don’t Care | NULL | Off |
| Farewell | Courtesy Lighting Delay - Extended | FAREWELL | COURTESYLIGHTINGDELAYEXT | Don’t Care | NULL | Don’t Care | NULL | Off |
| Farewell | NULL | FAREWELL | NULL | FAREWELL | NULL | FAREWELL | NULL | Off |
| NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | Off |

##### BCM Hardwired Exterior Illumination:

The BCM shall utilize the following functions to support illumination control of Exterior Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it (combination of Front, Rear, and Supplementary):

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 700ms
  + Fade Off = 1700ms
* “LE\_WF\_Illumination Response”, section 5.4.

##### BCM Hardwired Interior Courtesy Lamp Illumination:

The BCM shall utilize the following functions to support illumination control of Interior Courtesy Lamps, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it (combination of Dome Lamps and Cargo Lamps):

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 700ms
  + Fade Off = 1700ms
* “LE\_WF\_Illumination Response”, section 5.4.

##### BCM Hardwired Switch Backlighting Illumination:

The BCM shall utilize the following functions to support illumination control of Interior Switch Backlighting, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 700ms
  + Fade Off = 1700ms
* “LE\_WF\_Illumination Response”, section 5.4.

##### BCM Hardwired Illumination Summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Logical Data-flows & Vehicle Harmony RQT call-outs** | | **Exterior Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Interior Courtesy Lamp “LE\_WF\_Illumination\_Requestor” summary1** | **Switch Backlighting “LE\_WF\_Illumination\_Requestor” summary1** |
| **Welcome/ Farewell State** | **Welcome/ Farewell Substate** |
| Welcome | Approach Detection | “Fade On” | “Fade On” | “Fade Off” or “Off” |
| Welcome | Illuminated Entry | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” | “Fade Off” or “Off” |
| Welcome | Courtesy Lighting - All | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” |
| Welcome | Courtesy Lighting Delay - All | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” |
| Welcome | Courtesy Lighting - Extended | “Fade Off” or “Off” | “Fade On” or “On/Embrace” | “Fade Off” or “Off” |
| Welcome | Courtesy Lighting Delay - Extended | “Fade Off” or “Off” | “Fade Off” or “Off” | “Fade Off” or “Off” |
| Welcome | NULL | “Fade Off” or “Off” | “Fade Off” or “Off” | “Fade Off” or “Off” |
| Ignition  Run/Start | Don’t care | In-drive setting/Legislative mode | In-drive setting/Legislative mode | In-drive setting/Legislative mode |
| Farewell | Illuminated Exit | “On/Embrace” | “On/Embrace” | “On/Embrace” |
| Farewell | Courtesy Lighting - All | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” |
| Farewell | Courtesy Lighting Delay - All | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” | “Fade On” or “On/Embrace” |
| Farewell | Courtesy Lighting - Extended | “Fade Off” or “Off” | “Fade On” or “On/Embrace” | “Fade Off” or “Off” |
| Farewell | Courtesy Lighting Delay - Extended | “Fade Off” or “Off” | “Fade Off” or “Off” | “Fade Off” or “Off” |
| Farewell | NULL | “Fade Off” or “Off” | “Fade Off” or “Off” | “Fade Off” or “Off” |
| NULL | NULL | “Fade Off” or “Off” | “Fade Off” or “Off” | “Fade Off” or “Off” |

Note 1: Summary is a generic response, exact response per each Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

#### LED Driver Module (LDM) requirements

The LDM shall utilize the following functions and signals to support illumination control of Front Exterior Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “WFState” and “WFSubstate” published by BCM via LIN as part of “Welcome/Farewell State and Sub-state determination” function in section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 3 seconds
  + Fade Off = 5 seconds
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |
| --- | --- | --- |
| **LIN Signals** | | **Front Exterior Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **Wfstate** | **WFsubstate** |
| WELCOME | Approach | “Fade On” or “On/Embrace” |
| WELCOME | IllumEntry | “Fade On” or “On/Embrace” |
| WELCOME | DoorAjarCourtesyLight | “Fade On” or “On/Embrace” |
| WELCOME | CourtesyLightDelay | “Fade On” or “On/Embrace” |
| WELCOME | NULL | “Fade Off” or “Off” |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | IllumExit | “On” |
| FAREWELL | DoorAjarCourtesyLight | “Fade On” or “On/Embrace” |
| FAREWELL | CourtesyLightDelay | “Fade On” or “On/Embrace” |
| FAREWELL | NULL | “Fade Off” or “Off” |
| NULL | NULL | “Fade Off” or “Off” |

Note 1: Summary is a generic response, exact response per each Front Exterior Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

#### Rear Fade-Control-Module (R-FCM) requirements

The R-FCM shall utilize the following functions and signals to support illumination control of Rear Exterior Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “WFState” and “WFSubstate” published by BCM via LIN as part of “Welcome/Farewell State and Sub-state determination” function in section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 3 seconds
  + Fade Off = 5 seconds
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |
| --- | --- | --- |
| **LIN Signals** | | **Rear Exterior Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **Wfsuperstate** | **WFsubstate** |
| WELCOME | Approach | “Fade On” |
| WELCOME | IllumEntry | “Fade On” or “On/Embrace” |
| WELCOME | DoorAjarCourtesyLight | “Fade On” or “On/Embrace” |
| WELCOME | CourtesyLightDelay | “Fade On” or “On/Embrace” |
| WELCOME | NULL | “Fade Off” or “Off” |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | IllumExit | “On/Embrace” |
| FAREWELL | DoorAjarCourtesyLight | “Fade On” or “On/Embrace” |
| FAREWELL | CourtesyLightDelay | “Fade On” or “On/Embrace” |
| FAREWELL | NULL | “Fade Off” or “Off” |
| NULL | NULL | “Fade Off” or “Off” |

Note 1: Summary is a generic response, exact response per each Rear Exterior Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

#### Overhead Console (OHC) requirements

The OHC shall utilize the following functions and signals to support illumination control of Interior Courtesy Lamp Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “WelcomeFarewell\_State” and “WelcomeFarewell\_Substate” published by BCM via LIN as part of “Welcome/Farewell State and Sub-state determination” function in section 5.2.
  + Additionally subscribe to Door Ajar Signals (listed below)
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 3 seconds
  + Fade Off = 5 seconds
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **LIN Signals** | | | **Interior Courtesy Lamp Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **Welcome Farewell\_State** | **Welcome Farewell\_Substate** | **Door\_Ajar\_Status** |
| WELCOME | Approach | Don’t Care | “Fade On” |
| WELCOME | IllumEntry | Don’t Care | “Fade On” or “On/Embrace” |
| WELCOME | Door | Don’t Care | “Fade On” or “On/Embrace” |
| WELCOME | Delay | Don’t Care | “Fade On” or “On/Embrace” |
| WELCOME | NULL | DF\_Door\_Ajar\_Status | PF\_Door\_Ajar\_Status |  DR\_Door\_Ajar\_Status |  PR\_Door\_Ajar\_Status = Open | “Fade On” or “On/Embrace” |
| WELCOME | NULL | DF\_Door\_Ajar\_Status & PF\_Door\_Ajar\_Status &  DR\_Door\_Ajar\_Status &  PR\_Door\_Ajar\_Status = Closed | “Fade Off” or “Off” |
| RUNSTART | Don’t care | Don’t Care | In-drive setting/Legislative mode |
| FAREWELL | IllumExit | Don’t Care | “On/Embrace” |
| FAREWELL | Door | Don’t Care | “Fade On” or “On/Embrace” |
| FAREWELL | Delay | Don’t Care | “Fade On” or “On/Embrace” |
| FAREWELL | NULL | DF\_Door\_Ajar\_Status | PF\_Door\_Ajar\_Status |  DR\_Door\_Ajar\_Status |  PR\_Door\_Ajar\_Status = Open | “Fade On” or “On/Embrace” |
| FAREWELL | NULL | DF\_Door\_Ajar\_Status & PF\_Door\_Ajar\_Status &  DR\_Door\_Ajar\_Status &  PR\_Door\_Ajar\_Status = Closed | “Fade Off” or “Off” |
| NULL | NULL | DF\_Door\_Ajar\_Status | PF\_Door\_Ajar\_Status |  DR\_Door\_Ajar\_Status |  PR\_Door\_Ajar\_Status = Open | “Fade On” or “On/Embrace” |
| NULL | NULL | DF\_Door\_Ajar\_Status & PF\_Door\_Ajar\_Status &  DR\_Door\_Ajar\_Status &  PR\_Door\_Ajar\_Status = Closed | “Fade Off” or “Off” |

Note 1: Summary is a generic response, exact response per each Interior Courtesy Lamp Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

#### Ambient Light Module (ALM) & Mini-ICP requirements---LIN

The ALM and Mini-ICP shall utilize the following functions and signals to support illumination control of Interior Ambient Lighting and Mini-ICP Illumination, as per RQT-002004-704098 DNA, directly hardwired to it:

* Subscribe to “WelcomeFarewell\_State” and “WelcomeFarewell\_Substate” published by BCM via LIN as part of “Welcome/Farewell State and Sub-state determination” function in section 5.2.
  + Additionally subscribe to “Customer\_Color” and “Customer\_Intensity”
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 700ms
  + Fade Off = 1700ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |
| --- | --- | --- |
| **LIN Signals** | | **Interior Ambient Lighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **Welcome Farewell\_State** | **Welcome Farewell\_Substate** |
| WELCOME | Approach | “Fade On” **2** |
| WELCOME | Entry | “Fade On” or “On/Embrace” **2** |
| WELCOME | Door | “Fade On” or “On/Embrace” **2** |
| WELCOME | Delay | “Fade On” or “On/Embrace” **2** |
| WELCOME | NULL | “Fade Off” or “Off” |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | Exit | “On/Embrace” **2** |
| FAREWELL | Door | “Fade On” or “On/Embrace” **2** |
| FAREWELL | Delay | “Fade On” or “On/Embrace” **2** |
| FAREWELL | NULL | “Fade Off” or “Off” |
| NULL | NULL | “Fade Off” or “Off” |

Note 1: Summary is a generic response, exact response per each Interior Ambient Lighting Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall monitor Customer\_Color and Customer\_Intensity to determine Color and Intensity of ambient lighting while illuminated

#### Headlamp Switch (HDLPSW-LIN) requirements

The HDLPSW-LIN shall utilize the following functions and signals to support illumination control of Switch-Backlighting Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “Dimming\_lvl” published by BCM via LIN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **LIN Signals** | | **Switch-Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” | Off |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” to intensity | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

#### Steering Column Control Module (SCCM) requirements

The SCCM shall utilize the following functions and signals to support illumination control of Switch-Backlighting Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Switch-Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” | Off |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” to intensity | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

#### Instrument Panel Cluster (IPC) requirements

##### IPC Welcome/Farewell Graphics

The IPC shall utilize the following functions to support Welcome/Farewell animation transitions, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, for displays directly connected to it:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Welcome/Farewell Display”, section 5.5

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Inputs** | | **LE\_WF\_Welcome/Farewell Display** | |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** | **Welcome/Farewell Animation Request** | **Odometer display** |
| WELCOME | APPROACH | Wake-up display | Off |
| WELCOME | ILLUMINATEDENTRY | Wake-up display (stay awake) | Off |
| WELCOME | COURTESYLIGHTINGALL | Welcome Animation1 | On2 |
| WELCOME | COURTESYLIGHTINGDELAYALL | Welcome Animation1 | Off |
| WELCOME | COURTESYLIGHTINGEXTENDED | Off (stay awake) | Off |
| WELCOME | COURTESYLIGHTINGDELAYEXT | Off (stay awake) | Off |
| WELCOME | NULL | Off (Sleep) | Off |
| RUNSTART | Don’t care | Vehicle Start Animation1 then transition to in-drive display | On2 |
| FAREWELL | ILLUMINATEDEXIT | Background | On2 |
| FAREWELL | COURTESYLIGHTINGALL | Farewell Animation | On2 |
| FAREWELL | COURTESYLIGHTINGDELAYALL | Off (Sleep) | Off |
| FAREWELL | COURTESYLIGHTINGEXTENDED | Off (Sleep) | Off |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | Off (Sleep) | Off |
| FAREWELL | NULL | Off (Sleep) | Off |
| NULL | NULL | Off (Sleep) | Off |

Note 1: Specific animation owned by HMI and Studio group.

Note 2: Intensity to illuminate to dimming\_lvl, refer to section 6.1.2.2.3 “CAN Error Handling for Interior Illumination Specific Signals” for additional details

##### IPC Display Intensity and Backlighting

The IPC shall utilize the following functions to support illumination control of its Display and all other lighting emitting sources within it i.e. backlighting, halo rings, gauges etc. as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Display and Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” **3** | Off**3** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” to intensity | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

Note 3: Illuminate to Night\_12 intensity if warnings present, for duration of active warning.

#### Accessory Protocol Interface Module (APIM/SYNC) requirements

##### APIM Welcome/Farewell Graphics

The APIM shall utilize the following functions to support Welcome/Farewell animation transitions, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, for displays directly connected to it:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Welcome/Farewell Display”, section 5.5

|  |  |  |
| --- | --- | --- |
| **CAN Inputs** | | **LE\_WF\_Welcome/Farewell Display** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** | **Welcome/Farewell Animation Request** |
| WELCOME | APPROACH | Wake-up display |
| WELCOME | ILLUMINATEDENTRY | Wake-up display (stay awake) |
| WELCOME | COURTESYLIGHTINGALL | Welcome Animation1 |
| WELCOME | COURTESYLIGHTINGDELAYALL | Welcome Animation1 |
| WELCOME | COURTESYLIGHTINGEXTENDED | Off (stay awake) |
| WELCOME | COURTESYLIGHTINGDELAYEXT | Off (stay awake) |
| WELCOME | NULL | Off (Sleep) |
| RUNSTART | Don’t care | Vehicle Start Animation3 then transition to in-drive display |
| FAREWELL | ILLUMINATEDEXIT | ON |
| FAREWELL | COURTESYLIGHTINGALL | Farewell animation1 |
| FAREWELL | COURTESYLIGHTINGDELAYALL | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGEXTENDED | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | Off (Sleep) |
| FAREWELL | NULL | Off (Sleep) |
| NULL | NULL | Off (Sleep) |

Note 1: Specific animation owned by HMI and Studio group.

##### APIM Display Intensity and Backlighting

The APIM shall utilize the following functions to support illumination control of its Display and all other lighting emitting sources within it i.e. switch backlighting etc. as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAN Signals** | | | **Display and Backlighting Illumination “LE\_WF\_Illumination\_ Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** | **HMI\_HMIMode\_St (Extended Play)** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | Off | “Fade Off” or “Off” | Off |
| Off/ unused / invalid / missing (on reset) | OFF | Not-OFF | “Fade On” or “On/Embrace” | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

Note 3: Only applicable to Audio Control switch/knob backlighting. Remaining backlighting can go to OFF. If previous Dimming\_lvl non-OFF value cannot be determined, illuminate to Night\_12 intensity

#### Front Control Interface Module (FCIM, FCIMB) requirements

##### FCIM/FCIMB Display Intensity and Backlighting

The FCIM/FCIMB shall utilize the following functions to support illumination control of its switch backlighting. as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM and “HMI\_HMIMode\_St published by APIM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAN Signals** | | | **Backlighting Illumination “LE\_WF\_Illumination\_ Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** | **HMI\_HMIMode\_St (Extended Play)** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | Off | “Fade Off” or “Off” | Off |
| Off/ unused / invalid / missing (on reset) | OFF | Not-OFF | “Fade On” or “On/Embrace” | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

Note 3: Only applicable to Audio Control switch/knob backlighting. Remaining backlighting can go to OFF. If previous Dimming\_lvl non-OFF value cannot be determined, illuminate to Night\_12 intensity

#### Rear Audio Control Module (RACM) requirements

##### RACM Welcome/Farewell Graphics

The RACM shall utilize the following functions to support Welcome/Farewell animation transitions, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, for displays directly connected to it:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Welcome/Farewell Display”, section 5.5

|  |  |  |
| --- | --- | --- |
| **CAN Inputs** | | **LE\_WF\_Welcome/Farewell Display** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** | **Welcome/Farewell Animation Request** |
| WELCOME | APPROACH | OFF(but Wake-up display) |
| WELCOME | ILLUMINATEDENTRY | **OFF** - But Wake-up Display (Or Stay Awake, If Already Awake) |
| WELCOME | COURTESYLIGHTINGALL | **ON** - Start Welcome Animation |
| WELCOME | COURTESYLIGHTINGDELAYALL | **ON** - (And Continue Welcome Animation1 Until End, If Applicable) |
| WELCOME | COURTESYLIGHTINGEXTENDED | Off (stay awake) |
| WELCOME | COURTESYLIGHTINGDELAYEXT | Off (stay awake) |
| WELCOME | NULL | Off (Sleep) |
| RUNSTART | Don’t care | **ON** - Usable Interface ASAP |
| FAREWELL | ILLUMINATEDEXIT | **ON** - Usable Interface ASAP  (Only ON if Display not Manually Turned OFF) |
| FAREWELL | COURTESYLIGHTINGALL | **ON** - Start Farewell Screen/Animation and Continue Until End |
| FAREWELL | COURTESYLIGHTINGDELAYALL | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGEXTENDED | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | Off (Sleep) |
| FAREWELL | NULL | Off (Sleep) |
| NULL | NULL | Off (Sleep) |

Note 1: Specific animation owned by HMI and Studio group.

##### RACM Display Intensity and Backlighting

The RACM shall utilize the following functions to support illumination control of its Display and all other lighting emitting sources within it i.e. switch backlighting etc. as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM and “HMI\_HMIMode\_St published by APIM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAN Signals** | | | **Display and Backlighting Illumination “LE\_WF\_Illumination\_ Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** | **HMI\_HMIMode\_St (Extended Play)** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | Don’t’ Care | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | Don’t Care | “Fade On” or “On/Embrace” to intensity | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** (until “OFF” is received) |
| Off/ unused / invalid / missing (on reset) | OFF | Off | “Fade Off” or “Off” | Off |
| Off/ unused / invalid / missing (on reset) | OFF | Not-OFF | “Fade On” or “On/Embrace” | Last non-OFF value:  Night\_1 ... Night\_12, Day\_1 … Day\_6**3** |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

Note 3: Only applicable to Audio Control switch/knob backlighting. Remaining backlighting can go to OFF. If previous Dimming\_lvl non-OFF value cannot be determined, illuminate to Night\_12 intensity

#### Austere Heads-Up Display (aHUD) requirements

##### aHUD Welcome/Farewell Graphics

The aHUD shall utilize the following functions to support Welcome/Farewell animation transitions, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, for displays directly connected to it:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Welcome/Farewell Display”, section 5.5

|  |  |  |
| --- | --- | --- |
| **CAN Inputs** | | **LE\_WF\_Welcome/Farewell Display** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** | **Welcome/Farewell Animation Request** |
| WELCOME | APPROACH | Wake-up display |
| WELCOME | ILLUMINATEDENTRY | Wake-up display (stay awake) |
| WELCOME | COURTESYLIGHTINGALL | Off (stay awake) |
| WELCOME | COURTESYLIGHTINGDELAYALL | Off (stay awake) |
| WELCOME | COURTESYLIGHTINGEXTENDED | Off (stay awake) |
| WELCOME | COURTESYLIGHTINGDELAYEXT | Off (stay awake) |
| WELCOME | NULL | Off (Sleep) |
| RUNSTART | Don’t care | Vehicle Start Animation3 then transition to in-drive display |
| FAREWELL | ILLUMINATEDEXIT | Farewell animation1 |
| FAREWELL | COURTESYLIGHTINGALL | Off (stay awake) |
| FAREWELL | COURTESYLIGHTINGDELAYALL | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGEXTENDED | Off (Sleep) |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | Off (Sleep) |
| FAREWELL | NULL | Off (Sleep) |
| NULL | NULL | Off (Sleep) |

Note 1: Specific animation owned by HMI and Studio group.

##### aHUD Display Intensity and Backlighting

The aHUD shall utilize the following functions to support illumination control of its Display and all other lighting emitting sources as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Display and Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” **3** | Off**3** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

Note 3: Illuminate to Night\_12 intensity if warnings present, for duration of active warning.

#### Door Control Modules (DDM/PDM) requirements

##### DDM/PDM Hardwired Exterior Illumination:

The DDM/PDM shall utilize the following functions to support illumination control of Exterior Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it (combination of Puddle Lamps, Welcome Mats, Door Keypad Illumination):

* “Welcome/Farewell State and Sub-state determination”, section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 700ms
  + Fade Off = 1700ms
* “LE\_WF\_Illumination Response”, section 5.4.

##### DDM/PDM Auto-fold Mirrors Control:

The DDM/PDM shall utilize the following functions to support folding control of Mirrors, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* “Welcome/Farewell State and Sub-state determination”, section 5.2.

##### DDM/PDM Hardwired Exterior Illumination/Mirrors Summary:

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Exterior Illumination “LE\_WF\_ Illumination\_ Requestor” summary1** | **Autofold Mirrors**  **Ford/Lincoln** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** |
| WELCOME | APPROACH | “Fade On” or “Animation” | Unfold/Remain folded |
| WELCOME | ILLUMINATEDENTRY | “Fade On” or “Animation” | Unfold/Remain folded |
| WELCOME | COURTESYLIGHTINGALL | “Fade Off” or “Off” | Unfold/Remain folded |
| WELCOME | COURTESYLIGHTINGDELAYALL | “Off” | Unfold/Unfolded |
| WELCOME | COURTESYLIGHTINGEXTENDED | “Off” | Unfold/Fold |
| WELCOME | COURTESYLIGHTINGDELAYEXT | “Off” | Unfold/Unfold |
| WELCOME | NULL | “Off” | Don’t Care |
| RUNSTART | Don’t care | “Off” | Unfold (remain unfolded) |
| FAREWELL | ILLUMINATEDEXIT | “Off” | Unfold (remain unfolded) |
| FAREWELL | COURTESYLIGHTINGALL | “Off” | Unfold (remain unfolded) |
| FAREWELL | COURTESYLIGHTINGDELAYALL | “Off” | Unfold (remain unfolded) |
| FAREWELL | COURTESYLIGHTINGEXTENDED | “Off” | Unfold (remain unfolded) |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | “Off” | Unfold (remain unfolded) |
| FAREWELL | NULL | “Off” | Unfold (remain unfolded) |
| NULL | NULL | “Off” | Fold (remain folded) |

Note 1: Summary is a generic response, exact response per each Illumination element listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

##### DDM/PDM Hardwired Interior Switch Backlighting Illumination:

The DDM/PDM shall utilize the following functions to support illumination control of its Interior Trim Switch Backlighting as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Interior Switch Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” | Off |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

#### Rear-HVAC (R-HVAC) requirements

##### R-HVAC Hardwired Interior Switch Backlighting Illumination:

The R-HVAC shall utilize the following functions to support illumination control of its Switch Backlighting as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Interior Switch Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” | Off |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

#### All Terrain Control Module (ATCM/SDM) requirements

##### ATCM/SDM Hardwired Interior Switch Backlighting Illumination:

The ATCM/SDM shall utilize the following functions to support illumination control of its Switch Backlighting as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles:

* Subscribe to “Dimming\_lvl” published by BCM via CAN.
  + Additionally subscribe to “Litval” to meet “Smooth Dimming” requirements
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 40ms
  + Fade Off = 40ms
* “LE\_WF\_Illumination Response”, section 5.4.

|  |  |  |  |
| --- | --- | --- | --- |
| **CAN Signals** | | **Interior Switch Backlighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** | **Illumination Intensity2** |
| **Dimming\_lvl** | **Ignition\_Status** |
| Off/ unused / invalid / missing (on reset) | Not-OFF | “Fade On” or “On/Embrace” | Night\_12 |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | Not-OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | Not-OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6 |
| Off/ unused / invalid / missing (on reset) | OFF | “Fade Off” or “Off” | Off |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 | OFF | “Fade On” or “On/Embrace” | Night\_1 ... Night\_12, Day\_1 … Day\_6**2** |
| Night\_1 ... Night\_12, Day\_1 … Day\_6 -> Missing | OFF | “Fade On” or “On/Embrace” | Keep last valid Dimming\_lvl value > Missing (until “OFF” is received) |

Note 1: Summary is a generic response, exact response listed in RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles

Note 2: Shall also monitor and adjust illumination intensity based off of changes in Litval, in order to meet “Cockpit Illumination”/”Smooth Dimming” requirements listed in latest version of ES-H1BT-1A278-AA-VXX

#### Headlamp and Rear lamp Control Module requirements

##### Exterior Lighting Illumination:

The rear lighting modules shall utilize the following functions and signals to support illumination control of Rear Exterior Illumination, as per RQT-002004-021878 DNA Welcome-Farewell Strategy Rev. XX” for Ford vehicles and “RQT-002004-022094 Lincoln Embrace Welcome and Farewell Behavior Rev. XX” for Lincoln vehicles, directly hardwired to it:

* Subscribe to “VehWlcmFrwl\_D\_Stat” and “VehWlcmFrwlMde\_D\_Stat” sent by HCM via private CAN as part of “Welcome/Farewell State and Sub-state determination” function in section 5.2.
* “LE\_WF\_Illumination Requestor”, section 5.3, with the following default values:
  + Fade On = 3 seconds
  + Fade Off = 5 seconds
* “LE\_WF\_Illumination Response”, section 5.4.

##### Exterior Lighting Illumination Summary:

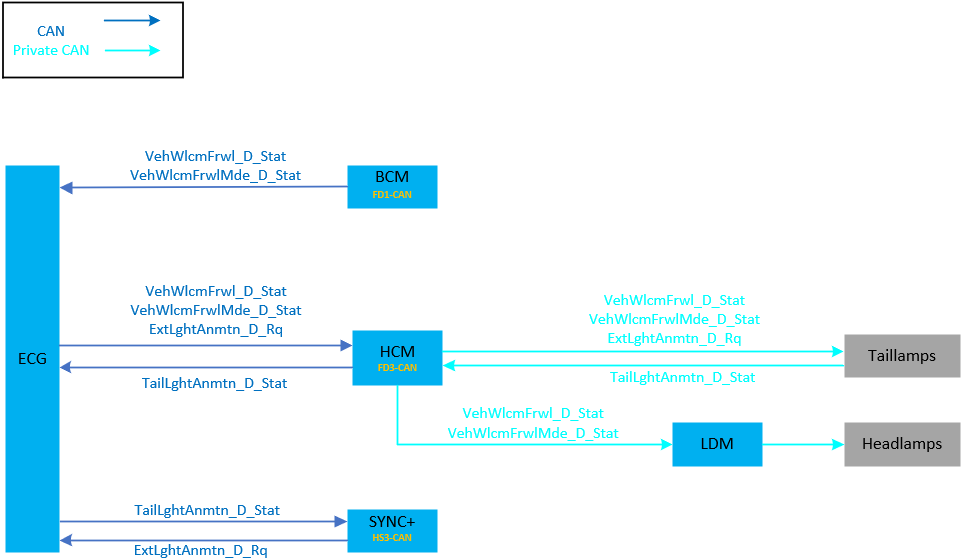
|  |  |  |
| --- | --- | --- |
| **Private CAN Signals** | | **Exterior Lighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** |
| WELCOME | APPROACH | “Fade On” or “Animation” |
| WELCOME | ILLUMINATEDENTRY | “Fade On” or “Animation” |
| WELCOME | COURTESYLIGHTINGALL | “On/Embrace” |
| WELCOME | COURTESYLIGHTINGEXTEND | “Off” |
| WELCOME | COURSTEYLIGHTINGDELAYALL | “On/Embrace” |
| WELCOME | COURSTEYLIGHTINGDELAYEXTEND | “On/Embrace” |
| WELCOME | NULL | “Fade Off” or “Off” |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | ILLUMINATEDEXIT | “On/Embrace” |
| FAREWELL | COURTESYLIGHTINGALL | On/Embrace” |
| FAREWELL | COURTESYLIGHTINGEXTEND | “Off” |
| FAREWELL | COURSTEYLIGHTINGDELAYALL | “On/Embrace” |
| FAREWELL | COURSTEYLIGHTINGDELAYEXTEND | “On/Embrace” |
| FAREWELL | NULL | “Fade Off” or “Off” |
| NULL | NULL | “Fade Off” or “Animation” |

###### 

#### Taillamp 3 types of animation

##### 6.1.3.17 .1 Boundary Diagram-3 types of rear lamp’s animation

Headlamp control module receives public CAN signals of “VehWlcmFrwl\_D\_Stat” and “VehWlcmFrwlMde\_D\_Stat” that send by BCM, and transmits these two signals via private CAN to headlamps and taillamps to indicate vehicle welcome farewell status.



Other than welcome farewell status signals, HCM also transmits the signal of “ExtLghtAnmtn\_D\_Rq” to taillamps that send by APIM\_CIM(SYNC+) which indicates which exterior lighting animation type is selected by customer through center screen.

Also, Taillamps would also send the private CAN signal of “TailLghtAnmtn\_D\_Stat” which tells HCM the real animation type that taillamps play. HCM would transmit the signal via public CAN to APIM\_CIM(SYNC+) and check if it matches with the selected animation.

##### 6.1.3.17.2 Rear Lighting Animation Setting

The rear lighting animation client interfaces with the user via HMI and is responsible for sending the rear lighting animation setting request to the rear lighting animation server.

The rear lighting animation server is responsible for the rear lighting animation function and interfaces with the rear lighting animation client.

##### 6.1.3.17.3 Use Cases

|  |  |
| --- | --- |
| **Actors** | Vehicle front seat occupant(s) |
| **Pre-conditions** | Ignition is ON  Center stack display is ON and stay at “Rear Lighting Animation” menu |
| **Scenario Description** | User selects an animation among three selections via rear lighting animation HMI |
| **Post-conditions** | The selected rear lighting animation is the new one and is saved in APIM  The selected animation signal transfers from APIM\_CIM to HCM via public CAN, then transfers via private CAN to taillamp modules  Rear lighting animation settings in HMI shows the animation is selected |
| **Notes** | The corresponding animation effect could be showed in HMI when user select it.  The specific HMI design is owned by studio or HMI team. |

##### 6.1.3.17.4 Interface Requirements

Message Type: Request

Note: Request signal from rear lighting animation client to rear lighting animation server to select which animation should be selected and showed for rear lighting.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| ExtLghtAnmtn\_D\_Rq | Null | 0x0 | Default value. |
| Type1 | 0x1 | The first type of exterior lighting animation. |
| Type2 | 0x2 | The second type of exterior lighting animation. |
| Type3 | 0x3 | The third type of exterior lighting animation. |
| Type4 | 0x4 | The fourth type of exterior lighting animation. |
| Type5 | 0x5 | The fifth type of exterior lighting animation. |
| Type6 | 0x6 | The sixth type of exterior lighting animation. |
| Type7 | 0x7 | Disable animation for exterior lighting. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| TailLghtAnmtn\_D\_Stat | Null | 0x0 | Default value. |
| Type1 | 0x1 | The first type of taillight animation is played. |
| Type2 | 0x2 | The second type of taillight animation is played. |
| Type3 | 0x3 | The third type of taillight animation is played. |
| Type4 | 0x4 | The fourth type of taillight animation is played. |
| Type5 | 0x5 | The fifth type of taillight animation is played. |
| Type6 | 0x6 | The sixth type of taillight animation is played. |
| Type7 | 0x7 | No animation for exterior lighting. |

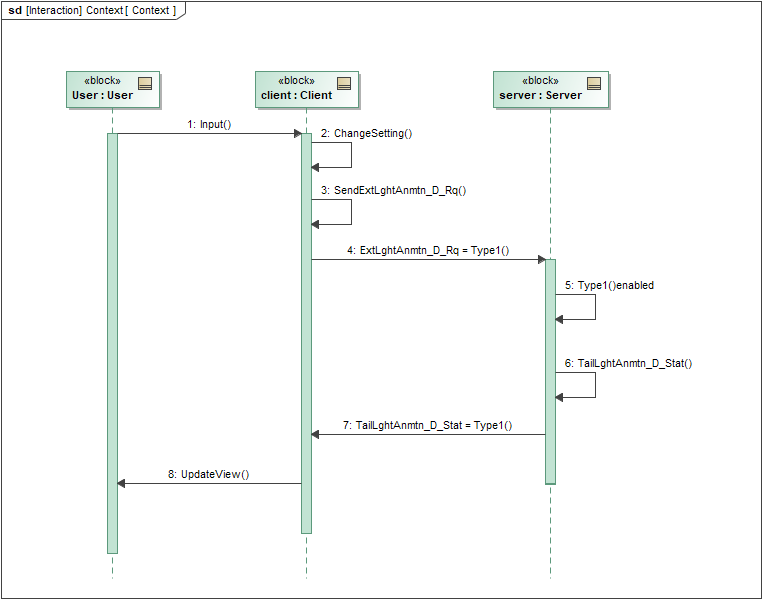
APIM\_CIM would send “ExtLghtAnmtn\_D\_Rq” for synchronization with taillamp when ignition is on every time. Apart from that, when customer click center screen for choosing a type of rear lighting animation, “ExtLghtAnmtn\_D\_Rq” will be sent also.

##### 6.1.3.17.5 Sequence Diagram

Pre-Condition:

Ignition Status is on

Center stack display is ON and stay at “Rear Lighting Animation” menu



#### Lincoln Embrace Lit Grille 3 animation (refer to lit grille feature spec)

##### Lit Grille animation decision table

|  |  |  |
| --- | --- | --- |
| **Private CAN Signals** | | **Exterior Lighting Illumination “LE\_WF\_Illumination\_Requestor” summary1** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** |
| WELCOME | APPROACH | “Fade On” or “Animation” |
| WELCOME | ILLUMINATEDENTRY | “Fade On” or “Animation” or Continue “Animation” |
| WELCOME | COURTESYLIGHTINGALL | “On/Embrace” or continue “animation” |
| WELCOME | COURTESYLIGHTINGEXTEND | “Off” |
| WELCOME | COURSTEYLIGHTINGDELAYALL | “On” |
| WELCOME | COURSTEYLIGHTINGDELAYEXTEND | “On” |
| WELCOME | NULL | “Fade Off” from on or remain “Off” |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | ILLUMINATEDEXIT | “On” |
| FAREWELL | COURTESYLIGHTINGALL | On” |
| FAREWELL | COURTESYLIGHTINGEXTEND | “Off” |
| FAREWELL | COURSTEYLIGHTINGDELAYALL | “On” |
| FAREWELL | COURSTEYLIGHTINGDELAYEXTEND | “On” |
| FAREWELL | NULL | “Fade Off” from on or remain “Off” |
| NULL | NULL | “Fade Off” or “Animation” |

\*Animation is from studio team, adjusted the output if needed after animation finalized.

##### 6.1.3.18.2 Boundary Diagram-3 types of lit grille animation (refer to Lit Grille feature spec)

VehWlcmFrwl\_D\_Stat

VehWlcmFrwlMde\_D\_Stat

Lit Grille Driver

BCM

HCM

APIM\_CIM

GrilleAnmtn\_Rq

GrilleAnmtn\_Stat

GrilleAnmtn\_IVI\_Rq

GrilleAnmtn\_IVI\_Stat

#### Ambient Light Control Module (ALCM) Requirements---CAN

##### 6.1.3.19.1 Ambient Lighting illumination in Lincoln Embrace

|  |  |  |
| --- | --- | --- |
| **CAN Inputs** | | **Interior Ambient Lighting Illumination** |
| **VehWlcmFrwl\_D\_Stat** | **VehWlcmFrwlMde\_D\_Stat** |
| WELCOME | APPROACH | Off |
| WELCOME | ILLUMINATEDENTRY | Off |
| WELCOME | COURTESYLIGHTINGALL | “Fade On” or Welcome Animation (final assumption depends on Studio input) |
| WELCOME | COURTESYLIGHTINGDELAYALL | Continue Welcome Animation + On (final assumption depends on Studio input) |
| WELCOME | COURTESYLIGHTINGEXTENDED | Fade Off or Off |
| WELCOME | COURTESYLIGHTINGDELAYEXT | Fade On |
| WELCOME | NULL | Fade Off or Off |
| RUNSTART | Don’t care | In-drive setting/Legislative mode |
| FAREWELL | ILLUMINATEDEXIT | On |
| FAREWELL | COURTESYLIGHTINGALL | “Fade On” or Farewell animation (final assumption depends on Studio input) |
| FAREWELL | COURTESYLIGHTINGDELAYALL | Continue Farewell Animation + On (final assumption depends on Studio input) |
| FAREWELL | COURTESYLIGHTINGEXTENDED | Fade Off or Off |
| FAREWELL | COURTESYLIGHTINGDELAYEXT | Fade On |
| FAREWELL | NULL | Fade Off or Off |
| NULL | NULL | Fade Off or Off |

##### 6.1.3.19.2 Lincoln Embrace Ambient Light 3 Animations（refer to ambient light feature spec）

Users can select 3 types of Lincoln Embrace ambient lighting animation via HMI setting. When users select the corresponding ambient lighting animation, IVI will send the signa : IVI\_ALCM\_WFTheme\_Rq to ALCM, and ALCM will feedback the signal ALCM\_WFTheme\_Num\_FB to IVI indicator if the corresponding animation selected successfully. And the corresponding Lincoln Embrace ambient lighting animation will play in the next time.

Users also can turn on/off the Lincoln Embrace ambient lighting animation via HMI setting. When users select to enable/disable the ambient lighting animation, IVI will send the signa : IVI\_User\_OnOff\_WF\_Rq to ALCM, and ALCM will feedback the signal ALCM\_User\_OnOff\_WF\_Stat to IVI to indicate if the animation is enabled/disable successfully. . And Lincoln Embrace ambient lighting animation will be enabled/disabled in the next time.

Boundary Diagram:

CAN Bus

LIN Bus

VehWlcmFrwl\_D\_Stat

VehWlcmFrwlMde\_D\_Stat

ALCM

LEDs

BCM

APIM\_CIM

IVI\_ALCM\_WFTheme\_Rq

IVI\_User\_OnOff\_WF\_Rq

ALCM\_WFTheme\_Num\_FB

ALCM\_User\_OnOff\_WF\_Stat

# Data Dictionary

## Dictionary

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **Customer\_Color**

Description: Color X, where X is a value in the range of 0 🡪 15 and corresponds to the customer’s selected color

Type: Discrete

Category: LIN

Initial Value: 0

Storage Class: Non-Volatile – Customer Set

Structure of Data: Scalar

Units: N/A

Resolution: 1

Min Value: 0

Max Value: 15

-------------------------------------------------------------------------------------------------------------------------------------------

Name: **Customer\_Intensity**

Description: A value in the range of 0 🡪 0xF and corresponds to the customer’s selected intensity.

Type: Discrete

Category: LIN

Initial Value: 1

Storage Class: Non-Volatile – Customer Set

Structure of Data: Scalar

Units: N/A

Resolution: 1

Min Value: 0

Max Value: 15

-------------------------------------------------------------------------------------------------------------------------------------------

Name: **Dimming\_Lvl**

Description: Intensity level of dimmable backlighting.

Type: Discrete

Category: CAN and LIN

Initial Value: NIGHT\_12

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

DAY\_1 daytime step 1, minimum daytime mode brightness

DAY\_2 daytime step 2

DAY\_3 daytime step 3

DAY\_4 daytime step 4

DAY\_5 daytime step 5

DAY\_6 daytime step 6, maximum daytime mode brightness

INVALID means that the BCM is not configured for Day-time Dimmable Backlighting

NIGHT\_1 nighttime step 1, minimum nighttime mode brightness

NIGHT\_10 nighttime step 10

NIGHT\_11 nighttime step 11

NIGHT\_12 nighttime step 12, maximum nighttime mode brightness

NIGHT\_2 nighttime step 2

NIGHT\_3 nighttime step 3

NIGHT\_4 nighttime step 4

NIGHT\_5 nighttime step 5

NIGHT\_6 nighttime step 6

NIGHT\_7 nighttime step 7

NIGHT\_8 nighttime step 8

NIGHT\_9 nighttime step 9

OFF backlighting is off

UNKNOWN is not used. BCM never sets this to UNKNOWN.

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **Litval**

Description: An indication of ambient light level for use by modules implementing non-standard dimmable backlighting.

Type: Discrete

Category: CAN & LIN

Initial Value: NIGHT

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

DAY ambient light is at day level

NIGHT ambient light is at night level

TWILIGHT\_1 ambient light is at twilight 1 level

TWILIGHT\_2 ambient light is at twilight 2 level

TWILIGHT\_3 ambient light is at twilight 3 level

TWILIGHT\_4 ambient light is at twilight 4 level

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **HMI\_HMIMode\_St**

Description: Multimedia system state

Type: Discrete

Category: CAN

Initial Value: OFF

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

Invalid Invalid state (error)

OffMode Sync screen is OFF

On Sync screen is ON

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **Ignition\_Status**

Description: The processed value for current Ignition state.

Type: Discrete

Category: CAN

Initial Value: OFF

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

ACC ignition is in the ACC position

OFF ignition is in the OFF position

RUN ignition is in the RUN position

START ignition is in the START position

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **Wfsuperstate**

Description: Indicates the different phases of Courtesy illumination. i.e Welcome/Farewell/Iginition Run.

Used by Exterior Lighting specific modules connected to BCM via LIN

Type: Discrete

Category: LIN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

OFF Vehicle is not in any part of Welcome/Farewell

WELCOME Vehicle is in Welcome State

RUNSTART Vehicle is in Ignition Run/Start State

FAREWELL Vehicle is in Farewell State

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **Wfsubstate**

Description: Tell the status of BCM current welcome farewell Substate(i.e. Entry, Door, Delay, Exit, Approach) on LIN. Used by Exterior Lighting specific modules connected to BCM via LIN

Type: Discrete

Category: LIN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

NULL Vehicle is either locked or timed out of states

IllumEntry Vehicle was unlocked from outside of vehicle

IllEXIT Vehicle ignition has transitioned to OFF

DoorAjarCourtesyLight Vehicle door(s) transitioned to Ajar

CourtesyLightDelay Vehicle door(s) transitioned from Ajar to all Closed

APPROACH Vehicle Approach was detected

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **WelcomeFarewell\_State**

Description: Indicates the different phases of Courtesy illumination. i.e Welcome/Farewell/Iginition Run. Used by Interior Lighting specific modules connected to BCM via LIN

Type: Discrete

Category: LIN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

NULL Vehicle is not in any part of Welcome/Farewell

WELCOME Vehicle is in Welcome State

RUN\_START Vehicle is in Ignition Run/Start State

FAREWELL Vehicle is in Farewell State

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **WelcomeFarewell\_Substate**

Description: Tell the status of BCM current welcome farewell Substate(i.e. Entry, Door, Delay, Exit, Approach) on LIN. Used by Interior Lighting specific modules connected to BCM via LIN

Type: Discrete

Category: LIN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

NULL Vehicle is either locked or timed out of states

APPROACH Vehicle Approach was detected

DELAY Vehicle door(s) transitioned from Ajar to all Closed

DOOR Vehicle door(s) transitioned to Ajar

ENTRY Vehicle was unlocked from outside of vehicle

EXIT Vehicle ignition has transitioned to OFF

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **VehWlcmFrwl\_D\_Stat**

Description: Indicates the different phases of Welcome/Farewell. i.e Welcome/Farewell/Iginition Run.

Type: Discrete

Category: CAN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

NULL Vehicle is not in any part of Welcome/Farewell

WELCOME Vehicle is in Welcome State

FAREWELL Vehicle is in Farewell State

RUNSTART Vehicle is in Ignition Run/Start State

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **VehWlcmFrwlMde\_D\_Stat**

Description: Tell the status of BCM current welcome farewell Substate on CAN.

Type: Discrete

Category: CAN

Initial Value: NULL

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

NULL Vehicle is either locked or timed out of states

APPROACH Vehicle Approach was detected

ILLUMINATEDENTRY Vehicle was unlocked from outside of vehicle

COURTESYLIGHTINGALL Vehicle door(s) transitioned to Ajar – Interior and Exterior

COURTESYLIGHTINGDELAYALL Vehicle door(s) transitioned from Ajar to all Closed – Interior and Exterior

COURTESYLIGHTINGEXTENDED Vehicle door(s) transitioned to Ajar – Interior only

COURTESYLIGHTINGDELAYEXT Vehicle door(s) transitioned from Ajar to all Closed – Interior only

ILLUMINATEDEXIT Vehicle ignition has transitioned to OFF

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **ExtLghtAnmtn\_D\_Rq**

Description: Request the customer selected animation type.

Type: Discrete

Category: CAN

Initial Value: Null

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

Null Default value.

Type1 The first type of exterior lighting animation.

Type2 The second type of exterior lighting animation.

Type3 The third type of exterior lighting animation.

Type4 The fourth type of exterior lighting animation.

Type5 The fifth type of exterior lighting animation.

Type6 The sixth type of exterior lighting animation.

Type7 Disable animation for exterior lighting.

--------------------------------------------------------------------------------------------------------------------------------------------

Name: **TailLghtAnmtn\_D\_Stat**

Description: Response from the taillight that indicates the type of animation played.

Type: Discrete

Category: CAN

Initial Value: Null

Storage Class: Volatile

Structure of Data: Scalar

Domain Domain Element Description

Null Default value.

Type1 The first type of taillight animation is played.

Type2 The second type of taillight animation is played.

Type3 The third type of taillight animation is played.

Type4 The fourth type of taillight animation is played.

Type5 The fifth type of taillight animation is played.

Type6 The sixth type of taillight animation is played.

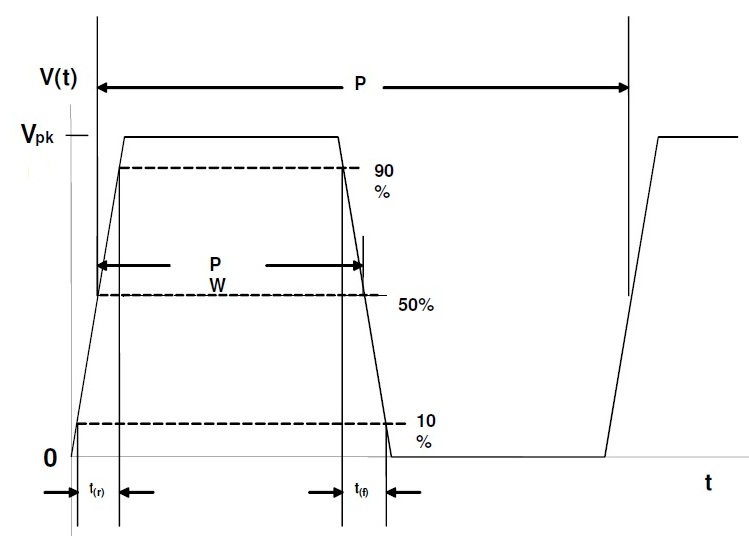
Type7 No animation for exterior lighting.

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision Level | Name | Change Description | Date |
| V2.0 | FEHSAN2 | Initial Release | 9/20/2018 |
| V2.2.2 | YWU150 | Headlamp Control Module Requirements | 4/27/2021 |
| V2.2.3 | Fliu86 | ExtLghtAnmtn\_D\_Rq\TailLghtAnmtn\_D\_Stat CAN signals add type7 requirement. | 8/31/2022 |

# APPENDIX

## Appendix 1: Exterior Lighting PWM Signal Specification



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Conditions: 1,2 System Voltage: 9.5 < Vsys < 16.0 volts  Ambient Temperature: -40oC < Tamb < 85oC | | | | | | |
| **No** | **Characteristic** | **Comment** | **Min** | **Typ** | **Max** | **Unit** |
| 1 | PWM output frequency 1/P for Incandescent Bulbs | Configurable in the ECU | 100 | 110 |  | Hz |
| 2 | PWM output frequency 1/P for LED Bulbs | Configurable in the ECU | 100 | 220 |  | Hz |
| 3 | Frequency jitter | Measured via 1 second sliding window |  |  | 0.1 | Δ % |
| 4 | PWM rise t(r) / fall time t(f) |  | 8 |  | 50 | µs |
| 5 | PWM output duty cycle Pw/P7 |  | 0 |  | 100 | % |
| 6 | PWM output duty cycle jitter | Measured via 1 second sliding window |  |  | 0.1 | Δ % |
| 7 | PWM output duty cycle tolerance total |  |  |  | 0.2 | Δ % |
| 8 | PWM resolution | 8 bit or better |  |  | 1/255 |  |
| 9 | PWM response time message 4 |  |  |  | 21 | ms |
| 10 | PWM response time voltage 5 |  |  |  | 18 | ms |
| 11 | Shortage to GND detection | Duty cycle while error detection active | 10 |  | 100 | % |
| 12 | Shortage to Ubat or open line detection | Duty cycle while error detection active | 0 |  | 90 | % |
| 13 | PWM output voltage (Vpk) | Short circuit & reverse battery protected | Vsys-1.5 |  |  | V |
| 14 | Ground Offset | See ELCOMP requirement RQT-191001-009976 & 009989 | | | | V |

Note 1: Specified values are valid for complete range of system voltage and ambient temperature.

Note 2: Output values are measured at the ECU with the PWM output and related to ECU GND.

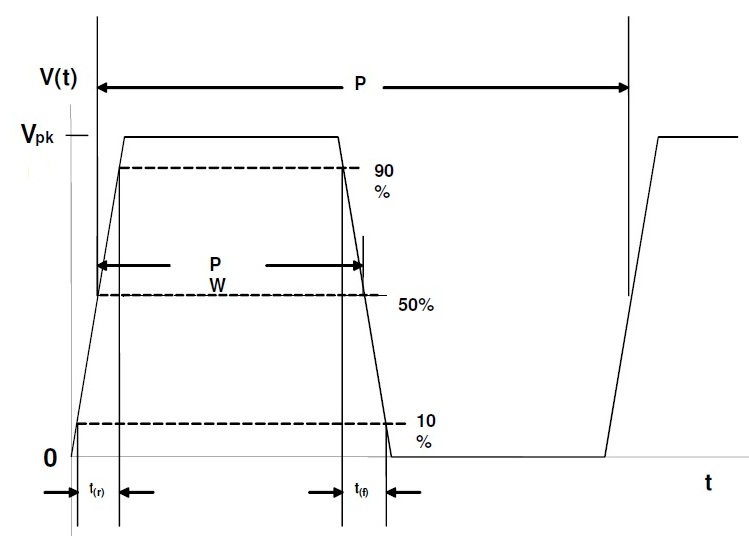
Note 4: Time when message is complete at bus to PWM response is measured at ECU PWM output.

Note 5: Time when voltage jump is applied to PWM response is measured at ECU PWM output.

Note 6: Any received PWM duty cycle shall be mapped to the closed available (taking into account

resolution) duty cycle in the receiving ECU.

## Appendix 2: Interior Lighting PWM Signal Specification



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Conditions: 1,2 System Voltage: 9.5 < Vsys < 16.0 volts  Ambient Temperature: -40oC < Tamb < 85oC | | | | | | |
| **No** | **Characteristic** | **Comment** | **Min** | **Typ** | **Max** | **Unit** |
| 1 | PWM output frequency 1/P for Incandescent Bulbs | Configurable in the ECU | 100 | 110 |  | Hz |
| 2 | PWM output frequency 1/P for LED Bulbs | Configurable in the ECU | 100 | 220 |  | Hz |
| 3 | Frequency jitter | Measured via 1 second sliding window |  |  | 0.1 | Δ % |
| 4 | PWM rise t(r) / fall time t(f) |  | 8 |  | 50 | µs |
| 5 | PWM output duty cycle Pw/P7 |  | 0 |  | 100 | % |
| 6 | PWM output duty cycle jitter | Measured via 1 second sliding window |  |  | 0.1 | Δ % |
| 7 | PWM output duty cycle tolerance total |  |  |  | 0.2 | Δ % |
| 8 | PWM resolution | 8 bit or better |  |  | 1/255 |  |
| 9 | PWM response time message 4 |  |  |  | 21 | ms |
| 10 | PWM response time voltage 5 |  |  |  | 18 | ms |
| 11 | Shortage to GND detection | Duty cycle while error detection active | 10 |  | 100 | % |
| 12 | Shortage to Ubat or open line detection | Duty cycle while error detection active | 0 |  | 90 | % |
| 13 | PWM output voltage (Vpk) | Short circuit & reverse battery protected | Vsys-1.5 |  |  | V |
| 14 | Ground Offset | See ELCOMP requirement RQT-191001-009976 & 009989 | | | | V |

Note 1: Specified values are valid for complete range of system voltage and ambient temperature.

Note 2: Output values are measured at the ECU with the PWM output and related to ECU GND.

Note 4: Time when message is complete at bus to PWM response is measured at ECU PWM output.

Note 5: Time when voltage jump is applied to PWM response is measured at ECU PWM output.

Note 6: Any received PWM duty cycle shall be mapped to the closed available (taking into account

resolution) duty cycle in the receiving ECU.

## Appendix 3: CAN LIN Signals Mapping Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | CAN:  **VehWlcmFrwl\_D\_Stat** |  | LIN: Interior Lighting  **WelcomeFarewell\_State** |  | LIN: Exterior Lighting  **Wfsuperstate** |
| 0 | NULL | 0 | NULL | 0 | OFF |
| 1 | WELCOME | 3 | WELCOME | 1 | WELCOME |
| 2 | FAREWELL | 1 | FAREWELL | 3 | FAREWELL |
| 3 | RUNSTART | 2 | RUN\_START | 2 | RUNSTART |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | CAN:  **VehWlcmFrwlMde\_D\_Stat** |  | LIN: Interior Lighting  **WelcomeFarewell\_Substate** |  | LIN: Exterior Lighting  **Wfsubstate** |
| 0 | NULL | 0 | NULL | 0 | NULL |
| 1 | APPROACH | 1 | APPROACH | 5 | APPROACH |
| 2 | ILLUMINATEDENTRY | 4 | ENTRY | 1 | IllumEntry |
| 3 | COURTESYLIGHTINGALL | 3 | DOOR | 3 | DoorAjarCourtesyLight |
| 4 | COURTESYLIGHTINGDELAYALL | 2 | DELAY | 4 | CourtesyLightDelay |
| 5 | COURTESYLIGHTINGEXTENDED | 0 | NULL | 0 | NULL |
| 6 | COURTESYLIGHTINGDELAYEXT | 2 | DELAY | 4 | CourtesyLightDelay |
| 7 | ILLUMINATEDEXIT | 5 | EXIT | 2 | IllumExit |