Trailer Light Check

F002052

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Important Note

You need to use the RE specification macros provided by the "RE_SpecificationMacroTemplate.dotm" (refer to "Utilities" on page "Specification Templates" in the RE Wiki) to allow seamless VSEM import of the specification content. ***Use only these RE specification macros to create requirements*** *in this specification. Refer to "How to use the Specification Templates" on how to enable and use the macros and the requirements templates in this specification.*

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1 INTRODUCTION

1.1 Document Purpose

The Aggregated Feature Specification (AFS) specifies a Feature from Feature level (customer & market perspective) down to Component level on an electrical platform.

The 3 chapters

- Feature Document
- Function Specifications
- Feature Implementation Specification

correspond to the 3 levels of the RE Information Model - Feature Level, Function Level, and Component Level (cross-ECU/platform view only). The AFS requirements are cascaded to the ECU Functional Specs on Component Level.

1.2 Document Scope

The following Feature from the Global Feature & Function List and its deployment to the electrical architecture is described in this AFS:

- Trailer Light Check

1.3 Document Audience

The AFS is authored by <Eric Vieira / Core Feature Owner>. All Stakeholders, i.e., all people who have a valid interest in the ECU behavior should read and, if possible, review the AFS. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the AFS.

1.3.1 Stakeholder List

For the latest list of the Feature stakeholders and their roles & responsibilities refer to VSEM Link.

1.4 Document Organization

1.4.1 Document Context

Refer to the Ford RE Wiki to get more information about the different Requirements Engineering (RE) templates (and how the AFS relates to those) and the overall RE approach for SW-enabled Features.

1.4.2 Document Structure

The structure of this document is explained below:

Section 1 – Introduction how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.
Section 2 – Feature Document. Defines the Feature level requirements of the Feature realized by the system described in this specification
Section 3 – Functional Architecture: Specifies the functional decomposition of the Feature.
Section 4 – Function Specifications: Specifies the Logical Functions of the functional architecture of the Feature.
Section 5 – Feature Implementation Specification: Specifies details of how the Feature / Logical Functions are deployed to the given electrical platform.
Section 6 – List Open Concerns
Section 7 – Revision History.
Section 8 – Appendix (Data Dictionary, etc.)

1.5 Document Conventions

1.5.1 Requirements Templates

Each requirement, use case or scenario in this specification shall follow the corresponding template given in the document template *Specification_Macros.dotm* at RE Wiki - Specification Templates.

1.5.1.1 Identification of requirements

The unique requirement ID given in the headline of any requirement follows the requirement throughout the development process. The requirement ID format follows a well-defined syntax.

All identifiers in this specification shall be composed of 4 parts:

- A leading prefix, which indicates the type of requirement (R=Requirement, UC=Use Case, SC=Scenario, …)
- A prefix, which indicates the abstraction level (F=Feature, FNC=Function, CMP = component).
- Followed by a name, indicating the scope, which the requirement belongs to (e.g. feature or function name)
- Ending with the actual requirement number

Example:

R_CMP_LockArbitrator_00004	This is the fourth requirement on component level for the function Lock Arbitrator.

1.5.1.2 Requirements Attributes

The templates provided by *Specification_Macros.dotm* define a list of attributes for each requirement. This helps to classify the requirement. The attributes are explained at RE Wiki - Requirements Attributes.

1.6 References

1.6.1 Ford documents

List here all Ford internal documents, which are directly related to the feature.

Reference	Doc. ID	Title	Revision
Spec 1	FS-LU5T-14B476-AAA	Functional Specification Body Control Module	12.02
	FS-MU5T-14B476-ACJ		
	FS-NU5T-14B476-AAF		
	FS-PU5T-14B476-AGB	Functional Specification Body Control Module	15.07
	FDS004146	AppLink	1.31
	VDOC076964-Trailer Light Check ECG SPSS	ECG Infotainment SPSS	1.4
	VDOC079457-Trailer Light Check APIM SPSS	APIM Infotainment SPSS	1.1
	VDOC012447-FS DG9T-19H517-AB	Functional Specification TTLM (GEN I)	AB
	VDOC088749-FS-NU5T-19H517-AA005	Functional Specification iTRM (TTLM GEN II)	1.4
	VDOC081877-FS-MU5T-19J294-AC	Functional Specification iTRM	1.8
	VSEM ID FDS051699	BCM MY23 GEN III - FS & Model Releases	R04^3
	VSEM ID FDS031885	BCM MY21 GEN I M - FS & Model Releases	RC02^3
	VSEM ID FDS042133	BCM MY22 GEN I M - FS & Model Releases	RC01.2^2

Table 1: Ford Documents

1.6.2 External documents and publications

The list of external documents should include e.g. relevant standards.

Reference	Doc. ID	Title	Revision
1	N/A	FMVSS 108 - Lamps, Reflective Devices, And Associated Equipment	N/A
2	N/A	ECE R/48 Rev.7 - Vehicles with Regard to The Installation of Lighting And Light Signaling Devices	7

Table 2: External documents and publications

1.7 Glossary

1.7.1 Definitions

Definition	Description
Vehicle Stationary	Vehicle is defined as stationary if vehicle speed is less than 4 KPH and vehicle in in the “Parked State”
Parked State	On automatic transmissions, the vehicle PRNDL is in “PARK” and for manual transmissions, the vehicle has the parking brake applied
Parking / position lamps	Notionally the parking/position lights. Legal issues prevent us saying parking position lights without saying side lights and license plate lights as FMVSS108 requires all these to be turned on together.
Stop Lamps	The stop lamps (also named as brake lamps) are located at the rear of the vehicle and when illuminated indicate the brakes are being applied and provide an indication that the vehicle is reducing speed and shall stop completely.
Turn Indicator Lamps	The Turn Indicator lamps when illuminated provide the indication that the driver of the vehicle intends to turn or change the lane and can only be illuminated on one side of the vehicle at a time.
Reverse Lamps	The backup/reverse lamps are located at the rear of the vehicle and when illuminated provide an indication that the vehicle is in the reverse gear and may be moving backwards.
Rear Fog Lamps	Rear Fog lamps when illuminated improve visibility of the vehicle to drivers approaching from the rear and are only to be used in conditions of severely reduced visibility.

Table 3: Definitions used in this document

1.7.2 Abbreviations

Abbr.	Stands for	Description
AFS	Aggregated Feature Spec	Type of this document
ARL	Attribute Requirements List	Documents vehicle-level characteristics, using RQMTs and DVMs
APIM	Application Protocol Interface Module	User interface to vehicle and APIM_CDC (Phoenix Domain Controller)
BCM	Body Control Module	Feature arbitrator
CAN	Controller Area Network	Vehicle communication architecture / protocol
ECG	Enhanced Central Gateway	Module that diverts CAN traffic through vehicle
GWM	Gateway Module	Module that diverts CAN traffic through vehicle
LED	Light Emitting Diode	Diode that emits light when voltage is applied to it
PDB	Power Distribution box	Box that delivers power to the trailer tail and reverse lights
BCMc	Body control Module "C" (PDB)	Power Distribution Box
TCU	Telematics Control Unit	Vehicle modem that communicates with cloud/FordPass
TTLM	Trailer Tow Light Module	Module that delivers power to the trailer battery, turn lights and brake lights
ITRM	Integrated Trailer Module	Module that delivers power to the trailer battery, turn lights and brake lights
UI	User Interface	HMI interface to user
EOL	End of Line	Manufacturing location where ECU modules are programmed
CAN	Controller Area Network	Communications method between modules (bi-directional)
PCM	Powertrain Control Module	ECU which controls engine and transmission
ABS	Anti-lock Braking System	Brake ECU
EPB	Electric Parking Brake	Electronic park brake feature
MS1	Medium Speed 1	Medium Speed CAN network 1

HS1	High Speed 1	High Speed CAN network 1
HS3	High Speed 3	High Speed CAN network 3
FD1	Flexible Data Rate	Flexible Data Rate CAN network 1
SOC	State of Charge	12v Battery State of Charge
AOS	Android on Sync	Mobile phone display and synchronisation method for Android type mobile devices
BT	Bluetooth	APIM, AppLink - Bluetooth connection for Ford vehicles
HARA	Hazard Analysis and Risk Assessment	Risk assessment document
PDC	Phoenix Domain Controller	Ford's next generation IVI controller for multimedia post Sync
PAC	Phoenix Audio Controller	Ford's next generation audio controller post Sync
FTCP	Ford Telematics Communication Protocol	
TMC	Traffic Management Center	
FDRS	Ford Diagnostics and Repair Systems	Based on Dealer diagnostic tool usage (Near real time to FDSP SQL Server)
IDS		

Table 4: Abbreviations used in this document.

1.7.3 **Parameters / Values**

Name	Description	Range / Resolution

Table 5: Parameters / Values used in this document

2 FEATURE DOCUMENT

2.1 Feature Overview

2.1.1 Feature Purpose and Description

The Trailer Light Check feature will allow the vehicle user to independently visually check the light operation of a towed trailer. Upon activation of feature through in-vehicle HMI or via FordPass/LincolnWay the vehicle and trailer lights will illuminate in the sequence described below:

1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-7
    1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn lights on vehicle and trailer will flash on and off 6* times
4. Right turn lights on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds**
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds***
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking / position lamps (including front and rear side markers)****
    9.1 Turn off license plate lights
    9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out

** Duration for each step shall be individually calibratable in addition to number of sequence repetitions.*
*** If reverse lights are ON prior to entering step 6, this step shall be skipped.*
****Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will not be lit if the trailer is connected.*
***** If the parking / position lamps have been turned on via a hard switch in vehicle, parking / position lamps shall remain on during this step.*

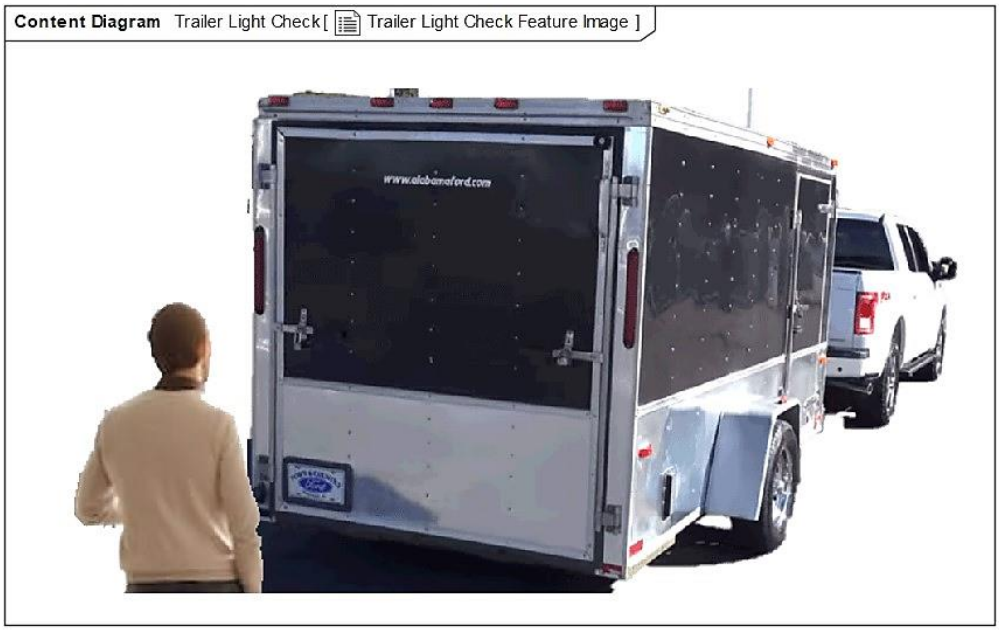


Figure 1: Trailer Light Check Feature Image

2.1.1.1 Background

2.1.1.1.1 Current State

Checking trailer light function visually is currently a compromised choreograph of due diligence in the way of the start of a new adventure. This typically requires a vocal call and response that good drivers feel obliged to do every time they hitch a trailer and bad drivers will often skip. There is a bulb out detection routine within the ITRM but it is only effective on ~90% of towed trailer lights and does neither check reverse nor rear fog lights or able to detect swapped left/right turn circuitry.

The Trailer Light Check function will allow for one person to complete this visual light inspection and fill the above mentioned TTLM/ITRM bulb detection gap in addition to enhancing the customer's trailer towing user experience. Trailer Rear Fog Lights has been proposed for vehicles in ECE homologated markets.

2.1.1.1.2 Feature Opportunity

The Trailer Light Check feature opportunities are listed below:

- One-person visual inspection of towed trailer lights
- Close the TTLM bulb out detection gap (~10% incompatible LEDs, reverse lights, swapped left/right circuitry)
- Enhanced customer towing experience

2.1.1.2 Feature Goals

The primary goal of the Trailer Light Check is to enhance the customer trailer towing experience. In addition to provide/make a Trailer Light Check feature which can be used globally in all markets in all Ford/Lincoln product sold no matter whether it is a FMVSS or ECE homologated market.

2.1.1.3 Feature Objectives

The Trailer Light Check feature objectives are below:

- Allow customer to initiate a Trailer Light Check through in vehicle HMI or FordPass/LincolnWay
- Once initiated, the below sequence of events will take place:

1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-7
   1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn lights on vehicle and trailer will flash on and off 6* times
4. Right turn lights on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds**
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds***
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking / position lamps (including front and rear side markers)****
   9.1 Turn off license plate lights
   9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out

** Duration for each step shall be individually calibratable in addition to number of sequence repetitions.*
*** If reverse lights are ON prior to entering step 6, this step shall be skipped.*
****Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will not be lit if the trailer is connected.*
***** If the parking or position lamps have been turned on via a hard switch in vehicle, parking or position lamps shall remain on during this step.*

2.1.1.4 Feature Planning

The pilot program for the feature is P702 for MY2021, the feature has been designed to support both FMVSS and ECE homologated markets – include trailer rear fog light in ECE markets and Brazil.

2.1.2 **Feature Variants**

Variant Name	Variant Description	Remarks
- ECE Homologated markets		
- FMVSS homologated markets with iTRM		
- MVSS homologated markets without iTRM/ with PDBc driving trailer lamps		

Table 6: Feature Variants

2.1.2.1 Regions & Markets

Market / Region / Variant Name	North America	South America	Europe	MiddleEast/Africa	Asia / Pacific	China
	All FMVSS-108 compliant regions only.	All FMVSS-108 compliant regions only.	ECE R/48 Rev. 7	ECE R/48 Rev. 7	ECE R/48 Rev. 7	N/A

2.1.3 **Input Requirements/Documents**

Reference (Reference as listed in ch. "References")	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. "Feature Requirement")
Input Requirements			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Legal Requirements			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Trustmark Requirements			
	FAP03-150		
Industry Standards			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Other Sources			

Table 7: Input Requirements/Documents

2.1.4 Lessons Learned

Global requirements such as rear fog lights should be considered when developing a feature.
Must consider all activation paths for trailer lights – specifically that US low spec vehicles without a TRM/ITRM can still operate trailer lights via 4 pin plug where fitted, with circuits routed from the PDB.
Full iOS and Android testing are required. (a lot of Android was untested and not implemented) with MY21 P702.

2.1.5 Assumptions

Assumptions and constraints listed below are representative of current strategies and may be subject to change:

- The trailer light function feature will utilize existing hardware on the vehicle, no new hardware will be required
- Vehicle is at a minimum FNV2 or later architecture
- Vehicle has Ford factory/dealer installed trailer wiring, hitch and TRM/ iTRM/BCMc.
- When any action button command comes from in-vehicle HMI, the request shall be processed instantaneously
- When any action button command comes from remote Applink, the request shall be processed within 5 seconds
- When any action button command comes from remote app cellular connection, the request shall be processed within 25 seconds
- Manual Transmission vehicles shall have electronic parking brake

2.1.6 Constraints

- 12v Battery SOC level with battery not supported (engine off)
- Vehicle ignition state
- Vehicle stationary status
- Trailer is electrically attached to the vehicle and has position, brake, reverse and rear fog lights fitted (where legally required)
- Manual transmission vehicles must have an electronic park brake fitted
  (Manual transmission with manual release park brake not supported)
- Status of other features that affect exterior lighting
- Available pairing options with smartphone (BT, USB, Cellular)

2.2 Feature Context

2.2.1 Feature Context Diagram

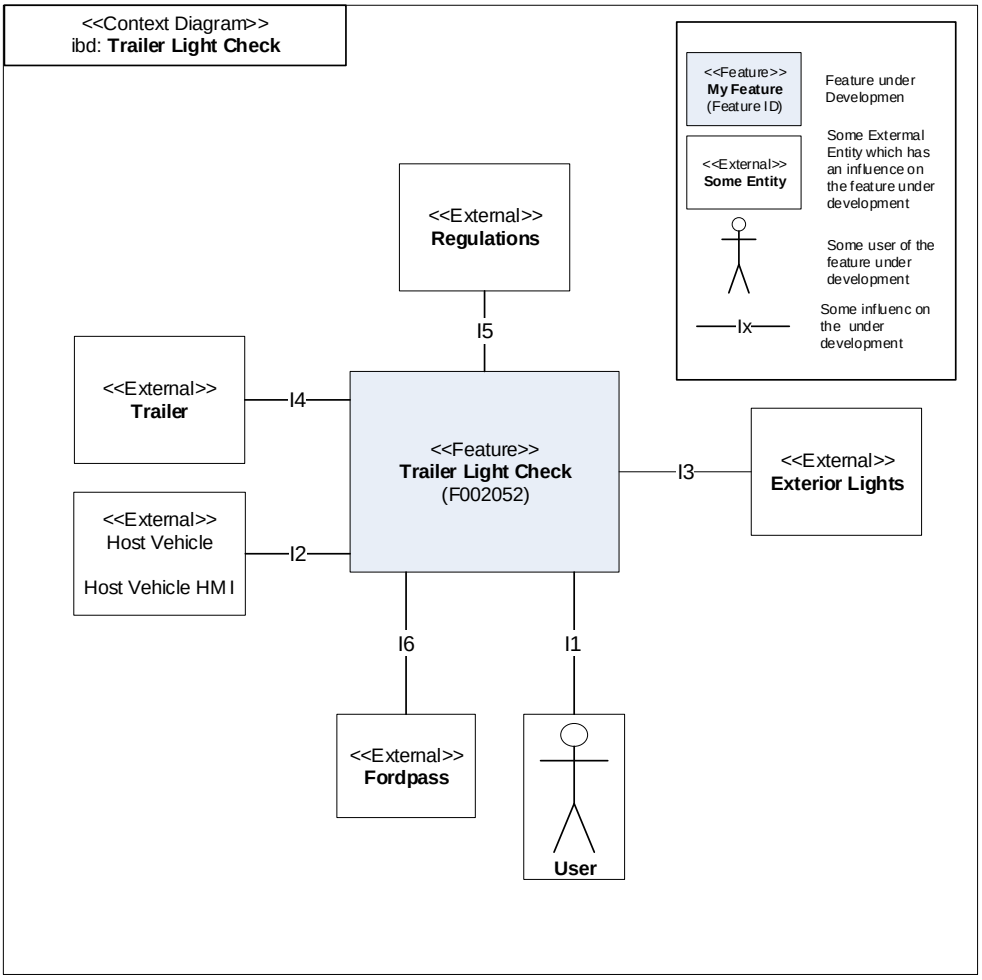


Figure 2: Context Diagram

2.2.2 List of Influences

ID	External Entity	Influence Description
I1	User	User requests to activate Trailer Light Check
I2	Host Vehicle	Host vehicle HMI to interact with Trailer Light Check
I3	Exterior Lights	Trailer Light Check feature interaction with exterior lights (turning lights ON)
I4	Trailer	Trailer Light Check feature interaction with trailer
I5	Regulations	Need compliance to FMVSS-108 or ECE R/48 Rev. 7, ISO26262:2018
I6	FordPass	Remote HMI to interact with Trailer Light Check

Table 8: List of Influences

2.3 Feature Modeling

2.3.1 Operation Modes and States

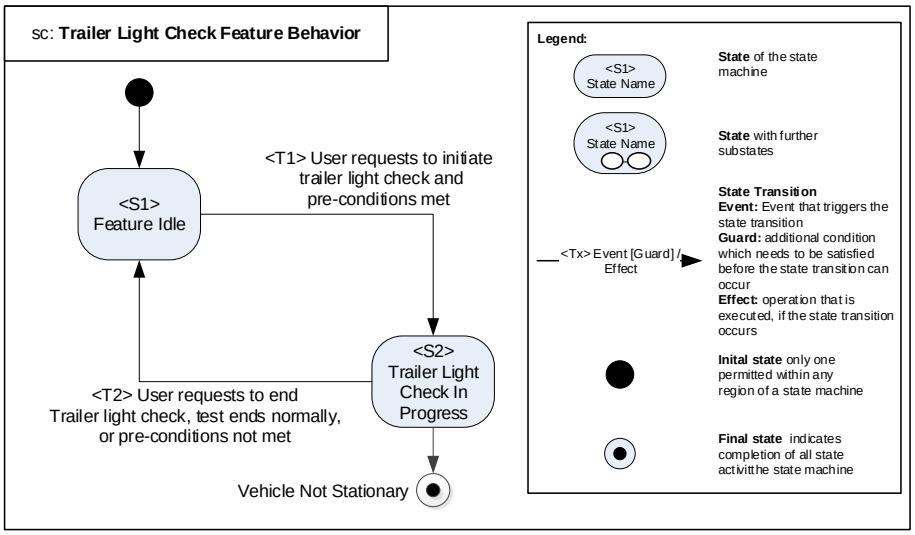


Figure 3: Feature Operation States and Modes

State	Description	Requirements Reference (optional)
S1	Feature is idle	
S2	Feature is available and in operation	

Table 9: Operation Modes

Transition ID	Description	Action	Requirements Reference (optional)
<T1>	User requests to initiate Trailer Light Check and pre-conditions are met	<S1> to <S2>	
<T2>	User requests to end Trailer Light Check, test ends normally, or pre-conditions are not met	<S2> to <S1>	

Table 10: Transition between Operational States

2.3.2 Use Cases

2.3.2.1 Use Case Diagram

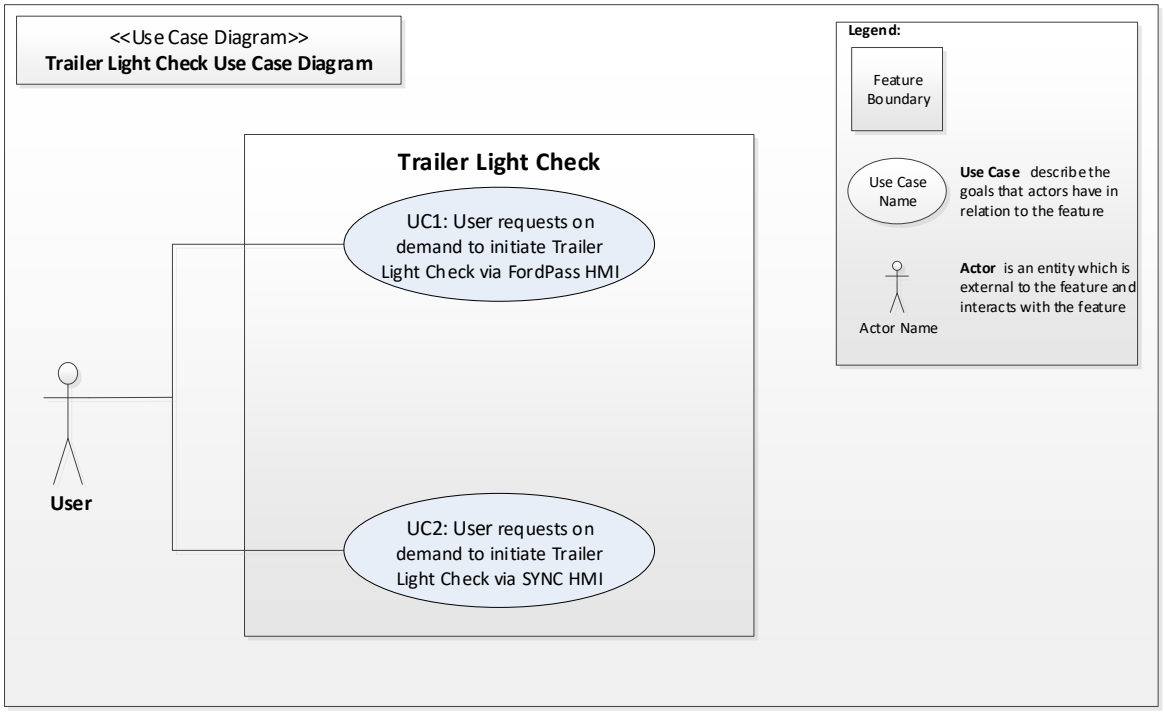


Figure 4: Use Case Diagram

2.3.2.2 Actors

Actor	Description
User	Driver or passenger(s) who own/use the vehicle

Table 11: List of Actors

2.3.2.3 Use Case Descriptions

###UC_F_Trailer Light Check_00001### User requests on demand to initiate Trailer Light Check via FordPass HMI

Purpose		User requests on demand to initiate Trailer Light Check via FordPass HMI
Actors		User
Precondition		Vehicle has factory or dealer installed trailer wiring Trailer is connected to the Vehicle Vehicle 12v battery is >= 75% state of charge with engine off Ignition is ON or ACC Vehicle is stationary All trailer lamps are Off (except position / parking lamps)
Main Flow	M1	User selects begin test button to activate Trailer Light Check using FordPass HMI
	M2	User waits for exterior lights to illuminate and turn off on vehicle and trailer
	M3	User waits for visual confirmation on the feature User Interface (UI) that test has ended
	M4	User selects “YES” to end of test question (to indicate that lights behaved as expected)
Alternative Flow 1	A1	• User can stop test at any time when it is running • Feature informs the user that test has been aborted
Alternative Flow 2	A2	• User runs test (refer to Main Flow) • User selects “NO” to end of test question (i.e., lights did not behave as expected). • Feature displays Troubleshooting screen
Post-condition		Light test sequence has ended User receives a visual confirmation

###UC_F_Trailer Light Check_00002### User requests on demand to initiate Trailer Light Check via APIM HMI

Purpose		User requests on demand to initiate Trailer Light Check via APIM HMI
Actors		User
Precondition		Vehicle has factory or dealer installed trailer wiring Trailer is connected to the Vehicle Vehicle 12v battery is >= 75% state of charge with engine off Ignition is ON or ACC Vehicle is stationary All trailer lamps are Off (except position / parking lamps)
Main Flow	M1	User selects begin test button to activate Trailer Light Check using APIM HMI
	M2	User waits for exterior lights to illuminate and turn off on vehicle and trailer
	M3	User waits for visual confirmation on the feature UI that test has ended
	M4	User selects “YES” to end of test question (to indicate that lights behaved as expected)
Alternative Flow 1	A1	• User can stop test at any time when it is running • Feature informs the user that test has been aborted
Alternative Flow 2	A2	• User runs test (refer to Main Flow) • User selects “NO” to end of test question (i.e., lights did not behave as expected). • Feature displays Troubleshooting screen

Post-condition		Light test sequence has ended User receives a visual confirmation

2.3.3 **Driving Scenarios**

Not applicable. Feature is 100% operational when the vehicle is not moving. There is no use case during driving or when the vehicle is in motion.

2.3.4 **Decision Tables**

Not applicable.

2.4 Feature Requirements

2.4.1 Functional Requirements

###R_F_Trailer Light Check_00001### Feature Start / Stop

Trailer Light Check feature shall enable the user to Start or Stop the Trailer Light Check by pressing a control element.

###R_F_Trailer Light Check_00002### Feature operation

Upon selection of Trailer Light Check Feature Start button and all preconditions are met, the vehicle and trailer lights shall exhibit the below behavior:

1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-7
    1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn lights on vehicle and trailer will flash on and off 6* times
4. Right turn lights on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds**
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds***
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking or position lamps (including front and rear side markers)****
    9.1 Turn off license plate lights
    9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out

** Duration for each step shall be individually calibratable in addition to number of sequence repetitions.*
*** If reverse lights are ON prior to entering step 6, this step shall be skipped.*
****Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will be lit if the trailer is connected.*
***** If parking or position lamps have been turned on via a hard switch in vehicle, parking or position lamps shall remain on during this step.*

###R_F_Trailer Light Check_00003### Provide Vehicle stationary status (Automatic transmission vehicles only)

For Trailer Light Check Feature, vehicle shall be defined as stationary if gearshift position is in Park and vehicle speed is less than or equal to 4 km/h (automatic transmission vehicles only).

###R_F_Trailer Light Check_00004### Provide Vehicle stationary status (Manual transmission vehicles only)

For Trailer Light Check Feature, vehicle shall be defined as stationary if electric parking brake is applied and the vehicle speed is less than or equal to 4 km/h (manual transmission vehicles only).

###R_F_Trailer Light Check_00005### Feature Pre-Conditions

The Trailer Light Check feature shall not allow the user to start the trailer light sequence OR shall exit test if it has already begun if any of the below pre-conditions are not met:

- Ignition is in ON or ACC state
- (12V Battery SOC >= 75% AND engine status = accessory) OR engine status = RUN
- Vehicle is stationary
- Trailer is electrically connected to vehicle (only if iTRM/TRM is equipped to vehicle)
- All parking / position lamps are OFF (except parking/position lights) unless demanded by Trailer Light Check
- Other higher priority features that impact external vehicle lighting are not ON (i.e. Police Dark Car, Silent Car, Re PA etc.)

Note: Vehicle equipped with BCM minimum s/w version MY21 GEN I M RC01.2 allow Zone Lighting and Trailer Light Check working at same time

###R_F_Trailer Light Check_00006### Feature feedback when test is aborted due to change in pre-condition status

The Trailer Light Check feature shall indicate to the user when the test is aborted due to a change in feature pre-conditions:

1. Ignition is not in ON or ACC state
2. Engine start required due to low 12v battery SOC
3. Vehicle is not stationary
4. Trailer is not electrically connected
5. Request for other higher priority feature active
6. Any other Trailer Light Check fault/error (can we give an example?)

###R_F_Trailer Light Check_00007### Feature behavior with multiple Start commands

Once Trailer Light Check feature has been initiated, the feature shall ignore any additional lower priority feature start commands.

###R_F_Trailer Light Check_00009### Feature turn signal behavior

When the Trailer Light Check feature is testing turn signal function, the feature shall flash the turn signals at same rate the vehicle would normally do when commanded manually. Note – the flash rate is configurable in the BCM P2 (DE52: Feat360_FlashOffTime_Cfg, Feat360_FlashOnTime_Cfg)

Error Handling

###R_F_Trailer Light Check_00010### Remote device out of cellular range

When remote app hosting device goes out of cellular range after Trailer Light Check feature has been initiated, the Trailer Light Check shall continue with normal test operation.

###R_F_Trailer Light Check_00012### Remote device unpaired with vehicle

When remote app hosting device gets unpaired with vehicle after Trailer Light Check feature has been initiated, the Trailer Light Check shall continue with normal test operation.

2.4.2 Nonfunctional Requirements

2.4.2.1 Security

2.4.2.2 Reliability

2.4.3 HMI Requirements

###R_F_Trailer Light Check_00013### Feature User Interface (UI)

The Trailer Light Check feature shall have a dedicated user interface screen on the in-vehicle and remote app displays.

###R_F_Trailer Light Check_00014### Feature feedback upon pre-condition violation

When the user selects start test and pre-conditions are not met, HMI feedback shall display the pre-condition that was not met:

1. Ignition is not in ON or ACC state
2. Engine start required due to...
3. Trailer is not connected
4. Vehicle is not stationary
5. Vehicle is not in Park (P)
6. Parking brake is not engaged (for Manual Transmission only)
7. Taillamps must be off (except for position / parking lamps)
8. Other higher priority features interaction

###R_F_Trailer Light Check_00015### Feature feedback upon Start/Stop command

When the user presses the Trailer Light Check Feature Start or Stop control element on in-vehicle UI or remote app, HMI shall behave as follows:

- Upon a valid Start test command, the screen shows a test description with the lights illumination sequence and test starts.
- Upon a valid Stop test command, the test will stop, and a Test Complete screen will be displayed.

###R_F_Trailer Light Check_00017### Test Ended due to a precondition not being met

When Trailer Light Check test has been initiated, but it has ended due to preconditions not being met, HMI feedback shall display as like below:

Light Check Stopped
{unmet precondition text}

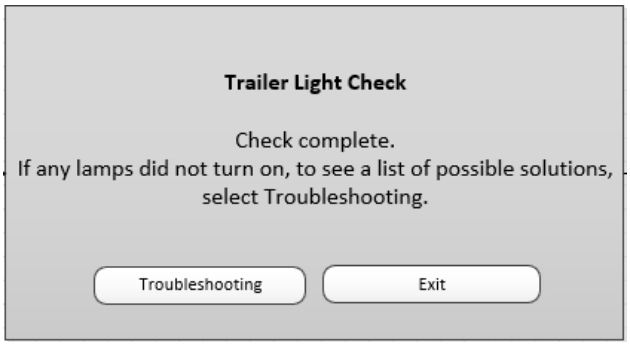
Preconditions as below:

1. Ignition is not in ON or ACC state
2. Engine start required due to...
3. Trailer is not connected
4. Vehicle is not stationary
5. Vehicle is not in Park (P)
6. Parking brake is not engaged (for Manual Transmission only)

7. Taillamps must be off
8. Other higher priority features interaction

###R_F_Trailer Light Check_00018### Trailer Lights Check

When test is completed a message box shall appear asking to click Troubleshooting if any lamps did not turn on.



2.4.4 Other Requirements

2.4.4.1 Manufacturing Requirements

2.4.4.2 Service Requirements

There are no formal requirements for Service. The feature is software based and uses the existing lights and modules in the vehicle.

The vehicle program's VSCS must be setup to allow service-related enablement of the Trailer Light Check Feature. This requires a 'Y' to be noted in column J "customer preference" of the VSCS against the relevant configuration parameters in all ECUs which influence this feature directly.

2.4.4.2.1 After Sales Requirements

There are a number of factors which need to be considered on a program by program basis for After Sales TLC support.

A commonly occurring situation exists, where the owner may decide to fit a trailer/hitch post build. They may be the second owner, or the original owner simply had a lifestyle change which has now added a need to support towing capability, perhaps for camping, or boating for example.

The Trailer Light Check (TLC) feature can be offered to customers who fit up a genuine Ford towing hitch, trailer module (if required) and wiring. However, there are some constraints.

Some programs do not support wiring giveaways to the trailer circuits. The C1Cxx/C1Mxx/C1Dxx family represents available inclusions of trailer wiring and will differ by program. Usually, but not always, C1CAA will mean no towing support is offered. Some of the C1Cxx family will not include a TRM/ITRM (e.g. C1CAB), and others will. Check your program PDL. Note that FMVSS markets do give away 4pin trailer connectors standard, and don't require a TRM to enable TLC necessarily.

Additionally, not all markets are 'connected markets' or necessarily towing markets. FordPass is not available in all global markets and has a significant back-end organization requirement to support it. Please refer to the Enterprise

Connectivity Group to understand the current rollout plan with respect to your export plan for your specific program. As of 2021, around 80 markets are connected, mostly in Europe, America, and IMG markets. You can still operate TLC using the touch screen only in non-connected markets however, so this is not a pre-requisite, necessarily.

The feature may be offered as a subscription-based service. Discuss this with the Enterprise Connectivity Team to determine monetary value and setup of the backend (CVBOP/Enrolment/Subscription Services) to support this. This may be constrained by available payment methods, which are still being worked through currently, particularly in the IMG region.

The program VSCS needs to support TLC activation through in column J “customer preference” in the VSCS having a ‘Y’ (Yes) so that the IDS/FDRS tool can pick up these parameters and turn them on post build. This will involve APIM, BCM and ECG tabs (latter if FordPass is to be activated). Note that there are **many** other trailer related configuration items to be turned on in general also, however these are outside the scope of the TLC activation specifically and should be referred to your Trailer Module D&R/Feature owner if required.

2.4.4.3 Process requirements

2.5 Functional Safety

Feature has no system behaviors requiring HARA analysis. No functional safety analysis required beyond Item Definition

2.5.1 System Behaviors for HARA

ID	Name	Description
SB_Trailer Light Check_00001	UnintendedTrailer Light Check Activation	N/A

Table 12: System Behaviors for HARA

2.5.2 Safety Assumptions

ID		Assumption
A1	**Name**	Activate Trailer Light Check
	Description	The defined lights sequence begins with turning on according pre defined sequence.
	Purpose	This function conducts a test of the trailer lights by illuminating each light in conjunction with the vehicle lights. Upon initiation of the test, the lights will be illuminated in the sequence
	Category	Behavioral
	Related FSR IDs	REQ-471457/B
A2	**Name**	Cancel Trailer Light Check
	Description	The defined sequence turn off trailer light check as required by user.
	Purpose	This function conducts a test of the trailer lights by illuminating each light in conjunction with the vehicle lights. Upon initiation of the test, the lights will be illuminated in the sequence
	Category	Behavioral
	Related FSR IDs	REQ-471457/B
A3	**Name**	Display Pre-condition Status
	Description	The feature shall display pre-conditions that are not met on remote app or in-vehicle UI.
	Purpose	The feature shall display pre-conditions that are not met on remote app or in-vehicle UI.
	Category	Behavioral

	Related FSR IDs	REQ-471457/B
A4	**Name**	End of Test Question
	Description	Upon end of test or test cancelation, the feature shall ask the question if all lights illuminated properly. A NO response will present a troubleshooting pop-up
	Purpose	Upon end of test or test cancelation, the feature shall ask the question if all lights illuminated properly. A NO response will present a troubleshooting pop-up
	Category	Behavioral
	Related FSR IDs	REQ-471457/B

Table 13: Functional Safety Assumptions

2.5.3 **Safety Goals**

ID	**Goal**		
SG-01	**Goal Name**	Prevent Unintended Trailer Light Check Activation	
	Description	When Trailer Light Check is unintended activated and precondition is not met, it can result in rear collision when the driver presses the brake pedal and the Stop Lamp is not activated.	
	Safety Goal Concept	Safety Goal Concept: Warning & Recovery Concept:	
	ASIL	A	**FTTI**
	Related FSR IDs	REQ-471457/B	

Table 14: Functional Safety Goals

2.5.4 **Functional Safety Requirements**

2.5.4.1 Safety Goal: SG_01 SG01: Prevent Unintended Trailer Light Check Activation

Name: SG01: Prevent Unintended Trailer Light Check Activation
Purpose: When Trailer Light Check is unintended activated and precondition is not met, it can result in rear collision when the driver presses the brake pedal and the Stop Lamp is not activated.
Text: The Trailer Light Check shall not be activated when preconditions are not met to prevent hazard conditions
ASIL: A

2.5.4.2 Derivation of Requirements on Assumptions

2.5.4.3 ASIL Decomposition of Functional Safety Requirements

2.6 Cybersecurity

#**Classification**: Cybersecurity only – Otherwise remove substructure and state “not applicable”.

Feature/Module Name	Non Relevant		Cyber Relevancy						
	Private Network	Public CAN Basic	CR1	CR 2	CR 3	CR 4	CR5	CR6	CR7
Trailer Light Check			X	X			X		

Cybersecurity Relevancy Assessment:	Cyber Relevant (Full)
Description	This feature/ECU is cyber relevant and must complete the cybersecurity deliverables including a Threat Model.

	Does the feature or ECU:	ANSWER *Y or N*	Comments Provide Justification
A	Reside ONLY on a vehicle private bus (LIN or Private CAN) or not networked (e.g. Hardwired)? *=(Private_Bus) **OR** (Not_Networked) or (Hardwaried)*	N	only CAN communication
B	Have E/E Technology and has External Interfaces for data exchange (external to vehicle or devices brought in from outside, etc.)?	Y	conection over SDN/ cloud with cellphone
C.1	Have E/E technology that contributes to safe operation of the vehicle (Motion control and/or Functional Safety ASIL A through D classification)? *=(Has_Motion_Control) **OR** (ASIL A, B, C or D)*	Y	ASIL A rating - Communication with break light
C.2	Have E/E Technology that is goverend by Regulation?	N	no regulation governs the TLC feature
D	Have E/E Wireless Technology and connects to sensors and actuators? *=(Wireless_Technology) **AND** (Sensors **OR** Actuators)*	N	we have wireless conncetion (BT/ cellular) but we do not connect to neither sensors nor to actuators
E	Have E/E technology and collects "user" identifiable data that persists long term or passes that "user" identifiable data to the backend IT systems (Data about passengers and driver)?	N	no customer data stored at backends from FEATURE
F	Have Ethernet?	Y	yes, via TCU
G	Have E/E technology and main purpose is to provide security function? (ex secure valuables, prevent theft, protect accessories, prevent hacking, encrypt data)	N	FEATURE offers a customer experience function as such he/she has not to do the light test upfront trailering
H	Have critical sensors that are used for motion control, safety critical, or security critical purposes?	N	sereral steps to ensure vehicle is in stand-still while FEATURE operation/ activation

2.6.1 Security Goals

#**Classification**: Cybersecurity only
#**Hint:** The list of Cybersecurity Goals are an output of the Threat Model. The CAL attribute is not used yet.
#**Link:** *Alignment with Cybersecurity* – RE Wiki

2.6.1.1 VDOC092294/A

Trailer Light Check TARA

2.6.2 **Cybersecurity Requirements**

#Classification: Cybersecurity only
#Hint: Cybersecurity requirements derived from the Cybersecurity Goals. Those requirements should be granular enough to be satisfied by a single Logical Function in the Functional Architecture.
#Link: *Alignment with Cybersecurity* – RE Wiki
#Macro: Add Ins -> Add Requirement macro (select "**Requirement**" as type)

3 FEATURE DECOMPOSITION (LOGICAL DESIGN)

3.1 Overview

The feature is decomposed into logical functions as mentioned in Section 3.5.

3.2 Input Requirements

###R_FNC_Trailer Light Check_00047### Feature availability

The feature shall be available for all FMVSS-108 compliant regions and ECE R/48 Rev. 7. Compliant regions.

###R_FNC_Trailer Light Check_00048### Selection on user interface

The requests made from the feature user interface shall be an input to determine feature response.

###R_FNC_Trailer Light Check_00049### EOL Configuration

Vehicle EOL configuration status shall be input to determine if the vehicle region is FMVSS-108 or ECE R/48 Rev. 7, with/without trailer rear fog lamps and whether a TRM/ITRM is fitted and whether the vehicle's rear fog light will stay on or off with a trailer connected.

3.3 Assumptions & Constraints

1. Exterior lights actuation functions are already available
2. Vehicle transmission status monitoring function is already available
3. 12v Battery SOC level function is already available
4. Ignition status monitoring capability is already available
5. Electric & manual parking brake status monitoring function is already available
6. Monitoring of other features that affect exterior lighting is already available

4 FUNCTIONAL ARCHITECTURE

4.1 Description

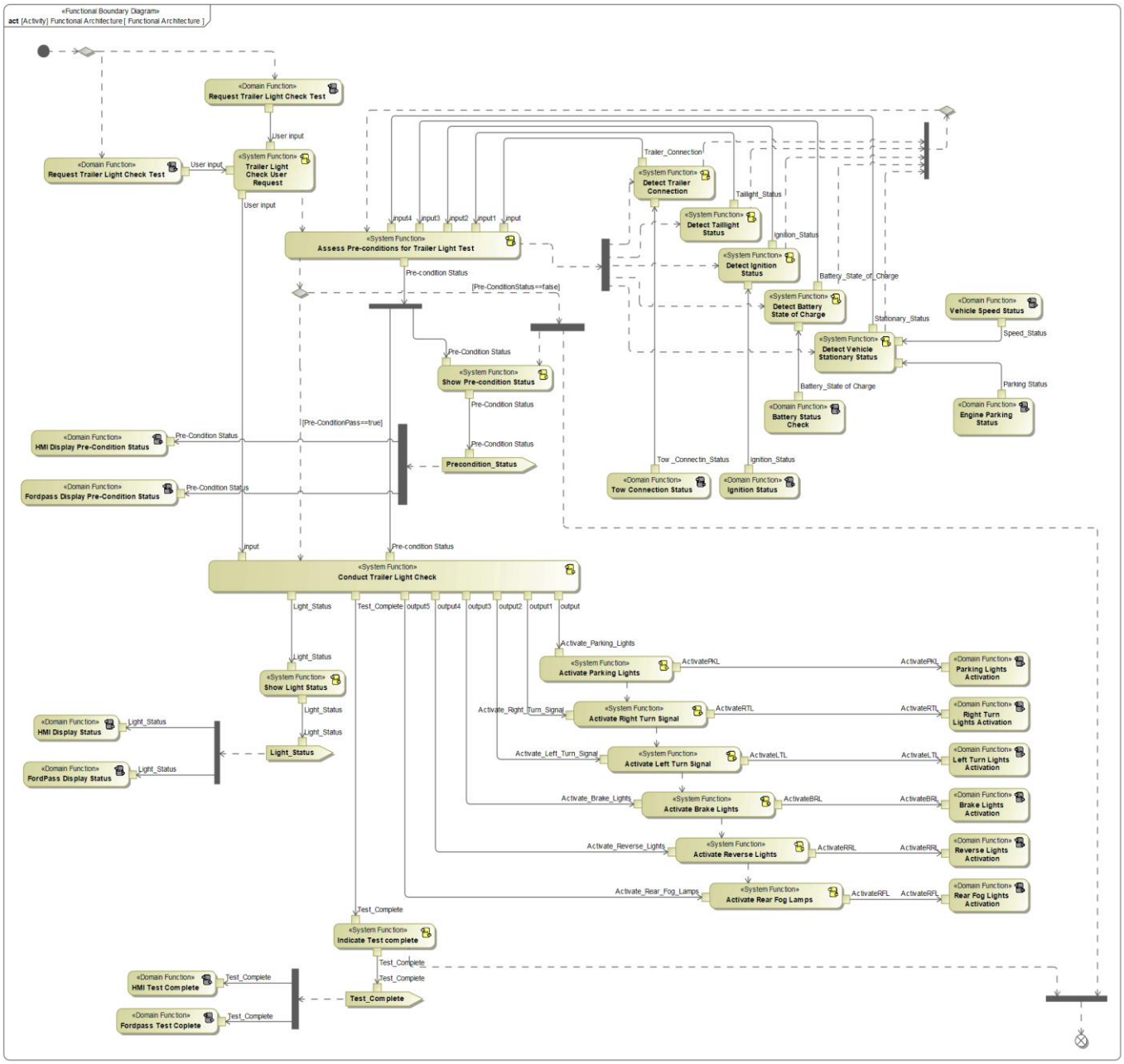


Figure 5: Functional Architecture

4.2 Function List

Function Name	Description	Link to Function Spec	Comments
Detect Ignition Status	Ignition status determination for feature pre-condition assessment	N/A	Existing function
Detect Taillight Status	Taillight status determination for feature pre-condition assessment	N/A	Existing function
Detect 12v Battery State of Charge	Vehicle 12v battery state of charge determination for feature pre-condition assessment	N/A	Existing function
Activate Parking / position lamps	Illuminate parking / position lamps on vehicle and trailer	N/A	Existing function
Activate Right Turn Signal	Illuminate right turn signal lights on vehicle and trailer	N/A	Existing function
Activate Left Turn Signal	Illuminate Left turn signal lights on vehicle and trailer	N/A	Existing function
Activate Brake Lights	Illuminate brake lights on vehicle and trailer	N/A	Existing function
Activate Reverse Lights	Illuminate reverse lights on vehicle and trailer	N/A	Existing function
Activate Rear Fog Lights	Illuminate rear fog lights on vehicle and trailer	N/A	Existing function
Trailer Light Check User Request	Sends user request to initiate or end test to conduct Trailer Light Check function		New function
Detect Vehicle Stationary Status	Vehicle stationary status determination for feature pre-condition assessment		New function
Assess Pre-conditions for Trailer Light Check	Evaluates pre-conditions for enabling Trailer Light Check feature. Receives ignition status, 12v battery SOC, vehicle stationary status, and exterior light status. Sends out pre-condition status message		New function
Conduct Trailer Light Check	Illuminates exterior lights in feature determined sequence and sends test complete message		New function
Show Pre-condition Status	Displays pre-condition status on UI if pre-conditions are not met		New function
Indicate Test Complete	Displays test complete or test ended (if user requests test cancellation) notification on UI		New function
Trailer Light Check HMI Display	User HMI that allows interaction with the Trailer Light Check feature		New function

Table 15: List of Logical Functions

4.3 Signal List

Refer to the Data Dictionary – Logical Signals

5 FUNCTION SPECIFICATIONS

5.1 Logical Function Trailer Light Check

5.1.1 Trailer Light Check User Request

5.1.1.1 Description

This function allows the user to make a selection using in-vehicle HMI or FordPass/LincolnWay to initiate or end Trailer Light Check. When the user selects the start or stop buttons this function will send the user input to Conduct Trailer Light Check function. This function also serves to acknowledge receipt of test in progress message.

5.1.1.2 Variants

Variant Name	Variant Description	Variant Condition (optional)

5.1.1.3 Input Requirements/Documents

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "Feature Requirement")
Input Requirements			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Legal Requirements			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Trustmark Requirements			
	FAP03-150		
Industry Standards			
	FMVSS-108		
	ISO 26262:2018		
	ECE R/48 Rev. 7		
Other Sources			

Table 16: Input Requirements/Documents

5.1.1.4 Assumptions

5.1.1.5 Function Scope

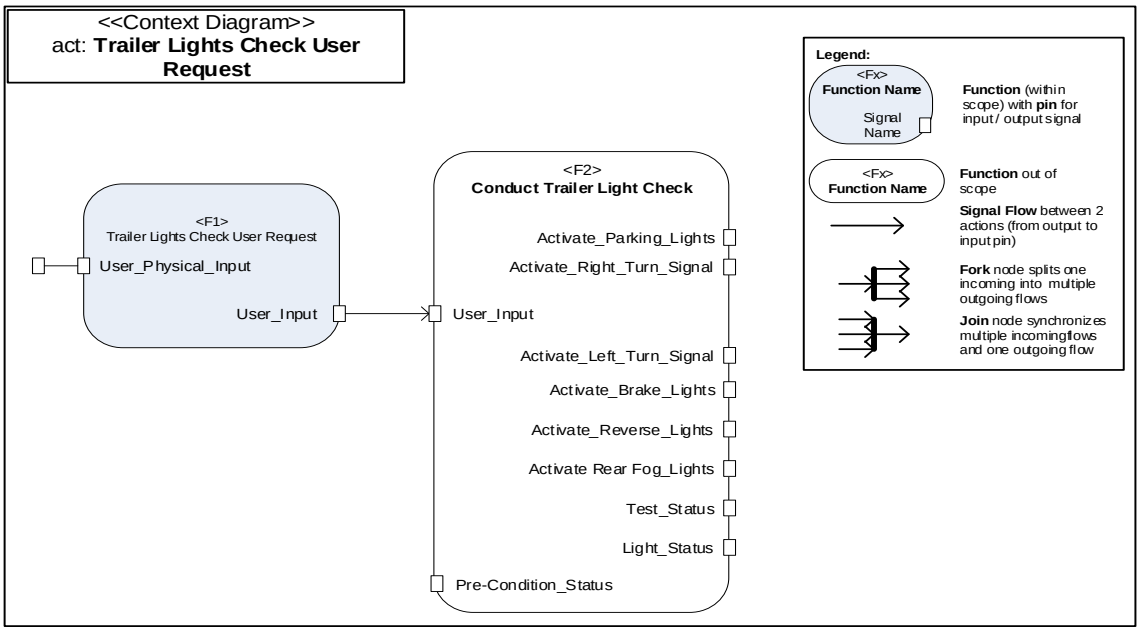


Figure 6: Context Diagram of Function Trailer Light Check User Request

5.1.1.6 Function Interfaces

5.1.1.7 Logical Inputs

Signal Name	Description
User_Input	User selects Start or Stop buttons using in-vehicle HMI or FordPass / LincolnWay UI, this logical signal notifies if the user is requesting the test to be initiated or stopped

Table 17: Logical Inputs

5.1.1.8 Logical Outputs

Signal Name	Description
Test_Status	When test is finished or interrupted by User, the in-vehicle HMI or FordPass / LincolnWay UI, shows a test status completion message.

Table 18: Logical Outputs

5.1.1.9 Logical Parameters

Parameter Name	Description

<(Mandatory) Word reference to the "*Logical Parameters*" name bookmark in the Data Dictionary>	<(Optional) Word reference to the "*Logical Parameters"* description bookmark in the Data Dictionary>

Table 19: Logical Parameters

5.1.1.10 Function Modeling

5.1.1.11 Use Cases

5.1.1.12 State Charts / Activity Diagrams / Sequence Diagrams / Decision Tables

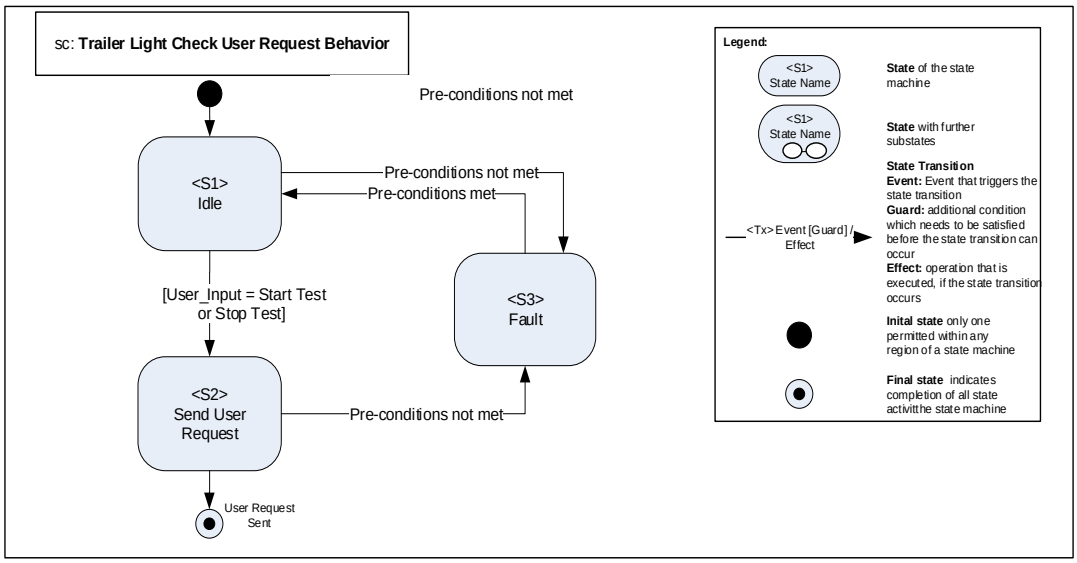


Figure 7: State Machine of Function "MyLogicalFunction1"

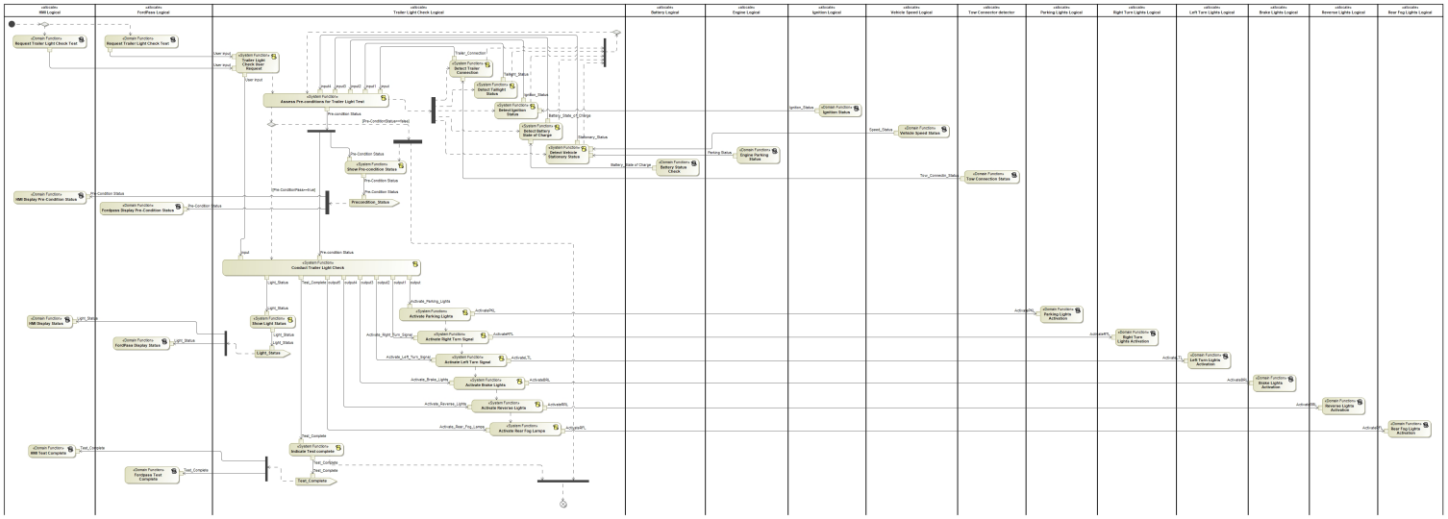


Figure 8: Sequence Diagram of Trailer Light Check

Input Signal 1	Input Signal 2	Input Signal 3	Input Signal 4	Output Signal

Table 20: Decision Table of Function “MyLogicalFunction1”

5.1.1.13 Function Requirements

###R_FNC_Trailer Light Check_00001### User request response (Start test)

Upon user selection of Start Test control element on in-vehicle or FordPass HMI, the function shall send Start_Test (0x2) message to Conduct Trailer Light Check function.

###R_FNC_Trailer Light Check_00002### Start test message acknowledgement

When Test_Status = 0x3 (Test_in_Progress), the User_Input signal shall be 0x0 (Null).

###R_FNC_Trailer Light Check_00003### User request response (Stop test)

Upon user selection of Stop Test control element on in-vehicle or FordPass HMI, the function shall send Stop_Test (0x1) message to Conduct Trailer Light Check function.

5.1.1.14 Normal Operation

5.1.1.15 Error Handling

*#**Hint:** In this chapter requirements could be derived e.g. from “FMEA counter measures”*

5.1.1.16 Non-Functional Requirements

*#**Hint:** Non-functional requirements specify some performance criteria in addition to the functional behavior given defined by the functional requirements. Timing (if not already included in the functional requirements), security*

details (e.g. how secure does an algorithm have to be) reliability (e.g. mean time between failure) or maintainability could be specified in this section.

5.1.1.17 Functional Safety Requirements

*#**Classification**: Functional Safety only – If not used, remove content and state "Not Applicable"*
*#**Hint:** The table references the Functional Safety Requirements (FSR) satisfied by the Logical Function. The FSRs themselves are listed in the Feature Docs.*
*#**Link:** RE Wiki – RE Alignment with Functional Safety (ISO26262)*
Functional Safety Sharepoint – Functional Safety Concept

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 21: Inherited FSRs

5.1.1.18 Other Requirements

*#**Hint**: Further requirements relevant from development process side could be listed in this section.*

5.1.1.18.1 Design Requirements

*#**Hint:** Requirements of a Logical Function should be typically agnostic of their SW/HW implementation. If for specific reasons the function owner needs to define explicitly design constraints, it can be done in this chapter.*

5.1.2 Provide Vehicle Stationary Status

5.1.2.1 Functional Description

This function will determine the stationary status of the vehicle. The vehicle is determined to be stationary if vehicle speed is < 4kph and either PRNDL is in "Park" (automatic transmission vehicles only) OR electronic parking brake is applied (manual transmission vehicles only).

5.1.2.2 **Function Scope**

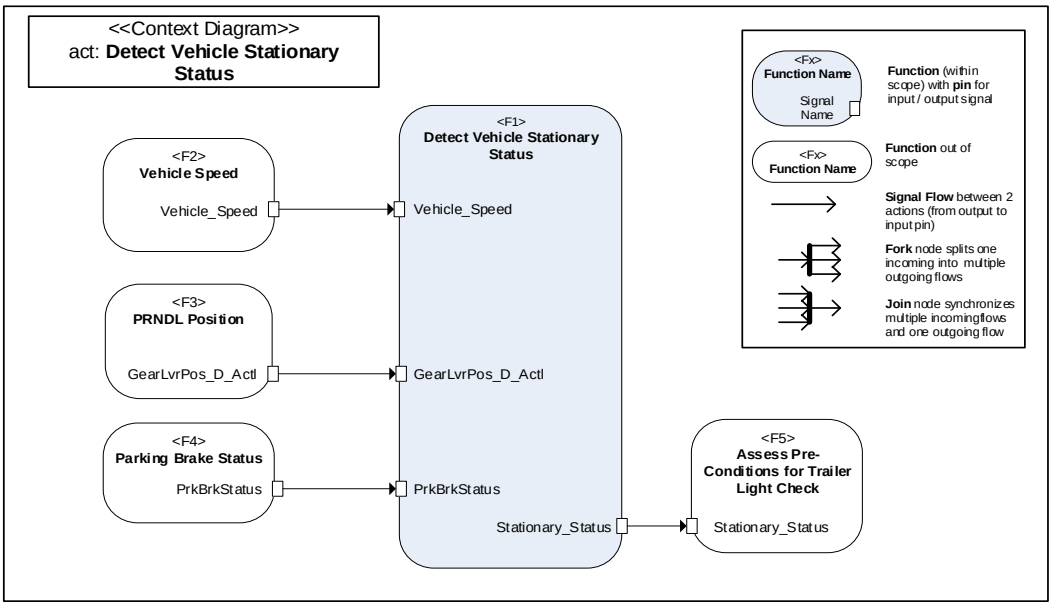


Figure 9: Context Diagram of Detect Vehicle Stationary Status

5.1.2.3 **Function Interfaces**

5.1.2.3.1 **Logical Inputs**

Signal Name	Description
Veh_V_ActlEng	This logical signal indicates the vehicle speed
PrkBrkStatus	This logical signal indicates the status of the EPB
GearLvrPos_D_Actl	This logical signal indicates the PRNDL position

Table 22: Logical Inputs – Function Interfaces

5.1.2.3.1 **Logical Outputs**

Signal Name	Description
Stationary_Status	This logical signal indicates the vehicle stationary status

Table 23: Logical Outputs – Function Interfaces

5.1.2.3.1 **Configuration Parameters**

Parameter ID	Parameter Name	Description

5.1.2.3.1 **Tunable Parameters**

Parameter ID	Parameter Name	Description

5.1.2.4 **Function Modeling**

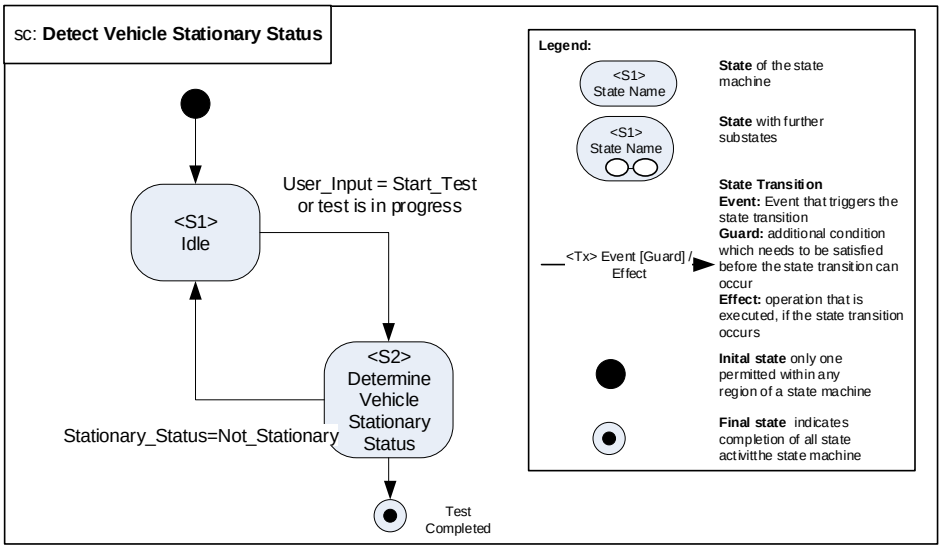


Figure 10: State Machine of Function: Detect Vehicle Stationary Status

5.1.2.5 Function Requirements

###R_FNC_Trailer Light Check_00004### Vehicle not stationary (automatic transmission ONLY)

When Vehicle_Speed is more than 4 KPH or GearLvrPos_D_Actl != 0x0 (PARK), the Stationary_Status signal shall be 0x0 (Not_Stationary)

###R_FNC_Trailer Light Check_00005### Vehicle not stationary (manual transmission ONLY)

When Vehicle_Speed is more than 4 KPH or PrkBrkStatus != 0x1 (Rear_Caliper_Closed), the Stationary_Status signal shall be 0x0 (Not_Stationary)

###R_FNC_Trailer Light Check_00006### Vehicle is stationary (automatic transmission ONLY)

When Vehicle_Speed is less than or equal to 4 KPH and GearLvrPos_D_Actl = 0x0 (PARK), the Stationary_Status signal shall be 0x1 (Stationary)

###R_FNC_Trailer Light Check_0007### Vehicle is stationary (manual transmission ONLY)

When Vehicle_Speed is less than or equal to 4 KPH and PrkBrkStatus = 0x1 (Rear_Caliper_Closed), the Stationary_Status signal shall be 0x1 (Stationary)

5.1.2.5.1 Error Handling

###R_FNC_Trailer Light Check_00050### Transmission status unavailable for less than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for less than 5 seconds, BCM shall hold onto previous value of GearLvrPos_D_Actl for determining vehicle stationary status of Trailer Light Check feature

###R_FNC_Trailer Light Check_00051### Transmission status unavailable for more than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_FNC_Trailer Light Check_00052### Park brake status unavailable for less than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for less than 5 seconds, BCM shall hold onto previous value of PrkBrkStatus for determining vehicle stationary status of Trailer Light Check feature

###R_FNC_Trailer Light Check_00053### Park brake status unavailable for more than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_FNC_Trailer Light Check_00054### Vehicle Speed unavailable for less than 5 seconds

When Veh_V_ActlEng signal is not available for less than 5 seconds, BCM shall hold onto the previous value of Veh_V_ActlEng for determining vehicle stationary status of Trailer Light Check feature

###R_FNC_Trailer Light Check_00055### Vehicle Speed unavailable for more than 5 seconds

When Veh_V_ActlEng signal is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

5.1.3 Assess Pre-conditions for Trailer Light Check

5.1.3.1 Function Description

This function assesses the pre-conditions for enabling the Trailer Light Check to be initiated. The Trailer Light Check feature will not be initiated or the test will exit if already initiated when the following pre-conditions are not met: Ignition Status = ON or ACC, Vehicle Stationary Status = Stationary, Trailer connected, (12v Battery SOC >= 75% AND Engine Status = OFF) OR engine status = RUN, all parking / position lamps are OFF (except parking or position lights) unless demanded by Trailer Light Check, and other features that affect exterior lighting are not active (i.e. Police Dark Car, Silent Car, RePA, etc). This function will also send Pre-condition status message to Conduct Trailer Light Check and Show Pre-Condition Status functions.

5.1.3.2 **Function Scope**

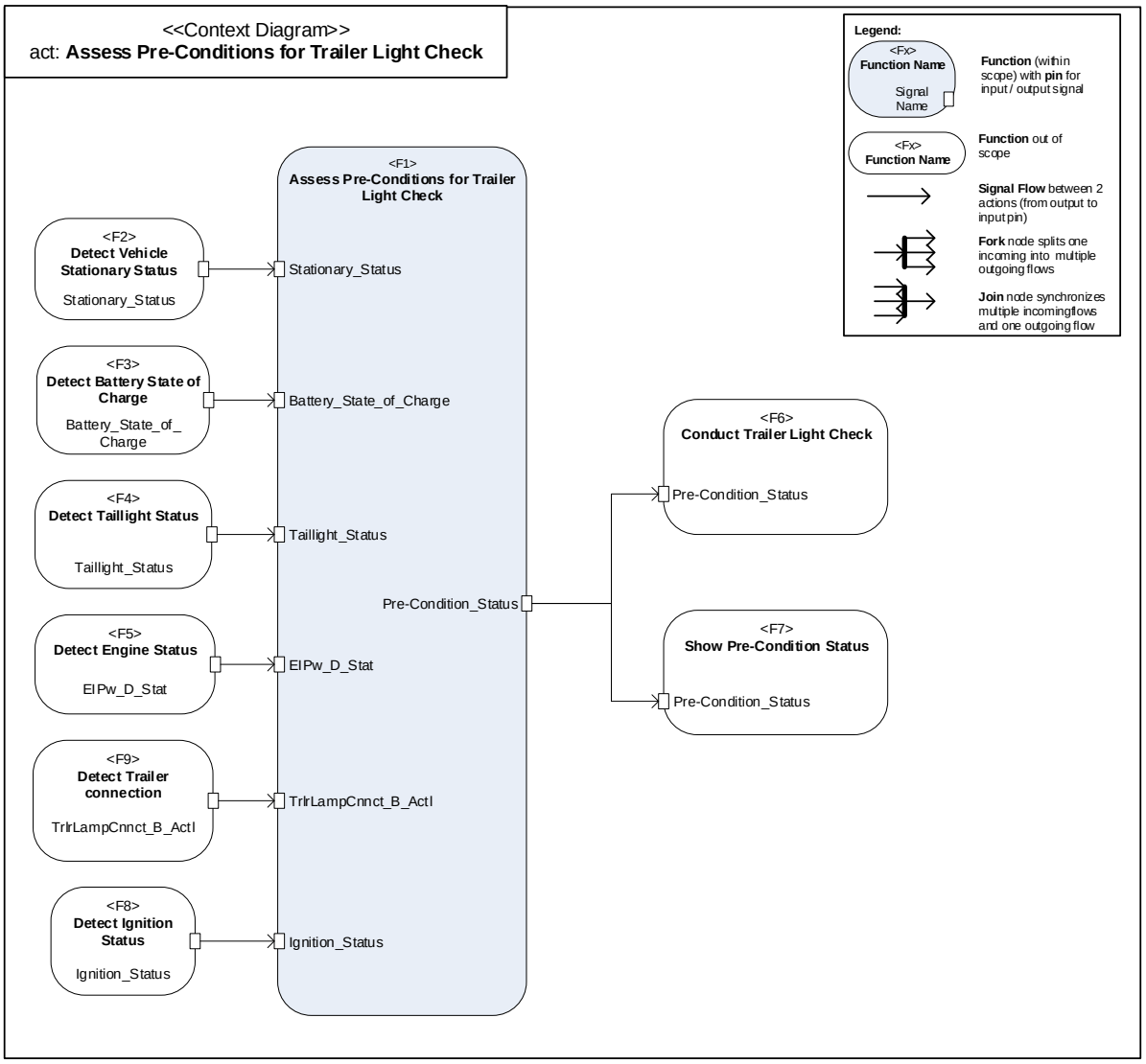


Figure 11: Context Diagram of Function Assess Pre-conditions for Trailer Light Check

5.1.3.3 Function Interfaces

5.1.3.3.1 Logical Inputs

Signal Name	Description
Battery_State_of _Charge	This logical signal carries the current 12v battery state of charge
Taillight_Status	This logical signal carries the illumination status of the vehicle and trailer taillights by commands other than Trailer Light Check feature
Ignition_Status	This logical signal carries the ignition state
Stationary_Status	This logical signal carries the vehicle stationary status
ElPw_D_Stat	This logical signal indicates the status of whether the 12v battery is supported or not
Feature_Interaction	This logical signal indicates the status of whether other exterior lighting features are active or not
Detect_Trailer_Connection.	This logical signal indicates the status of whether the trailer is connected to the vehicle or not.

5.1.3.3.1 Logical Outputs

Signal Name	Description
Pre-Condition_Status	This logical signal carries the pre-condition status for the Trailer Light Check feature

5.1.3.3.1 Configuration Parameters

Parameter Name	Description
TRM_Available_Cfg	BCM Configuration parameter to represent Trailer Tow Module (TRM) Module is Present or Absent.
TLC_ChkTrailerConnected_ Cfg	Determines if Trailer Light Check feature is allowed to operate only when a trailer is connected.

5.1.3.3.1 Tunable Parameters

Parameter Name	Description

5.1.3.4 Function Modeling

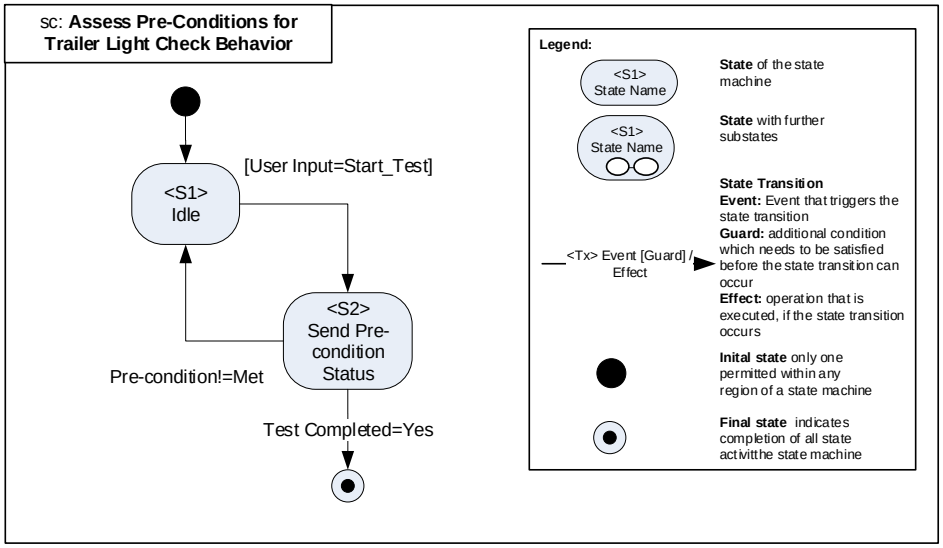


Figure 12: State Machine of Function: Assess Pre-conditions for Trailer Light Check

5.1.3.5 Function Requirements

###R_FNC_Trailer Light Check_0008### Pre-condition status signal with user input

If Pre-Condition_Status != 0x4 (Preconditions_Passed) when User_Input = 0x2 (Start_Test), the function shall send Pre-Condition_Status signal to Show Pre-Condition Status function.

###R_FNC_Trailer Light Check_0009### Pre-condition status changes signal

If Pre-Condition_Status != 0x4 (Preconditions_Passed) while conduct Trailer Light Check function is in progress, the function shall send Pre-Condition_Status signal to Show Pre-Condition Status function.

###R_FNC_Trailer Light Check_00010### Pre-condition status sending duration

Pre-condition status message shall be sent continuously while Trailer Light Check is being performed

###R_FNC_Trailer Light Check_00011### 12v Battery SOC low or Quality not OK

When the 12v battery quality is not OK or 12v battery SOC is less than 75%, the Battery_State_of_Charge signal shall be 0x0 (Battery_SOC_Not_OK)

###R_FNC_Trailer Light Check_00012### 12v Battery SOC OK

When the 12v battery quality is OK and 12v battery SOC is equal to or greater than 75%, the Battery_State_of_Charge signal shall be 0x1 (Battery_SOC_OK)

###R_FNC_Trailer Light Check_00013### 12v Battery feedback unavailable

When the 12v battery quality or SOC is not available, the Battery_State_of_Charge signal shall be 0x0 (Battery_SOC_Not_OK)

###R_FNC_Trailer Light Check_00014### Another feature interaction not present

When other exterior lighting features (i.e. Police Dark Car, Silent Car, RePA, etc.) are not active, the Feature_Interaction signal shall be 0x1 (Feature_Interaction = No_Interaction)

Note: Vehicle equipped with BCM minimum s/w version MY21 GEN I M RC01.2 allow Zone Lighting and Trailer Light Check working at same time.

###R_FNC_Trailer Light Check_00015### Another feature interaction present

When other exterior lighting features (i.e. Police Dark Car, Silent Car, RePA, etc.) are active, the Feature_Interaction signal shall be 0x0 (Feature_Interaction = Interaction_Present)

Note: Vehicle equipped with BCM minimum s/w version MY21 GEN I M RC01.2 allow Zone Lighting and Trailer Light Check working at same time.

###R_FNC_Trailer Light Check_00016### Pre-Condition Signal Behavior

The logical signal Pre-Condition_Status shall publish values based on the logic mentioned in Table 26 below:

Requirement#	Stationary_ Status	Ignition_Status	Battery_State_of_ Charge	ElPw_D_Stat	Taillight_ Status	Feature_Interaction	Detect_Trailer_Connection	Pre-Condition_ Status
R_FNC_Trailer Light Check_ 00055.1	0x1 (Stationary)	0x2 (Acc.) or 0x4 (Run)	0x1 (Battery_SOC_OK)	Don't care	0x1 (Taillights OFF)	0x1 (No_Interaction)	0x1 (Yes)	0x4 (Preconditions_Passed)
R_FNC_Trailer Light Check_ 00055.2	0x0 (Not_Stationary)	0x2 (Acc.) or 0x4 (Run)	0x1 (Battery_SOC_OK)	Don't care	Don't care	Don't care	Don't care	0x6 (Not_Stationary)
R_FNC_Trailer Light Check_ 00055.3	Don't care	Not [0x2 (Acc.) or 0x4 (Run)]	Don't care	Don't care	Don't care	Don't care	Don't care	0x1 (Ignition_not_ON)
R_FNC_Trailer Light Check_ 00055.4	Don't care	0x2 (Acc.) or 0x4 (Run)	0x0 (Battery_SOC_Not_OK)	0x0 or 0x4 or (0x2 or 0x3 with previous state 0x0 or 0x4) – Battery not supported	Don't care	Don't care	Don't care	0x3 (Battery_SOC < 75% with_battery_not_supported)
R_FNC_Trailer Light Check_ 00055.5	0x1 (Stationary)	0x2 (Acc.) or 0x4 (Run)	0x1 (Battery_SOC_OK)	Don't care	0x0 (Taillights ON)	0x1 (No_Interaction)	Don't care	0x2 (Taillights_ON)
R_FNC_Trailer Light Check_ 00055.6	0x1 (Stationary)	0x2 (Acc.) or 0x4 (Run)	0x1 (Battery_SOC_OK)	Don't care	Don't care	0x0 (Interaction_Present)	Don't care	0x5 (Interaction_Present)
R_FNC_Trailer Light Check_ 00055.8	Don't care	0x2 (Acc.) or 0x4 (Run)	Don't care	Don't care	Don't care	Don't care	0x0 (No)	0x7 (Trailer not connected)

Table 24: Pre-Condition_Status Signal Behavior

###R_FNC_Trailer Light Check_00017### Taillight_Status signal for lights on

When one or more of the vehicle/trailer taillights (position / rear fog / reverse / turn indicators / brake / hazards / license plate) are illuminated by commands other than Trailer Light Check, the Taillight_Status logical signal shall be 0x0 (taillights on)

###R_FNC_Trailer Light Check_00018### Taillight_Status signal for lights off

When all of the vehicle/trailer taillights (position / rear fog / reverse / turn indicators / brake / hazards / license plate) are not illuminated by commands other than Trailer Light Check, the Taillight_Status logical signal shall be 0x1 (taillights off)

###R_FNC_Trailer Light Check_00049### Detect_Trailer_Connection without Trailer module

When TRM_Available_Cfg parameter is set to 0x00 (Absent) this function shall set Detect_Trailer_Connection to 0x1 to avoid the trailer connection precondition on vehicles without TRM/iTRM.

5.1.3.5.1 Error Handling

###R_FNC_Trailer Light Check_00047### Detect_Trailer_Connection unavailable for less than 5 seconds

When the TrlrLampCnnct_B_Actl signal is delayed or missing for less than 5 seconds, the function shall hold on to the previous value of the signal Detect_Trailer_Connection.

###R_FNC_Trailer Light Check_00048### Detect_Trailer_Connection unavailable for more than 5 seconds

When the TrlrLampCnnct_B_Actl signal is delayed or missing for less than 5 seconds, the function shall assume that trailer is not connected (Detect_Trailer_Connection is 0x0) and stop trailer light check sequence, HMI shall state trailer is not connected (Pre_Condition_Status is 0x7).

5.1.4 **Conduct Trailer Light Check**

5.1.4.1 **Description**

This function conducts a test of the trailer lights by illuminating each light in conjunction with the vehicle lights. Upon initiation of the test, the lights will be illuminated in the sequence below:

1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-7
    1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn light on vehicle and trailer will flash on and off 6* times
4. Right turn lights on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds**
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds***
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking / position lamps (including front and rear side markers)****
    9.1 Turn off license plate lights
    9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out

** Duration for each step shall be individually calibratable in addition to number of sequence repetitions.*
*** If reverse lights are ON prior to entering step 6, this step shall be skipped.*
****Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will not be lit if the trailer is connected.*
***** If parking or position lamps have been turned on through hard switch in vehicle, parking / position lamps shall remain on during this step.*

The conduct Trailer Light Check will be initiated only when User_Input = Start_Test and Pre-condition_Status = Preconditions_Passed

5.1.4.2 **Function Scope**

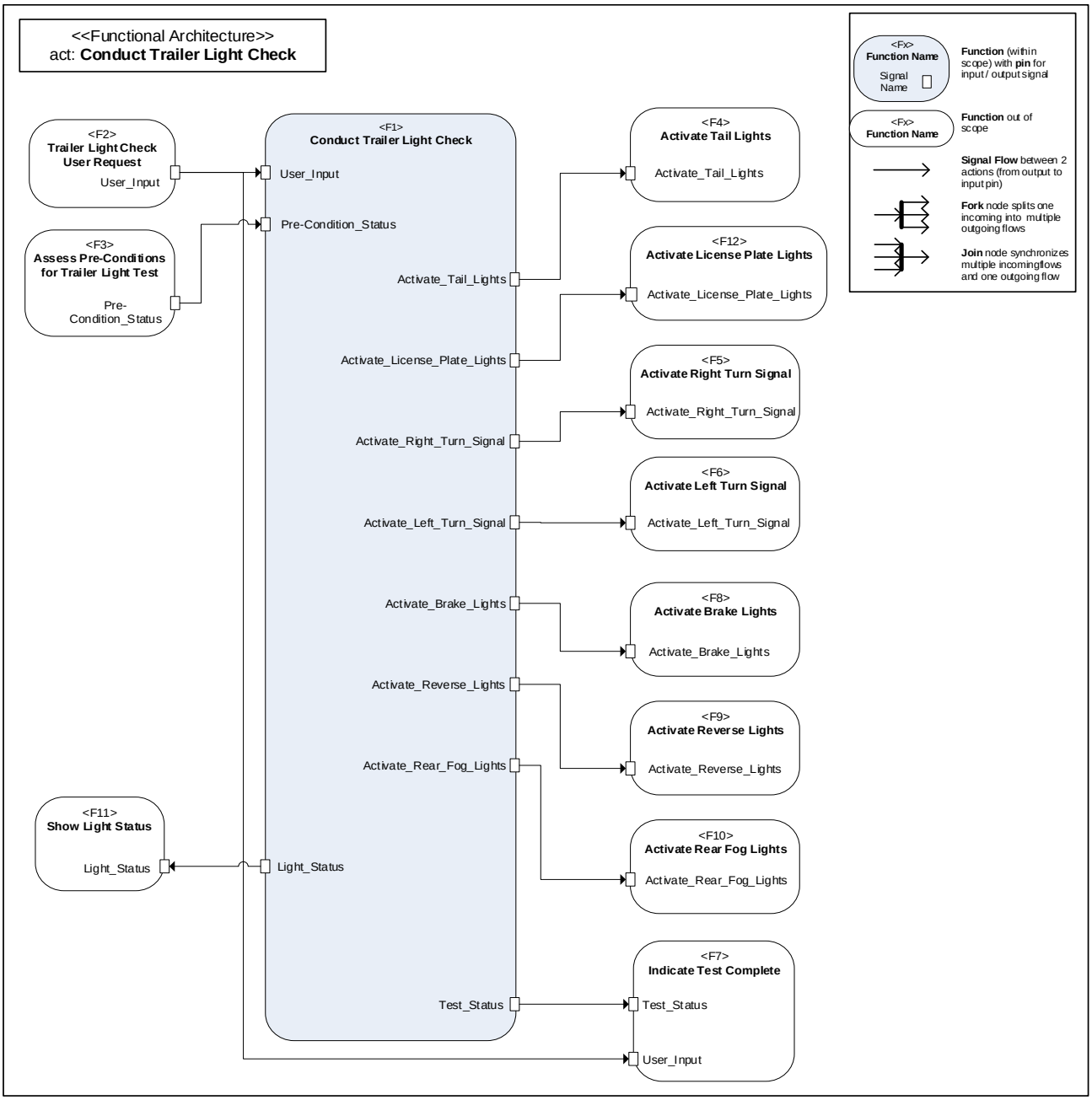


Figure 13: Context Diagram of Function Conduct Trailer Light Check

5.1.4.3 Function Interfaces

5.1.4.3.1 Logical Inputs

Signal Name	Description
User_Input	This logical signal indicates user request and acknowledgement of test complete
Pre-Condition_Status	This logical signal carries the pre-condition status for the Trailer Light Check feature

5.1.4.3.1 Logical Outputs

Signal Name	Description
Activate_Tail_Lights	This logical signal commands the parking lights on the vehicle and trailer ON/OFF (Front and Rear side markers will turn on/off)
Activate_Right_Turn_Signal	This logical signal commands the right turn signal on the vehicle and trailer ON/OFF
Activate_Left_Turn_Signal	This logical signal commands the left turn signal on the vehicle and trailer ON/OFF
Activate_Brake_Lights	This logical signal commands the brake lights on the vehicle and trailer ON/OFF
Activate_Reverse_Lights	This logical signal commands the reverse lights on the vehicle and trailer ON/OFF
Activate_Rear_Fog_Lights	This logical signal commands the rear fog lights on the vehicle and trailer ON/OFF
Activate_License_Plate_Lights	This logical signal commands the license plate lights on the vehicle ON/OFF
Test_Status	This logical signal indicates when the test has completed
Light_Status	This logical signal indicates which light is being tested/illuminated

5.1.4.3.2 Configuration Parameters

Parameter Name	Description
RearFog_Enable_cfg	BCM Configuration parameter required ECE markets vs FMVSS markets (with/ without fog lamps).

5.1.4.3.3 Tunable Parameters

Parameter Name	Description

5.1.4.4 **Function Modeling**

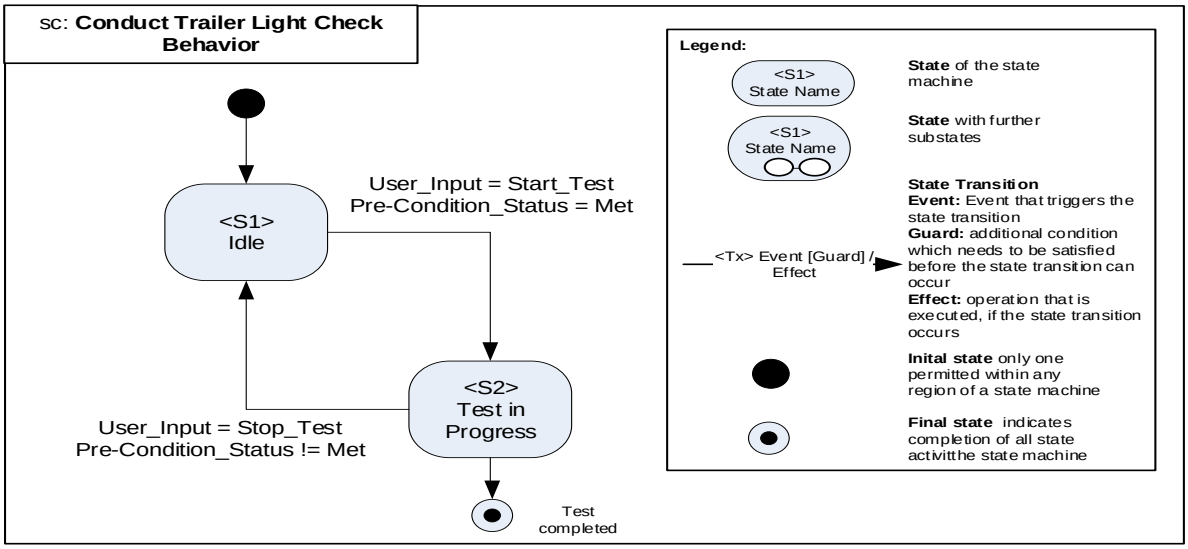


Figure 14: State Machine of Function: Conduct Trailer Light Check

5.1.4.5 **Function Requirement**

###R_FNC_Trailer Light Check_00019### Light test sequence

When User_Input = 0x2 (Start_Test) and Pre-Condition_Status = 0x4 (Preconditions_Passed), the conduct Trailer Light Check function shall illuminate the vehicle and trailer lights as indicated below:

1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-7
    1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn light on vehicle and trailer will flash on and off 6* times
4. Right turn light on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds**
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds***
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking / position lamps (including front and rear side markers)****
    9.1 Turn off license plate lights
    9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out

** Duration for each step shall be individually calibratable in addition to number of sequence repetitions.*
*** If reverse lights are ON prior to entering step 6, this step shall be skipped.*
****Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will not be lit if the trailer is connected.*
***** If parking or position lamps have been turned on through hard switch in vehicle, parking / position lamps shall remain on during this step.*

###R_FNC_Trailer Light Check_00020### Stop test commanded

When User_Input = 0x1 (Stop_Test) while conduct Trailer Light Check function is in progress, the function shall exit and the vehicle's lights will return to normal operation.

###R_FNC_Trailer Light Check_00021### Pre-condition status

If Pre-Condition_Status != 0x4 (Preconditions_Passed) while start button pressed for Trailer Light Check function, HMI feedback shall display the pre-condition that was not met.

###R_FNC_Trailer Light Check_00022### Pre-condition status changes

If Pre-Condition_Status != 0x4 (Preconditions_Passed) while conduct Trailer Light Check function is in progress, the function shall exit and vehicle lights return to normal operation.

###R_FNC_Trailer Light Check_00023### Test completed

When the conduct Trailer Light Check function has completed, the Test_Status signal shall be 0x1 (Test completed).

###R_FNC_Trailer Light Check_00025### Test completed acknowledge

When User_Input signal changes from 0x0 (Null) to 0x3 (Test_end_ack), the Test_Status signal shall be 0x0 (Null)

###R_FNC_Trailer Light Check_00026### Test ended

When the conduct Trailer Light Check function has ended manually (User_input = 0x1 (Stop_Test)), the Test_Status signal shall be 0x2 (Test ended).

###R_FNC_Trailer Light Check_00027### Test end acknowledge

When User_Input signal changes from 0x1 (Stop test) to 0x3 (Test_end_ack), the Test_Status signal shall be 0x0 (Null)

###R_FNC_Trailer Light Check_00028### Publishing light status

When the conduct Trailer Light Check function is in progress, the function shall publish the status of which lights are being tested/illuminated in real time

###R_FNC_Trailer Light Check_00029### Publishing light status (parking or position lamps status)

When publishing light status, lights other than parking / position lamps shall take highest priority for Light_Status signal content since parking / position lamps are illuminated throughout test (i.e. if parking / position lamps and right turn signal are on, Light_Status signal will publish 0x2 - Testing right turn signal). Parklamps_Status should be published on CAN when the parklamps are activated/deactivated as part of the Trailer Light Check sequence.

###R_FNC_Trailer Light Check_00047### Rear Fog Lights Activation – ECE homologated markets

When RearFog_Enable_Cfg parameter is set to 0x01 (Enabled) this function should perform step 7 of Trailer light check sequence, Rear Fog Lights on trailer will turn ON for 4.5* seconds.

###R_FNC_Trailer Light Check_00048### Rear Fog Lights Activation – FMVSS markets

When RearFog_Enable_Cfg parameter is set to 0x00 (Disabled) this function shall skip step 7 of Trailer light check sequence, Rear Fog Lights on trailer will turn ON for 4.5* seconds.

5.1.4.5.1 Functional Requirements

5.1.4.5.1.1 Normal Operation

5.1.4.5.1.2 Error Handling

5.1.4.5.2 Non-Functional Requirements

5.1.4.5.2.1 Safety

5.1.4.5.2.2 Security

5.1.4.5.2.3 Reliability

5.1.4.5.3 Other Requirements

5.1.4.5.3.1 Process requirements

5.1.5 Show Pre-Condition Status

5.1.5.1 Function Description

This function will display the pre-condition status of the feature on FordPass or in-vehicle HMI. When one or more of the pre-conditions are not met for the feature and user requests test to be initiated, the HMI will indicate to the user what must be done to the vehicle for the test to begin.

- If vehicle is not stationary, the HMI will tell the user to stop vehicle movement and shift to park (or apply parking brake for manual transmission vehicles)
- If Trailer is not connected with vehicle, the HMI will tell the user to ensure the trailer connection is made
- If 12v battery SOC < 75% with battery not supported (engine off), the HMI will tell the user to start the engine for test to begin
- If the rear fog lights or one of the taillights are illuminated (position / rear fog / reverse / turn indicators / brake / hazards / license plate), the HMI will tell the user to ensure the brake pedal, turn indicator, hazard lights, rear fog lights are not being manually activated
- If ignition is not on or in acc., the HMI will tell the user to turn on ignition in order to start test
- If another feature that impacts exterior lighting is active (ie. Police Dark Car, Silent Car, RePA, etc.), the HMI will tell the user to turn off interfering external lighting feature

Some vehicles on FMVSS markets have a trailer connection **without** a TRM or ITRM, In these cases the trailer connection precondition cannot be assessed. (Is this configurable in BCM to reflect which market the car is?)

5.1.5.2 Function Scope

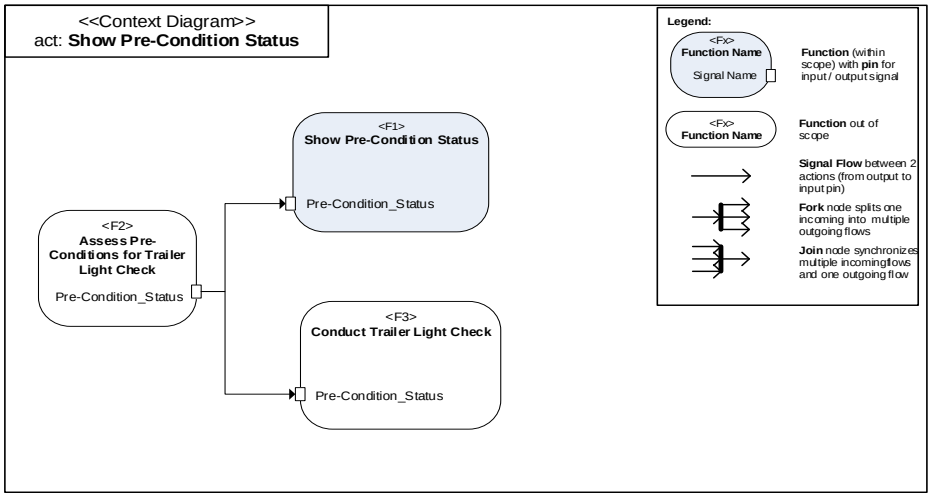


Figure 15: Context Diagram of Function Show Pre-Condition Status

5.1.5.3 Function Interfaces

5.1.5.3.1 Logical Inputs

Signal Name	Description
Pre-Condition_Status	This logical signal carries the pre-condition status for the Trailer Light Check feature

5.1.5.3.1 Logical Outputs

Signal Name	Description

5.1.5.3.1 Configuration Parameters

Parameter Name	Description
TRM_Available_Cfg	BCM Configuration parameter to represent Trailer Tow Module (TRM) Module is Present or Absent.
TLC_ChkTrailerConnected_Cfg	Determines if Trailer Light Check feature is allowed to operate only when a trailer is connected.

5.1.5.3.1 **Tunable Parameters**

Parameter Name	Description

5.1.5.4 **Function Modeling**

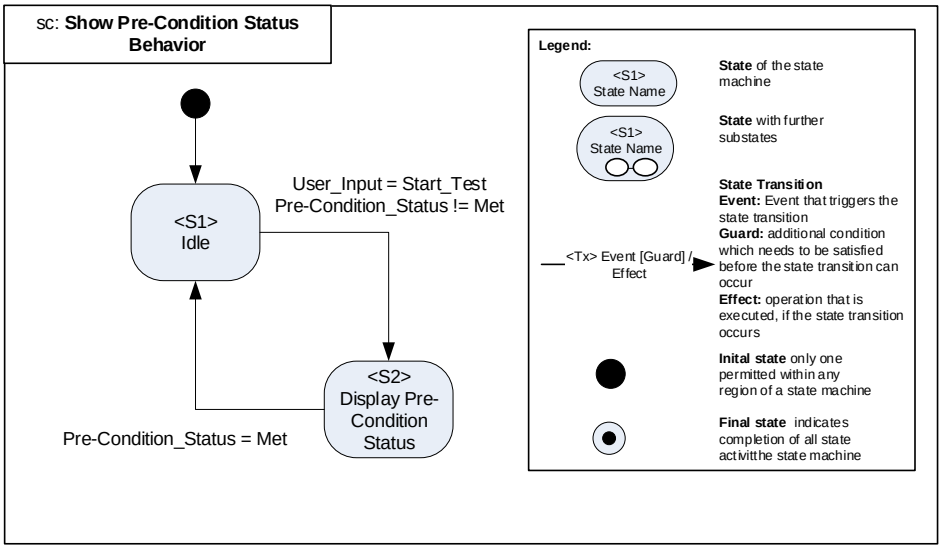


Figure 16: State Machine of Function: Show Pre-Condition Status

5.1.5.5 **Function Requirements**

###R_FNC_Trailer Light Check_00030### Pre-condition status on HMI

If Pre-Condition_Status != Preconditions_Passed immediately after receiving the User_Input = 0x2 (Start_Test) or while conduct Trailer Light Check function is in progress, the show pre-condition status feature shall display the pre-condition status on FordPass and in-vehicle HMI as indicated below:

- Pre-Condition_Status = 0x1 (Ignition OFF): HMI shall state “Vehicle ignition must be ON to conduct Trailer Light Check”
- Pre-Condition_Status = 0x2 (Taillights ON): HMI shall state “To conduct Trailer Light Check, ensure the brake pedal, turn indicator, hazard lights are not being manually activated”
- Pre-Condition_Status = 0x3 (12v Battery SOC < 75% with engine off): HMI shall state “To conduct Trailer Light Check, start the vehicle”
- Pre-Condition_Status = 0x5 (Interaction Present): HMI shall state “To conduct Trailer Light Check, turn off other features that may interact with vehicle lighting”
- Pre-Condition_Status = 0x6 (Not Stationary): HMI shall state “To conduct Trailer Light Check, stop vehicle movement and shift to park (or apply parking brake for manual transmission vehicles)”
- Pre-Condition_Status = 0x7 (Trailer Not Connected): HMI shall state “To conduct Trailer Light Check, connect trailer electrically to vehicle.)”

5.1.5.5.1 Functional Requirements

5.1.5.5.1.1 Normal Operation

5.1.5.5.1.2 Error Handling

###R_FNC_Trailer Light Check_00056### Transmission status is unavailable for less than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for less than 5 seconds, BCM shall hold onto previous value of GearLvrPos_D_Actl for determining the vehicle stationary status of the Trailer Light Check feature

###R_FNC_Trailer Light Check_00057### Transmission status is unavailable for more than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_FNC_Trailer Light Check_00058### Park brake status is unavailable for less than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for less than 5 seconds, BCM shall hold onto previous value of PrkBrkStatus for determining the vehicle stationary status of the Trailer Light Check feature

###R_FNC_Trailer Light Check_00059### Park brake status is unavailable for more than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_FNC_Trailer Light Check_00060### Vehicle Speed is unavailable for less than 5 seconds

When Veh_V_ActlEng signal is not available for less than 5 seconds, BCM shall hold onto the previous value of Veh_V_ActlEng for determining the vehicle stationary status of the Trailer Light Check feature

###R_FNC_Trailer Light Check_00061### Vehicle Speed is unavailable for more than 5 seconds

When Veh_V_ActlEng signal is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_FNC_Trailer Light Check_00062### Detect_Trailer_Connection unavailable for less than 5 seconds

When the TrlrLampCnnct_B_Actl signal is delayed or missing for less than 5 seconds, the function shall hold on to the previous value of the signal Detect_Trailer_Connection.

###R_FNC_Trailer Light Check_00063### Detect_Trailer_Connection unavailable for more than 5 seconds

When the TrlrLampCnnct_B_Actl signal is delayed or missing for less than 5 seconds, the function shall assume that trailer is not connected (Detect_Trailer_Connection is 0x0) and stop trailer light check sequence, HMI shall state trailer is not connected (Pre_Condition_Status is 0x7).

5.1.5.5.2 Non-Functional Requirements

5.1.5.5.2.1 Safety

5.1.5.5.2.2 Security

5.1.5.5.2.3 Reliability

5.1.5.5.3 Other Requirements

5.1.5.5.3.1 Process requirements

5.1.6 Indicate Test Completed

5.1.6.1 Function Description

This function will display the test completion status of the feature and potentially troubleshooting information on FordPass or in-vehicle HMI. When the Trailer Light Check has stopped by command or has come to an end, the HMI will indicate to the user that the test has ended and ask whether all lights on trailer illuminated properly. If the user answers no, a page of troubleshooting information will be displayed. If the user answers yes, the screen will exit.

User response	Behaviour
Yes	Exit screen
No	Display troubleshooting text: • Check trailer wiring harness connection at vehicle • Check trailer tow fuses in power distribution box. See owner's manual • Replace faulty bulb or take vehicle/trailer in for service

5.1.6.2 Function Scope

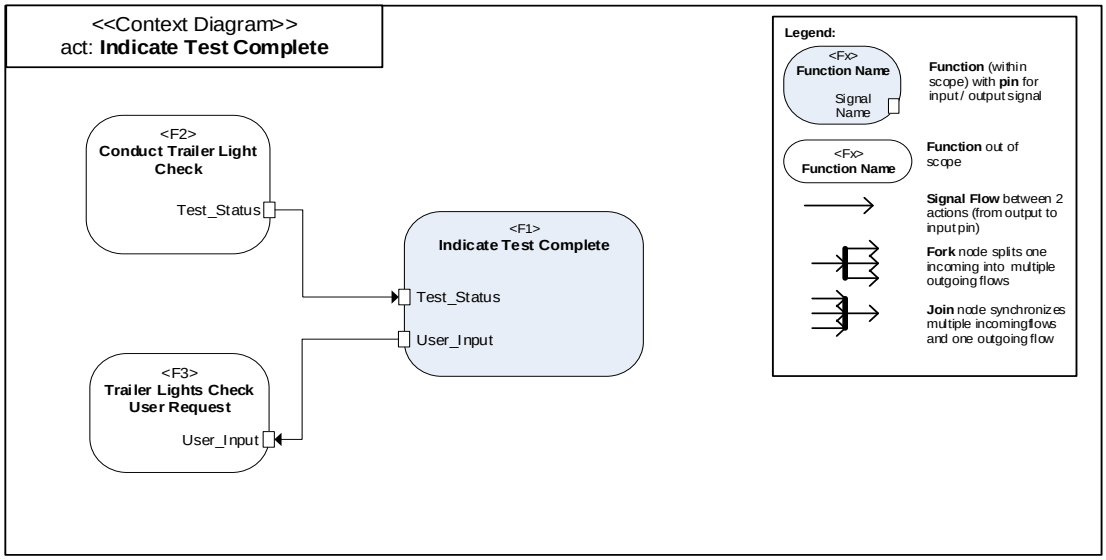


Figure 17: Context Diagram of Function Indicate Test Complete

5.1.6.3 Function Interfaces

5.1.6.3.1 Logical Inputs

Signal Name	Description
Test_Status	This logical signal indicates when the test has completed

5.1.6.3.1 Logical Outputs

Signal Name	Description
User_Input	This logical signal indicates user request and acknowledgement of test complete

5.1.6.3.1 Configuration Parameters

Parameter Name	Description

5.1.6.3.1 Tunable Parameters

Parameter ID	Parameter Name	Description

5.1.6.4 Function Modeling

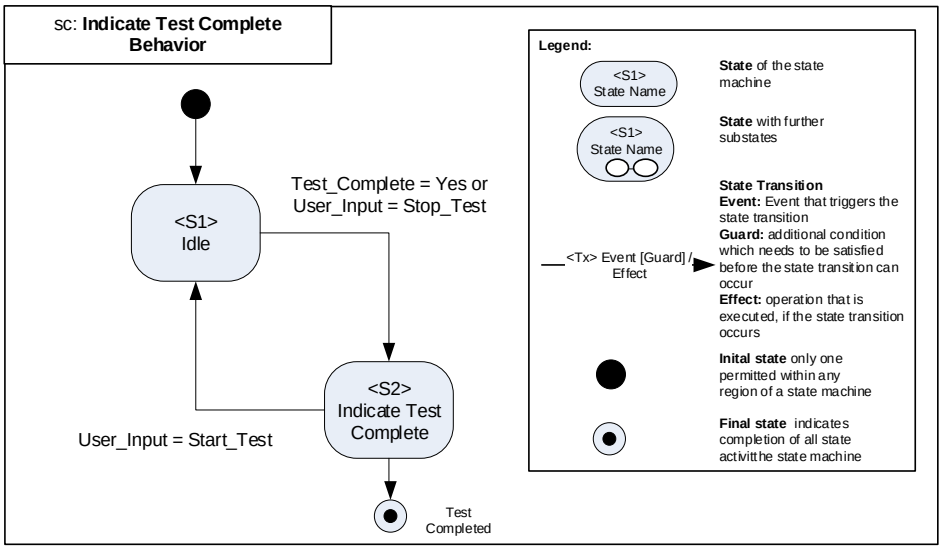
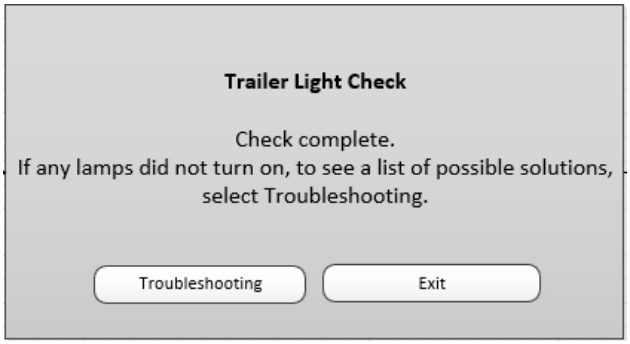


Figure 18: State Machine of Function: Indicate Test Complete

5.1.6.5 Function Requirements

###R_FNC_Trailer Light Check_00031### Trailer Light Check Completed

If Conduct Trailer Light Check function has completed (Test_Status = 0x1 (Test completed)) or ended (Test_Status = 0x2 (Test ended)), the indicate test complete function shall state “Trailer Light Check Completed” complemented by the text “If any lamps did not turn on, to see a list of possible solutions, select Troubleshooting”. When Troubleshooting is selected a new screen shall display Trailer Light Troubleshooting with specific orientations to the User.

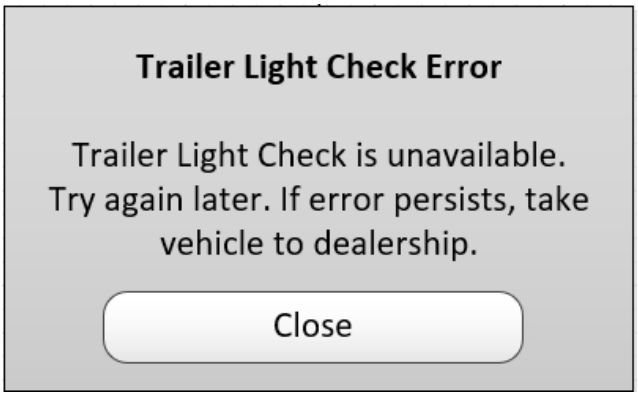


###R_FNC_Trailer Light Check_00032### Unexpected transition of Test_Status signal

If the BCM software resets while the Trailer Light Check is in progress, the Test_Status signal may transition from 0x3 (Test_in_Progress) to 0x0 (Null); upon transition the indicate test complete function shall behave as though test has ended and state “Trailer Light Check Stopped” complemented by text “Trailer Light Check Stopped unexpectedly. Please try again.” along with selectable “Close” button.

###R_FNC_Trailer Light Check_00033### User request times out

If User selects Trailer Light Check to start, but request times out, the indicate test function shall behaves as test has not started and state “Trailer Light Check Error” complemented by text “Trailer Light Check is unavailable. Try again later. If error persists, take vehicle to dealership.” along with selectable “Close” button.



###R_FNC_Trailer Light Check_00034### Test complete receipt

When Test_Status = [0x1 (Test completed) or 0x2 (Test ended)], the User_Input signal shall be 0x3 (Test_end_ack)

5.1.6.5.1 Functional Requirements

5.1.6.5.1.1 Normal Operation

5.1.6.5.1.2 Error Handling

5.1.6.5.2 Non-Functional Requirements

5.1.6.5.2.1 Safety

5.1.6.5.2.2 Security

5.1.6.5.2.3 Reliability

5.1.6.5.3 Other Requirements

5.1.6.5.3.1 Process requirements

5.2 HMI Function

5.2.1 Trailer Light Check HMI Display

5.2.1.1 Description

This function provides an HMI interface to the user on the APIM HMI display and FordPass / LincolnWay which describes the test and provides the user a method to Start or Stop the test.

5.2.1.2 Function Scope

5.2.1.3 Input Requirements/Documents

5.2.1.4 Assumptions

FordPass / LincolnWay require a functional cellular network in range to operate.
User must accept CCS settings permissions for FordPass / LincolnWay to operate.
Vehicle must have a TCU for FordPass / LincolnWay to work.
Sync 4 or later, portrait or landscape displays.

5.2.1.5 Function Requirements

5.2.1.5.1 Requirements on HMI Controller

###R_FNC_Trailer Light Check_00035### Trailer Light Check Initial Screen - FordPass / LincolnWay

In order to start Trailer Light Check in FordPass / LincolnWay UI by selecting the option from the screen menu. See example in Figure 19 below:

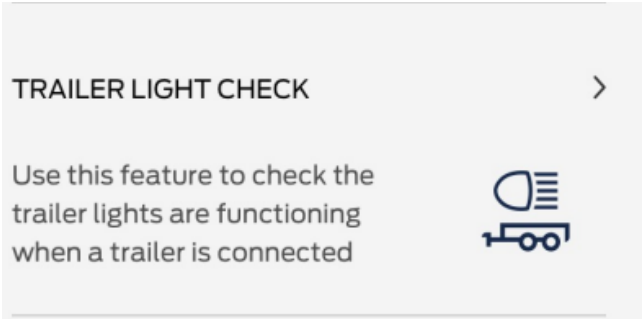


Figure 19: HMI Trailer Light Check Initial Screen – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00036### Trailer Light Check Main Screen - FordPass / LincolnWay

When Trailer Light Check is selected from the main screen menu, the remote display HMI shall present a user interface that displays/contains an explanation of the Trailer Light Check along with Start button. See example in Figure 20 below, (*Rear fog lights applicable for ECE homologated markets only*):

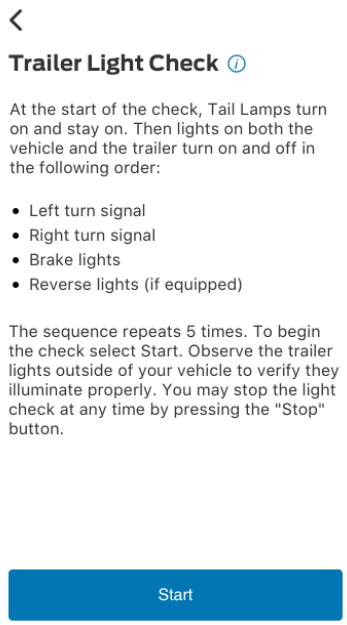


Figure 20: HMI Trailer Light Check Main Screen – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00037### Trailer Light Check Main Screen – APIM_HMI

When Trailer Light Check is selected from the Towing menu, the in-vehicle display APIM_HMI shall present a user interface that displays/contains an explanation of the Trailer Light Check along with Start/Stop and Exit buttons. See example in Figure 21 below, (5. Rear fog lights are applicable for ECE homologated markets only):

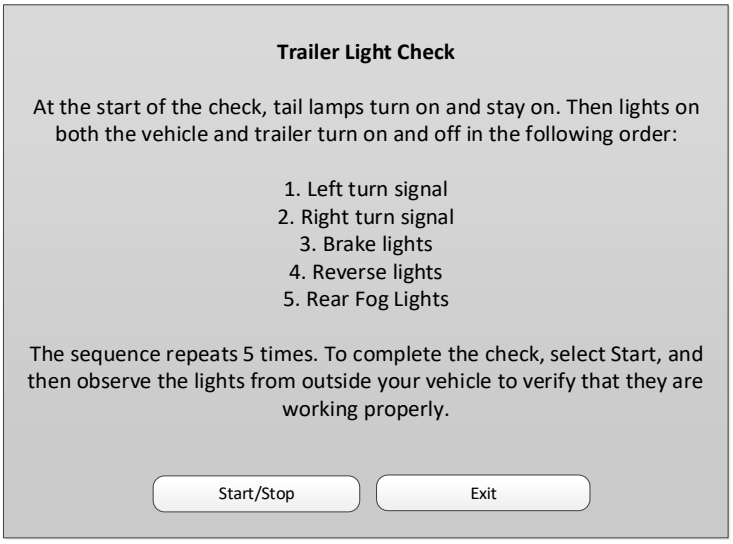


Figure 21: HMI Trailer Light Check Main Screen – APIM_HMI

###R_FNC_Trailer Light Check_00038### Test Ended Message – APIM_HMI

When Test_Status = 0x1 (Test completed) or 0x2 (Test ended), the test has ended and message popup shall be displayed. See example in Figure 22 below:

Figure 22: APIM HMI Test Ended Popup Message

###R_FNC_Trailer Light Check_00039### Not Stationary - Automatic Transmission ONLY – APIM_HMI

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x6 (Not stationary), the HMI shall display a message that indicates to the user to stop vehicle movement and shift the transmission to park to conduct the test. See example in Figure 23 below:

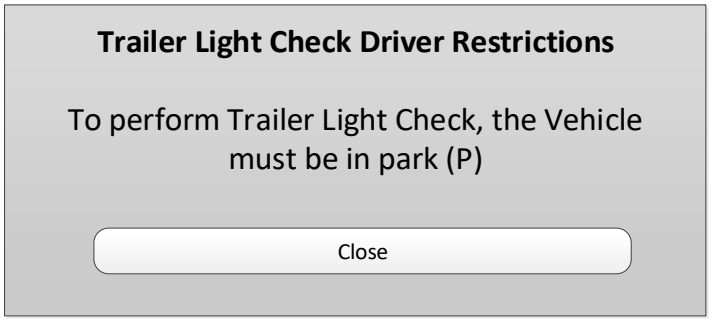


Figure 23: APIM HMI Not Stationary – Automatic Transmission

###R_FNC_Trailer Light Check_00040### Not Stationary - Automatic Transmission ONLY – FordPass / LincolnWay

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x6 (Not stationary), the HMI shall display a message that indicates to the user to stop vehicle movement and shift the transmission to park to conduct the test. See example in Figure 24 below:

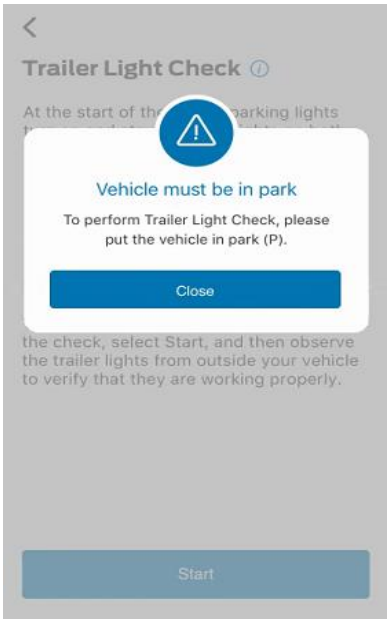


Figure 24: HMI Not Stationary – Automatic Transmission – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00041### Not Stationary - Manual Transmission ONLY – APIM_HMI

In a manual transmission equipped vehicle, when the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x6 (Not stationary), the HMI shall display a message that indicates to the user to stop vehicle movement and engage the parking brake to conduct the test. See example in Figure 25 below:

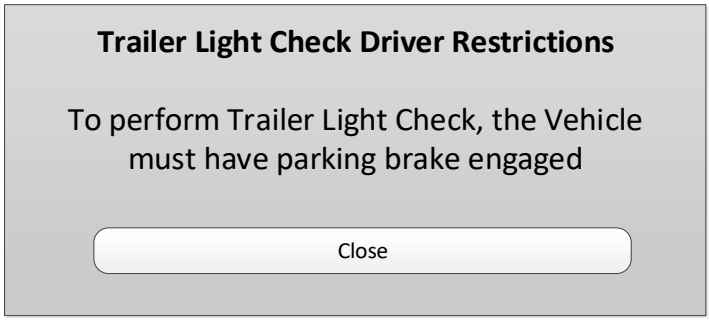


Figure 25: HMI Not Stationary – Manual Transmission

###R_FNC_Trailer Light Check_00042### Low 12v Battery Popup – APIM_HMI

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x3 (12v Battery SOC < 75% with battery not supported), the HMI shall display a message that the user must start the vehicle first. See example in Figure 26 below:

Figure 26: APIM HMI Low Battery

###R_FNC_Trailer Light Check_00043### Low 12v Battery Popup – FordPass / LincolnWay

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x3 (12v Battery SOC < 75% with battery not supported), the HMI shall display a message that the user must start the vehicle first. See example in Figure 27 below:

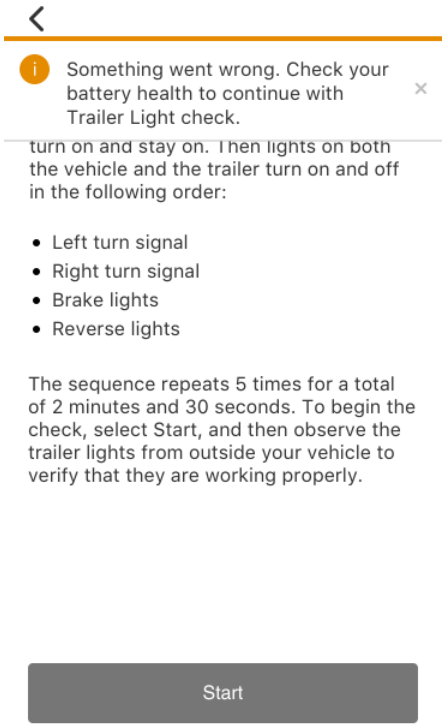


Figure 27: HMI Low 12v Battery – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00044### Ignition Is Not ON – APIM_HMI

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x1 (Ignition not ON), the HMI shall display a message that the user must turn on the vehicle ignition. See example in Figure 28 below:

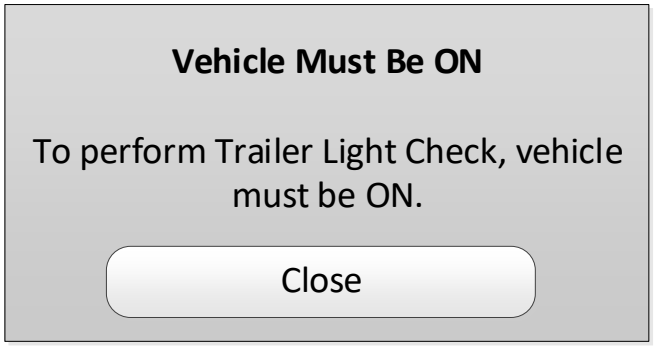


Figure 28: APIM HMI Ignition Not On

###R_FNC_Trailer Light Check_00045### Ignition Is Not ON – FordPass / LincolnWay

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x1 (Ignition not ON), the HMI shall display a message that the user must turn on the vehicle ignition. See example in Figure 29 below:

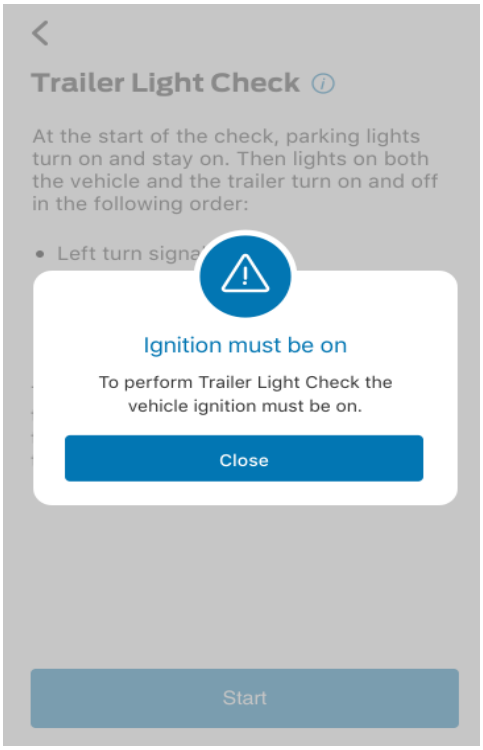


Figure 29: HMI Ignition Not On – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00046### Taillights must be Off – APIM_HMI

To perform Trailer Light Check, the brake lights, turn indicator lights, reverse lights, rear fog light (if equipped) and hazard lights shall not be on, otherwise HMI shall display the message “Taillights must be off”. See example in Figure 30 below (*Rear fog lights applicable for ECE region only*):

Figure 30: APIM HMI Taillight Interaction

###R_FNC_Trailer Light Check_00047### Taillights must be Off – FordPass / LincolnWay

To perform Trailer Light Check, the brake lights, turn indicator lights, reverse lights, rear fog light (if equipped) and hazard lights shall not be on, otherwise HMI shall display the message “Taillights must be off”. See example in Figure 30 below (*Rear fog lights applicable for ECE region only*):

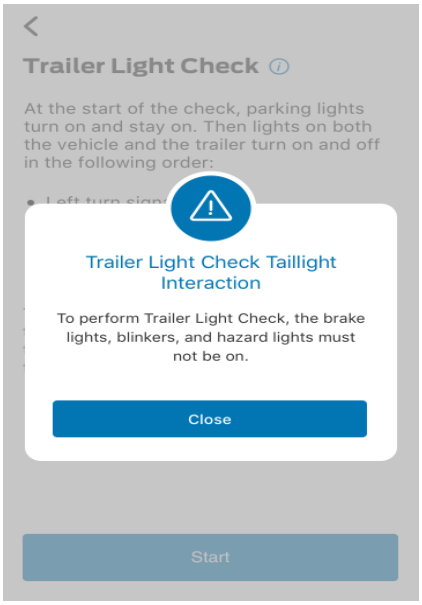


Figure 31: HMI Taillight Interaction – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00048### Trailer is not connected – APIM_HMI

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x7(Trailer not connected), the HMI shall display a message that the user must connect the trailer with vehicle. See example in Figure 32 below:

Figure 32: HMI Trailer not connected

###R_FNC_Trailer Light Check_00049### Feature Interaction Present – APIM_HMI

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x5 (Interaction Present), the HMI shall display a message that a feature interaction exists. See example in Figure 33 below:

Figure 33: HMI Taillight Interaction

Note: Vehicle equipped with BCM minimum s/w version MY21 GEN I M RC01.2 allow Zone Lighting and Trailer Light Check working at same time. If this happens, the rear facing white lights would stay on in the rear zone, if activated by Zone Lighting. Refer to the Zone Lighting AFS for more information.
Question - Will the Trailer reverse lights stay on if the trailer is connected and ZL rear zone is enabled and TLC sequence is started?

###R_FNC_Trailer Light Check_00050### Feature Interaction Present – FordPass / LincolnWay

When the Trailer Light Check is being requested or is currently in progress and Pre-Condition_Status = 0x5 (Interaction Present), the HMI shall display a message that a feature interaction exists. See example in Figure 34 below:

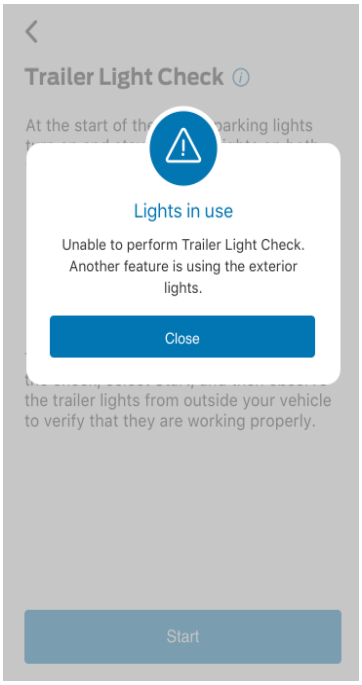


Figure 34: HMI Taillight Interaction – FordPass / LincolnWay

Note: Vehicle equipped with BCM minimum s/w version MY21 GEN I M RC01.2 allow Zone Lighting and Trailer Light Check working at same time. If this happens, the rear facing white lights would stay on in the rear zone, if activated by Zone Lighting. Refer to the Zone Lighting AFS for more information.

###R_FNC_Trailer Light Check_00051### Troubleshooting Screen – APIM_HMI

After the Trailer Light Check has ended and user selects Troubleshooting, the HMI shall display troubleshooting information. See example in Figure 35 below:

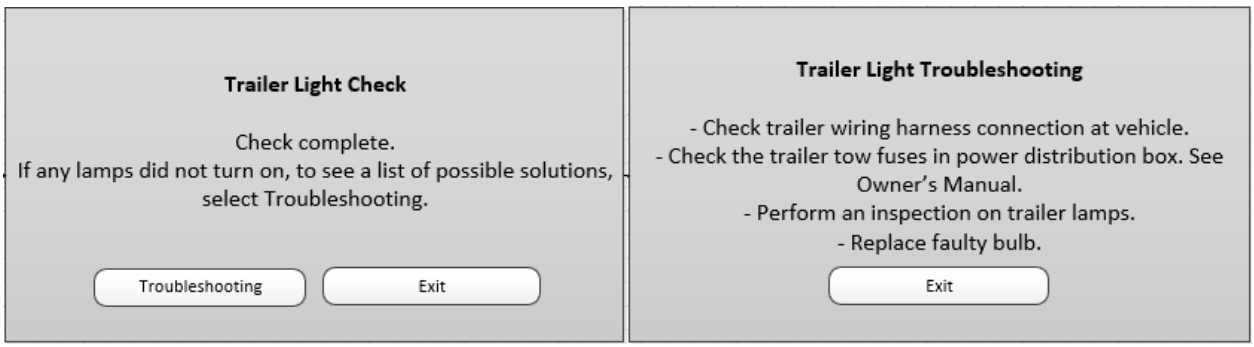


Figure 35: HMI Troubleshooting – APIM

###R_FNC_Trailer Light Check_00052### Troubleshooting Screen – FordPass / LincolnWay

To access Troubleshooting screen the user shall click on the blue bubble at upper right corner of Trailer Light Check main menu, the HMI shall display troubleshooting information. See example in Figure 36 below:

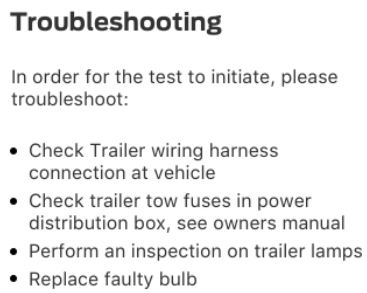


Figure 36: HMI Troubleshooting – FordPass / LincolnWay

###R_FNC_Trailer Light Check_00053### Test ended due to a precondition not being met Screen – APIM_HMI

After the Trailer Light Check has ended due to a precondition not being met, the HMI shall display unmet precondition text information. See example in Figure 37 below:

Figure 37: Test ended due to a precondition not being met – APIM

5.3 Sleep Inhibit Function

Feature doesn't work without key ignition on or acc status.

5.3.1 Function Overview

The condition to run Trailer Light Check (TLC) is the vehicle 12v battery more or equal than 75% state of charge with engine off. However, its possible to run with ignition in ON or ACC status.

5.3.2 Function Scope

Refer to VSEM_Link

5.3.3 Function Interfaces

Refer to VSEM_Link

6 FEATURE IMPLEMENTATION SPECIFICATION

6.1 Feature Implementation Overview

6.1.1 Description

6.1.2 Lessons Learned

*#**Classification**: Optional*
*#**Hint:** Additional information and lessons learned from previous development or related features. A typical source for Lessons Learned is the FMA Quality History.*

6.1.3 Assumptions

*#**Classification**: Optional*
*#**Hint:** A list of assumptions concerning the effects/dependencies of the feature's deployment as well as (e.g. known limitations). During the course of the feature development most of those assumptions are typically either converted into actual requirements or discarded at some point – such that this chapter ideally remains mostly empty.*

6.2 Functional Architecture

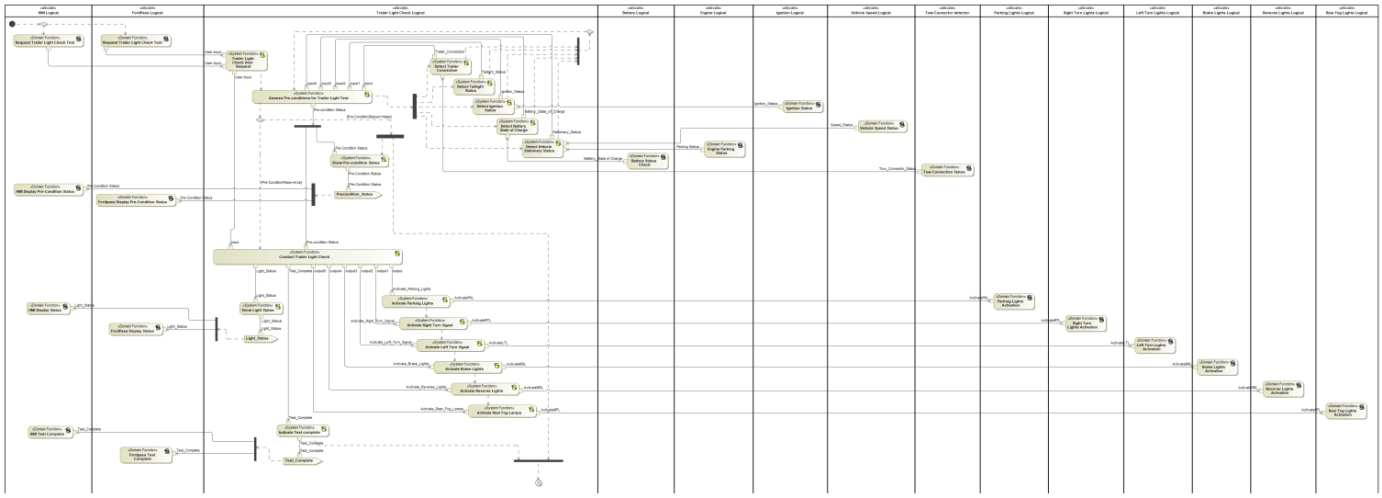
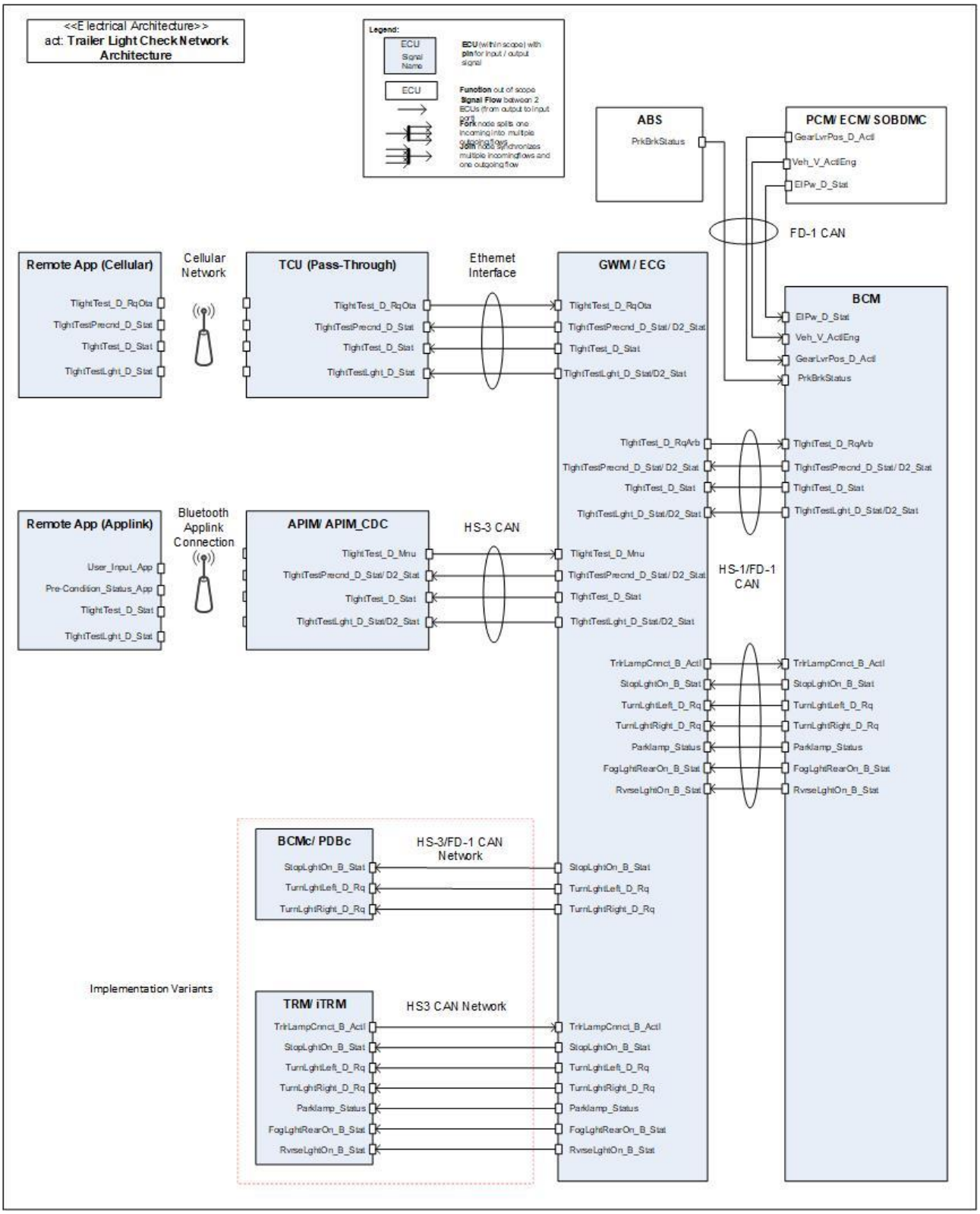


Figure 38: Functional Architecture

Refer to chapter *4* "*Functional Architecture*".

6.3 Physical Architecture

6.3.1 E/E Architecture



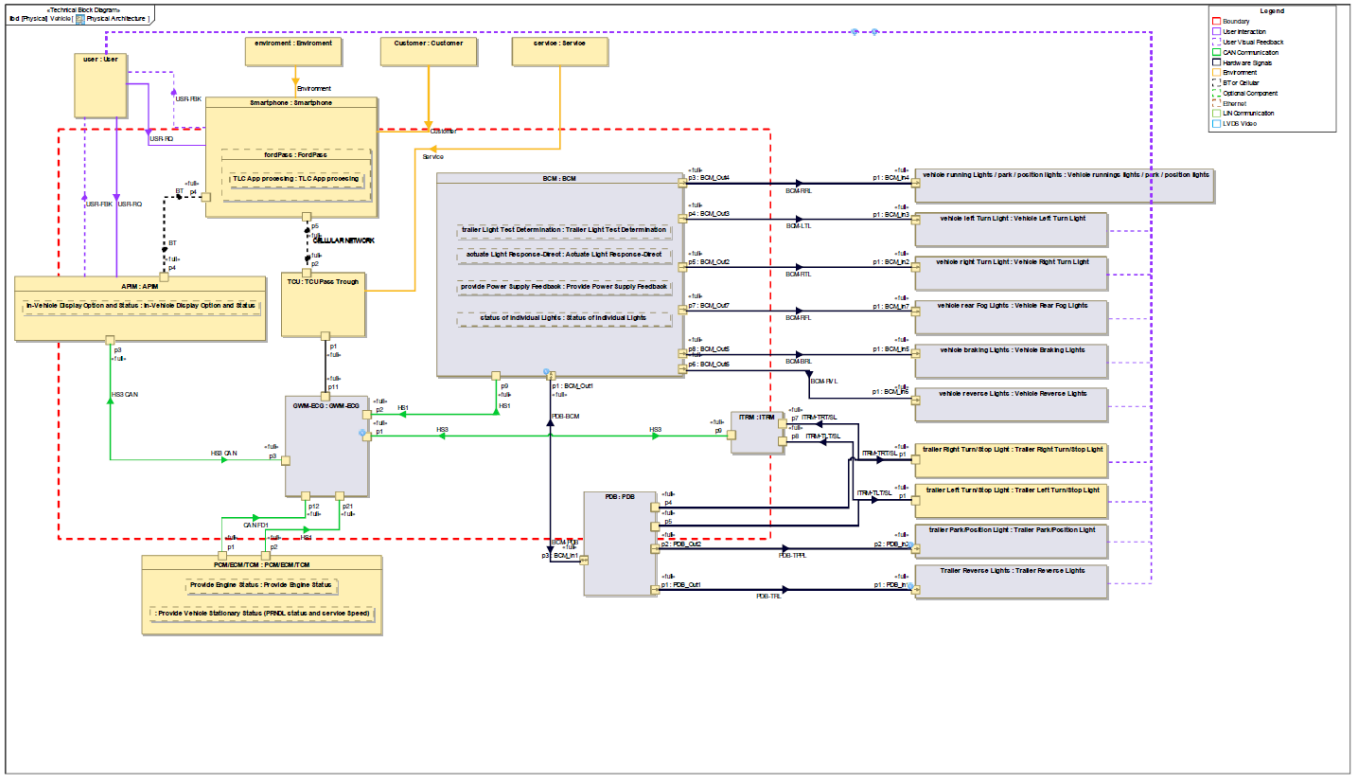
Note: Some vehicles on FMVSS markets have a trailer connection without a TRM or ITRM, the feature will still work but will not support trailer connection precondition cannot be assessed. Refer 4.1.5

Figure 39: Trailer Light Check Network Architecture

6.3.1.1 E/E Architecture Variants

E/E Architecture Variant Name	Variant Description	Variant Condition (optional)
FMVSS-108 Platform Architecture		With ITRM
FMVSS-108 Platform Architecture – Less ITRM	Relay based PDB solution on low series vehicles without ITRM/TRM	Without ITRM
ECE R/48 Rev .7 Platform Architecture		

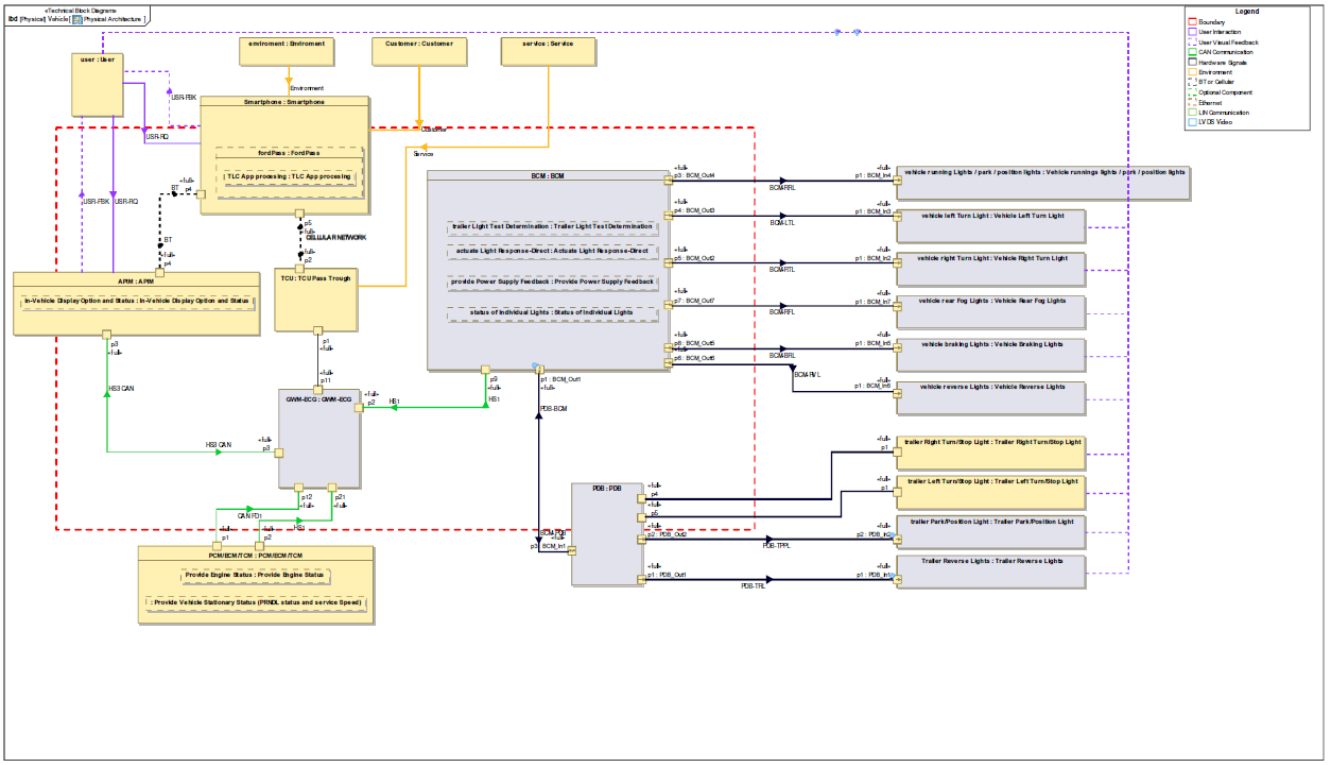
6.3.1.1.1 **FMVSS-108 Platform Architecture**



Note: Some vehicles on FMVSS markets have a trailer connection without a TRM or ITRM, **the feature will still work but will not support trailer connection precondition cannot be assessed. Refer 4.1.5**

Figure 40: Platform Architecture with ITRM

6.3.1.1.2 FMVSS-108 Platform Architecture – Less ITRM



Relay based PDB solution on low series vehicles without ITRM/TRM

Figure 41: Platform Architecture without ITRM/TRM

6.3.1.1.3 ECE R/48 Rev.7 Platform Architecture

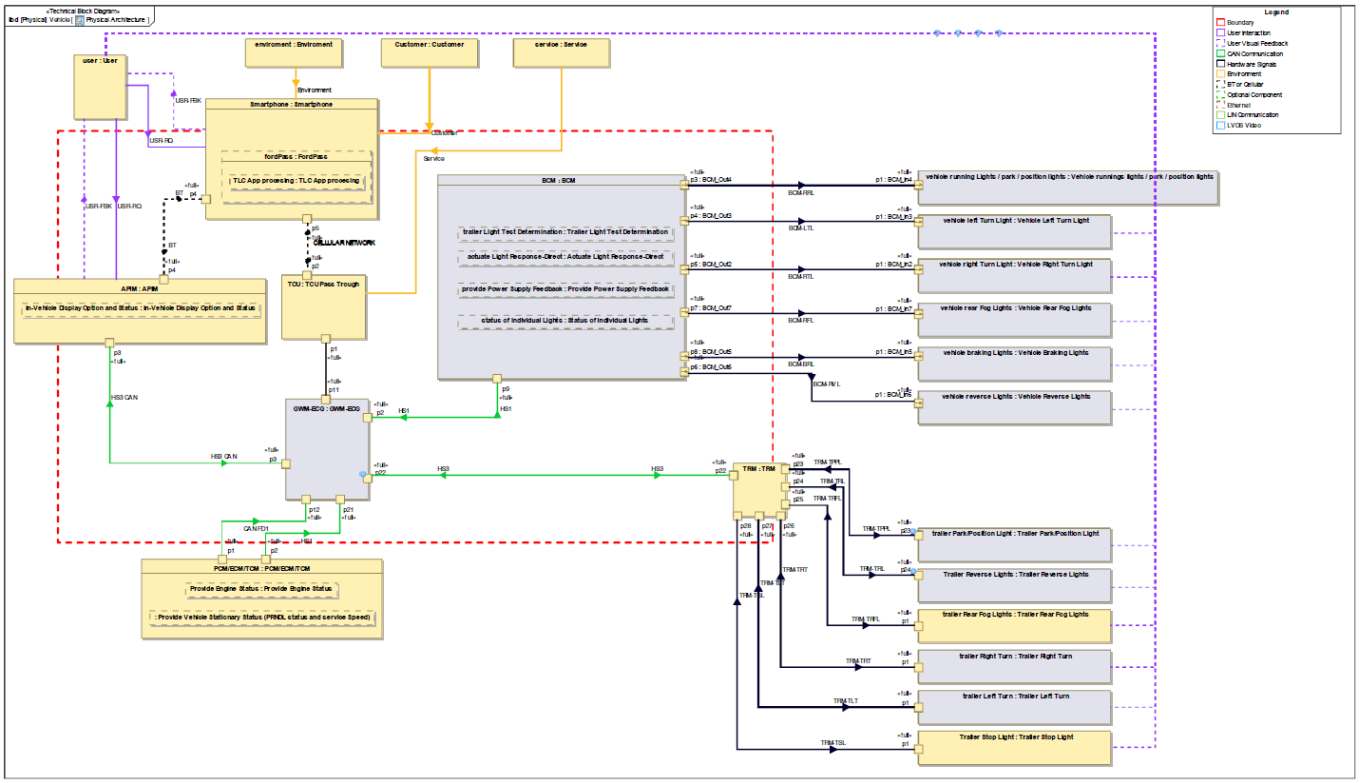


Figure 42: ECE R/48 Rev. 7 Platform Architecture

6.3.1.2 E/E Components

Component Name	Description
BCM	Body Control Module
APIM	Accessory Protocol Interface Module (SYNC or AOS/ Phoenix)
PCM/ECM/TCM	Powertrain Control Module / Engine Control Module / Transmission Control Module
GWM_ECG	Enhanced Central Gateway Module
TCU	Telematics Control Unit
Remote App	FordPass / LincolnWay app via Cellular network or Bluetooth
ITRM	Integrated Trailer Module
TTLM (TRM)	Trailer Tow Lighting Module (Trailer Module)
SOBDMC	Secondary OBD Module C
BCMc / PDBc	Body Control Module C / Power Distribution Box C
ABS	Anti-Lock Braking System Module

Table 1: Electrical Components

6.3.1.3 E/E Connections

Connection Name	Type	Description	Connected Nodes
HS1	High Speed	High speed 1 CAN network	BCM, GWM_ECG, BCMc / PDBc
HS3	High Speed	High speed 3 CAN network	APIM, GWM_ECG, TRM_ITRM
CAN FD1	Flexible Data-rate	CAN – Flexible Data-rate	PCM, ECM, TCM, BCM, GWM_ECG, SOBDMC, ABS, BCMc / PDBc
Ethernet	Ethernet	Ethernet connection	GWM_ECG, TCU

Table 2: E/E Connections

6.3.1.4 Signal List

Signal mapping found directly in the ECU specific chapters of section 6.6.2 “Requirements on Components”

6.3.2 Software Component Architecture

*#**Hint:** For a Feature with in-house SW development (specifically in an Agile Environment) it is required, that the development team documents and agrees on at least their SW interfaces to the outside world early in the process.*

6.3.2.1 Description

*#**Classification:** Optional*
*#**Hint**: Provide some informal description of the characteristics of the chosen Software Component Architecture. Also give some graphical representation of the Software Component Architecture. SysML Internal Block Diagrams or AUTOSAR Virtual Function Bus models could be used to depict such a Software Component Architecture.*
*#**Link:** SysML – Internal Block Diagrams and AUTOSAR*

This Software Component Architecture … <add some explanatory text here>

6.4 Function Deployment

*#**Hint:** This section lists and details the deployment variants of the Feature.*

6.4.1 **Deployment Variants**

*#**Classification:** Mandatory – State "No Variants defined", if not used.*
*#**Hint:** If there is more than 1 variant of deployment, the different variant should be listed and described below. Deployment variants are very much driven by E/E architecture variants (refer to section E/E Architecture Variants). Nevertheless, Feature/Function variant options might also drive additional deployment variants.*

Deployment Variant Name	**Variant Description**	**Variant Condition** (optional)

6.4.1.1 Deployment "Variant 1"

*#**Classification:** Optional*
*#**Hint:** Add a deployment diagram (e.g. a SysML Activity Diagram where the actions represent the Logical Functions and the swimlanes represent the components) and some explanatory text about the variant to this section.*

This deployment variant … <add some explanatory text here>

6.4.2 **Function Allocation**

Component	Technology Function Name	Logical Function Name
BCM	Assess Pre-conditions for Trailer Light Check	
	BCM_M2_Config	
	Conduct Trailer Light Check	
iTRM/TTLM/TRM	Gateway signal transfer	
	Trailer Connect	
APIM FordPass	Trailer Light Check User Request	
	Show Pre-Condition Status	
	Indicate Test Complete	
	Trailer Light Check HMI Display	
	TLC App processing	
APIM	M2 config APIM	
ABS ESC/EBB	Provide Parking Brake Status	
PCM/ECM/TCM	Provide Engine Status	
	Provide Vehicle Stationary Status	
ECG	Gateway signals ECG	
	M2_config	
TCU	Gateway signals TCU	

Table 3: Function Allocation Table (Basic)

Component		Technology Function Name	TSR	
Name	**ASIL**		**ID/Name**	**ASIL**
Component 1		Impl. Function 1	Req 1-1: ”Some Req Name”	
			…	
			Req 1-n: ”Another Req Name”	
		Impl. Function 2a	Req 2a-1	
			…	
			Req 2a-n	
		Impl. Function 2b	Req 2b-1	
			…	
			Req 2b-n	
		Impl. Function 6	Req 6-1	
			…	
			Req 6-n	
		n/a *#Hint: TSRs may be directly allocated to components. This is necessary for requirements such as ASIL hardware metric values and safety measures that don’t relate to functions (ex. thermal shielding or something like a fan cover to prevent access to moving parts).*	Req x	
Component 2		Impl. Function 3	Req 3-1	
			…	
			Req 3-n	
		Impl. Function 4	Req 4-1	
			…	
			Req 4-n	
		Impl. Function 5	Req 5-1	
			…	
			Req 5-n	

Table 4: Function Allocation Table (Functional Safety Extension)

6.5 Feature Implementation Modeling

6.5.1 Component Interaction Diagrams

6.5.1.1 Scenario: “Conduct Trailer Light Check Using Cellular”

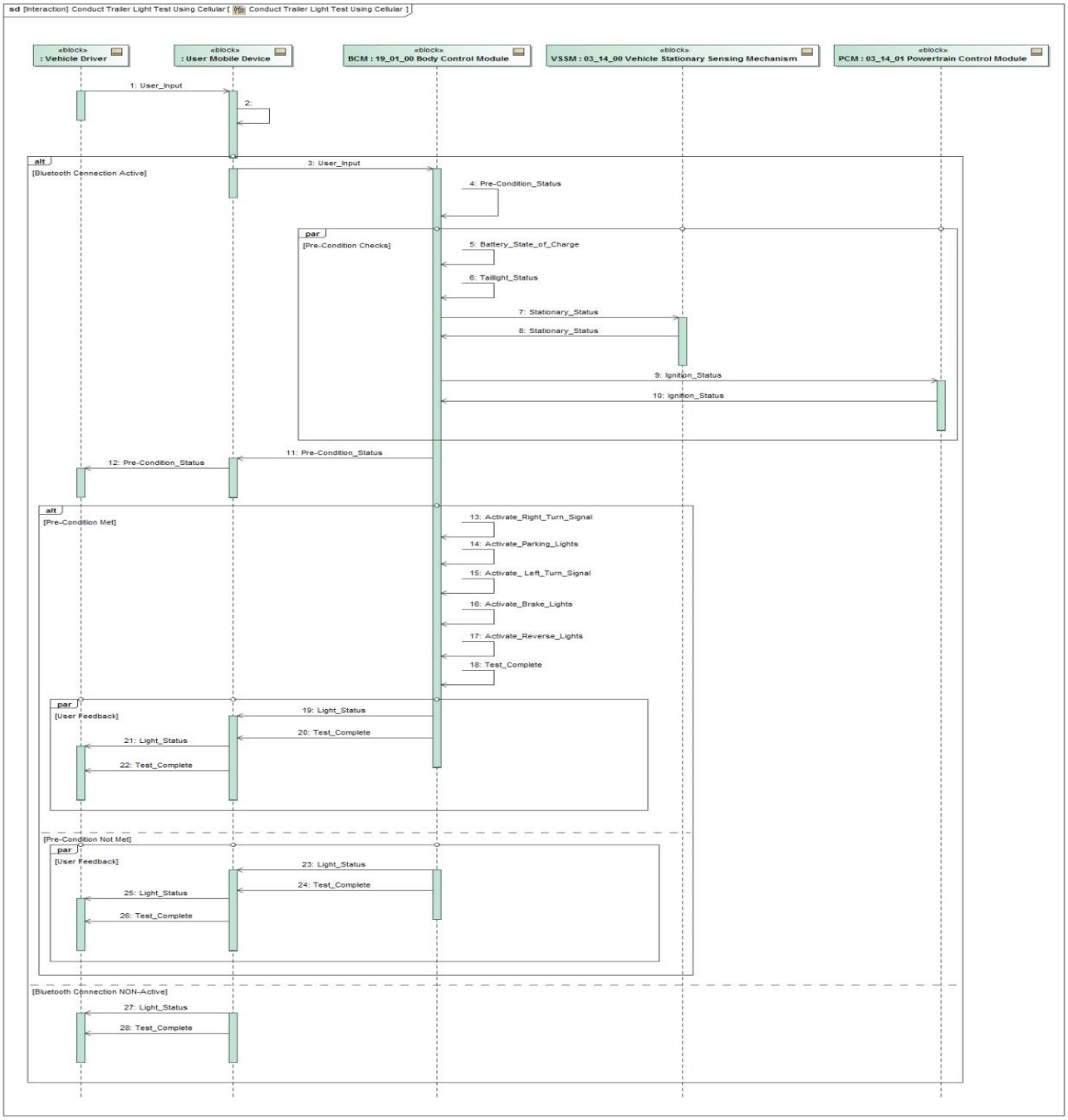


Figure 43: Sequence Chart “Conduct Trailer Light Check Using Cellular”

6.5.1.2 Scenario: “Conduct Trailer Light Check Using Bluetooth/APIM HMI”

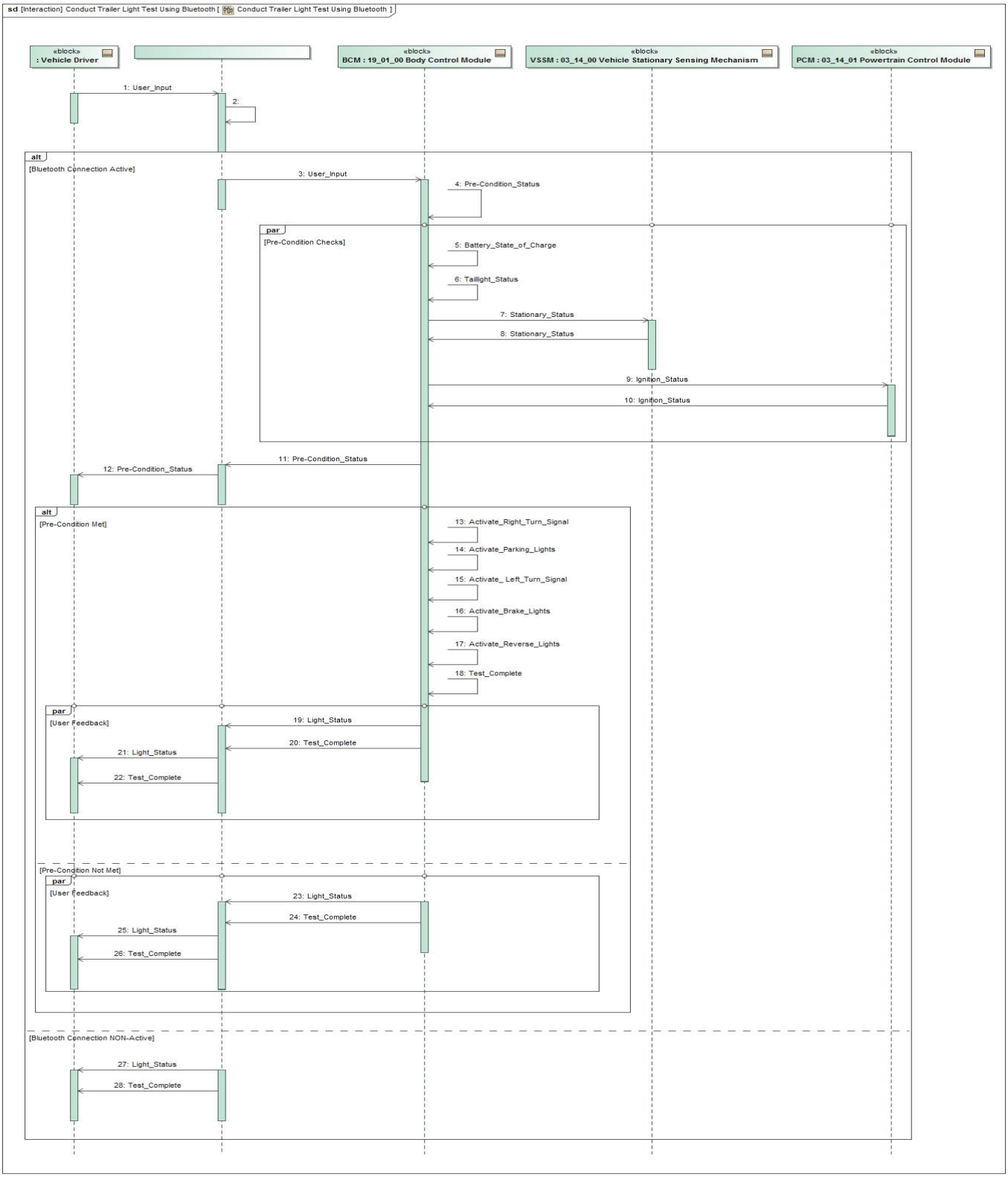


Figure 44: Sequence Chart "Conduct Trailer Light Check Using Bluetooth / APIM HMI"

6.5.2 Component Interface Behavior Diagrams

6.6 Feature Implementation Requirements

6.6.1 Functional Safety

*#**Classification**: Functional Safety only – If not used, remove content and state "Not Applicable"*
*#**Hint:** If feature is not Functional Safety critical, remove subsections from this chapter and state "Feature is not Functional Safety critical"*

6.6.1.1 ASIL Decomposition of Technical Safety Requirements

*#**Classification**: Functional Safety only – If not used, remove content and state "Not Applicable"*
*#**Hint:** Sometimes an ASIL decomposition of Technical Safety Requirements (TSRs) is required. The (input) TSRs, which are to be decomposed, are derived from FSRs. Those input TSRs are to be specified in this chapter (right above the corresponding ASIL decomposition table). For each input TSR add one "ASIL Decomposition Table". In the "ASIL Decomposition Table" the derived, decomposed TSRs are referenced by ID and Title. Those TSRs are however not specified in the FIS but in the ECU Functional Specfication.*
*#**Macro:** Add Ins -> Add Requirement macro (select "**Func./Tech. Safety Requirement**" as type)*
*#**Link:** Functional Safety Sharepoint - Functional Safety Concept*

<Place the input TSR here above the decomposition table>

Input TSR	<Provide the ID of the TSR which shall be decomposed. That TSR is given above>	
Decomposition Rationale	<Give a reason why the decomposition was performed>	
Method for Decomposition	Choose a Method	
TSR 1 after Decomposition	**TSR ID**	<Provide the ID of the decomposed TSR>
	TSR Title	<Provide the title of the decomposed TSR>
	ASIL	
	Rationale	<Provide a reason and thought behind that particular requirement. Should include how the requirement is able to independently fulfill the needs of the parent requirement>
	Satisfied by	<Provide an Technology Function, physical signal, or physical component satisfying the requirement. This element shall be independent of the element satisfied by the other half of the ASIL decomposition.>
TSR 2 after Decomposition	**TSR ID**	<Provide the ID of the decomposed TSR>
	TSR Title	<Provide the title of the decomposed TSR>
	ASIL	
	Rationale	<Provide a reason and thought behind that particular requirement. Should include how the requirement is able to independently fulfill the needs of the parent requirement>
	Satisfied by	<Provide an Technology Function, physical signal, or physical component satisfying the requirement. This element shall be independent of the element satisfied by the other half of the ASIL decomposition.>
TSR for Independence	**TSR ID**	
	TSR Title	

Input TSR	<Provide the ID of the TSR which shall be decomposed. That TSR is given above>	
Note: should consider commonly used input, output and processing *Note: additional row should be added if additional requirements for Independence are necessary*	**ASIL**	
	Rationale	

Table 5: ASIL Decomposition Table

6.6.2 Requirements on Components

6.6.2.1 BCM

###R_CMP_Trailer Light Check_00001### BCM signal timing for Trailer Light Check

The signals mentioned in this document shall be published within the timing of 1000 milliseconds.
Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator (TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)

###R_CMP_Trailer Light Check_00002### BCM signal latency for Trailer Light Check

The signals mentioned in this document shall be published with a signal latency of 40 milliseconds.
Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator (TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)

###R_CMP_Trailer Light Check_00014### BCM signal on FMVSS vehicles without ITRM/TRM modules for Trailer Light Check

On FMVSS vehicles without ITRM/TRM modules, the BCM shall internally control the TT Park Relay (FET) to activate or deactivate the trailer parking lights accordingly during the Trailer Light Check sequence.

6.6.2.1.1 Function “Detect Vehicle Stationary Status”

6.6.2.1.1.1 Interface Requirements

6.6.2.1.1.1.1 Published Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
00002	Stationary_Status	0x0 – Not stationary 0x1 – Stationary	N/A	N/A	BCM Internal

Table 6: BCM – Signal Mapping of Published Signals for Detect Vehicle Stationary Status function

6.6.2.1.1.1.2 Published Requirements

###R_CMP_Trailer Light Check_00003### Transmission status unavailable for less than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for less than 5 seconds, BCM shall hold onto previous value of GearLvrPos_D_Actl for determining vehicle stationary status of Trailer Light Check feature

###R_CMP_Trailer Light Check_00004### Transmission status unavailable for more than 5 seconds (automatic transmission ONLY)

When GearLvrPos_D_Actl is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_CMP_Trailer Light Check_00005### Park brake status unavailable for less than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for less than 5 seconds, BCM shall hold onto previous value of PrkBrkStatus for determining vehicle stationary status of Trailer Light Check feature

###R_CMP_Trailer Light Check_00006### Park brake status unavailable for more than 5 seconds (manual transmission ONLY)

When PrkBrkStatus is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

###R_CMP_Trailer Light Check_00007### Vehicle Speed unavailable for less than 5 seconds

When Veh_V_ActlEng signal is not available for less than 5 seconds, BCM shall hold onto the previous value of Veh_V_ActlEng for determining vehicle stationary status of Trailer Light Check feature

###R_CMP_Trailer Light Check_00008### Vehicle Speed unavailable for more than 5 seconds

When Veh_V_ActlEng signal is not available for 5 or more seconds, BCM shall set vehicle stationary status to 0x0 (Not stationary)

6.6.2.1.1.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
00003	Vehicle_Speed	0 to 655.35 KHP	Veh_V_ActlEng	0 to 655.35 KPH	CAN FD1
00004	PrkBrkStatus	0x0 Not_Supported 0x1 Rear_Caliper_Closed 0x2 Rear_Caliper_Transition 0x3 RWU_by_EPB_Active 0x4 Rear_Caliper_Open 0x5 EPM_Limphome_Active 0x6 ECD_by_Brake_ECU_Active 0x7 GeneralFault_MaintenanceMode	PrkBrkStatus	0x0 Not_Supported 0x1 Rear_Caliper_Closed 0x2 Rear_Caliper_Transition 0x3 RWU_by_EPB_Active 0x4 Rear_Caliper_Open 0x5 EPM_Limphome_Active 0x6 ECD_by_Brake_ECU_Active 0x7 GeneralFault_MaintenanceMode	CAN FD1
00005	GearLvrPos_D_Actl	0x0 Park 0x1 Reverse 0x2 Neutral 0x3 Drive 0x4 Sport/Drive Sport 0x5 Low 0x6 1 0x7 2 0x8 3 0x9 4 0xA 5 0xB 6 0xC undefined 0xD undefined 0xE unknown position 0xF fault	GearLvrPos_D_Actl	0x0 Park 0x1 Reverse 0x2 Neutral 0x3 Drive 0x4 Sport/Drive Sport 0x5 Low 0x6 1 0x7 2 0x8 3 0x9 4 0xA 5 0xB 6 0xC undefined 0xD undefined 0xE unknown position 0xF fault	CAN FD1

Table 7: BCM – Signal Mapping of Subscribed Signals for Detect Vehicle Stationary Status function

6.6.2.1.1.2 Inherited Function Level Requirement

Requirement ID	Requirement Title
0004	Vehicle not stationary (automatic transmission ONLY)
0005	Vehicle not stationary (manual transmission ONLY)
0006	Vehicle is stationary (automatic transmission ONLY)
0007	Vehicle is stationary (manual transmission ONLY)

6.6.2.1.1.3 ECU Specific Requirements

6.6.2.1.2 Function "Assess Pre-conditions for Trailer Light Check"

6.6.2.1.2.1 Interface Requirements

6.6.2.1.2.1.1 Published Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
00010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < 75% 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	0x0 – Null (Defaulted) 0x1 – Ignition_not_ON 0x2 – Taillights_ON 0x3 – Battery_SOC< 75% 0x4 - Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	HS1 CAN

Table 8: BCM – Signal Mapping of Published Signals for Assess Pre-conditions for Trailer Light Check

6.6.2.1.2.2 Publisher Requirement

6.6.2.1.2.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0001	User_Input	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	TlghtTest_D_RqArb	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	HS1 CAN
0007	Taillight_Status	0x0 – Taillights ON 0x1 – Taillights OFF	N/A	N/A	BCM internal
0008	Ignition_Status	0x0 - Unknown 0x1- Off 0x2 - Accessory 0x4 - Run 0x8 - Start 0xF - Invalid	Ignition_Status	0x0 - Unknown 0x1- Off 0x2 - Accessory 0x4 - Run 0x8 - Start 0xF - Invalid	CAN FD1
0006	Battery_State_of_Charge	0x0 – Battery_SOC_Not_OK 0x1 – Battery_SOC_OK	N/A	N/A	BCM internal
0002	Stationary_Status	0x0 – Not Stationary 0x1 – Stationary	N/A	N/A	BCM internal
0018	Feature_Interaction	0x0 – Interaction_Present 0x1 – No_Interaction	N/A	N/A	BCM internal
0009	ElPw_D_Stat	0x0 - Not_Supported 0x1 - Supported 0x2 – Not_Supported_Imminent 0x3 – LV_Event_In_Progress 0x4 – Fault_Limited 0x5 – NotUsed_1 0x6 - NotUsed_2 0x7 - NotUsed_3	ElPw_D_Stat	0x0 - Not_Supported 0x1 - Supported 0x2 – Not_Supported_Imminent 0x3 – LV_Event_In_Progress 0x4 – Fault_Limited 0x5 – NotUsed_1 0x6 - NotUsed_2 0x7 - NotUsed_3	CAN FD1
0011	Detect_Trailer_Connection	0x0 – No 0x1 – Yes	TrlrLampCnnct_B_Actl	0x0 – No 0x1 – Yes	HS3/MS1

Table 9: BCM – Signal Mapping of Subscribed Signals for Assess Pre-conditions for Trailer Light Check

6.6.2.1.2.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00010	Pre-condition status sending duration
00011	12v Battery SOC low or Quality not OK
00012	12v Battery SOC OK
00013	12v Battery feedback unavailable
00016	Pre-Condition Signal Behavior
00017	Taillight_Status signal for lights on
00018	Taillight_Status signal for lights off
00014	Another feature interaction not present
00015	Another feature interaction present

Table 10: BCM – Inherited Function Level Requirements

6.6.2.2 Technology Function "Conduct Trailer Light Check"

6.6.2.2.1 Interface Requirement

6.6.2.2.1.1 Published Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < 75% 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	0x0 – Null (Defaulted) 0x1 – Ignition_not_ON 0x2 – Taillights_ON 0x3 – Battery_SOC< 75% 0x4 - Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	HS1 CAN
0016	Test_Status	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	TlghtTest_D_Stat	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	HS1 CAN
0017	Light_Status	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 –All off 0x7 – Testing Rear Fog Light	TlghtTestLght_D2_Stat	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	HS1 CAN

Table 11: BCM – Signal Mapping of Published Signals for Conduct Trailer Light Check function

6.6.2.2.1.2 Publisher Requirements

6.6.2.2.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0001	User_Input	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	TlghtTest_D_RqArb	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	HS1 CAN

Table 12: BCM – Signal Mapping of Subscribed Signals for Conduct Trailer Light Check function

6.6.2.2.1.4 Subscriber Requirements

###R_CMP_Trailer Light Check_00009### TlghtTest_D_RqArb is unavailable/missing during test

When Trailer Light Check is in progress and TlghtTest_D_RqArb is unavailable/missing, BCM shall continue with test until end.

6.6.2.2.1.5 Inherited Function Level Requirements

Requirement ID	Requirement Title
00019	Light test sequence
00020	Stop test commanded
00022	Pre-condition status changes
0009	Pre-condition status changes signal
00063	Pre-condition status signal with user input
00023	Test completed
00025	Test completed acknowledge
00026	Test ended
00027	Test end acknowledge
00028	Publishing light status
00029	Publishing light status (Parking or Position lights status)

Table 13: BCM – Inherited Function Level Requirements

6.6.2.3 APIM

###R_CMP_Trailer Light Check_00010### APIM signal timing for Trailer Light Check

The signals mentioned in this document shall be published within the timing of 1000 milliseconds.
Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator (TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)

###R_CMP_Trailer Light Check_00011### APIM signal latency for Trailer Light Check

The signals mentioned in this document shall be published with a signal latency of 40 milliseconds.
Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator (TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)

6.6.2.3.1 Function “Trailer Light Check User Request”

6.6.2.3.1.1 Interface Requirements

6.6.2.3.1.1.1 Published Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0001	User_Input	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	TlightTest_D_Mnu	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	HS3 CAN

Table 14: APIM – Signal Mapping of Published Signals for Trailer Light Check User Request function

6.6.2.3.1.1.2 Publisher Requirements

6.6.2.3.1.1.3 Subscriber Requirements

6.6.2.3.1.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00001	User request response (Start test)
00002	Start test message acknowledgement
00003	User request response (Stop test)

6.6.2.3.2 Function "Show Pre-Condition Status"

6.6.2.3.2.1 Interface Requirements

6.6.2.3.2.1.1 Published Signals

6.6.2.3.2.1.2 Publisher Signals

6.6.2.3.2.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < TBD 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	0x0 – Null (Defaulted) 0x1 – Ignition_not_ON 0x2 – Taillights_ON 0x3 – Battery_SOC<TBD 0x4 - Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	HS3 CAN

Table 15: APIM – Signal Mapping of Subscribed Signals for Trailer Light Check User Request function

6.6.2.3.2.1.4 Subscriber Requirements

6.6.2.3.2.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00030	Pre-condition status on HMI

6.6.2.3.3 Function "Indicate Test Complete"

6.6.2.3.3.1 Interface Requirements

6.6.2.3.3.1.1 Published Signals

6.6.2.3.3.1.2 Published Requirements

6.6.2.3.3.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0016	Test_Status	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	TlghtTest_D_Stat	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	HS3 CAN

Table 16: APIM – Signal Mapping of Subscribed Signals for Indicate Test Complete function

6.6.2.3.3.1.4 Subscriber Requirements

6.6.2.3.3.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00024	End of test question
00025	End of test question response behavior
00034	Test complete receipt
00032	Unexpected transition of Test_Status signal

6.6.2.3.1 Function Trailer Light Check HMI Display"

6.6.2.3.1.1 Interface Requirements

6.6.2.3.1.1.1 Published Signal

6.6.2.3.1.1.2 Publisher Requirements

6.6.2.3.1.1.3 Subscriber Signals

6.6.2.3.1.1.4 Subscriber Requirements

6.6.2.3.1.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00037	Trailer Light Check Main Screen – APIM_HMI
00038	Test Ended Message – APIM_HMI
00039	Not Stationary – Automatic Transmission ONLY
00041	Not Stationary – Manual Transmission ONLY
00042	Low 12v Battery Popup
00044	Ignition Is Not ON
00046	Taillights must be Off
00051	Troubleshooting Screen - APIM
00049	Feature Interaction Present

6.6.2.4 GWM_ECG

6.6.2.4.1 Interface Requirements

6.6.2.4.1.1 Publisher Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < TBD 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	0x0 – Null (Defaulted) 0x1 – Ignition_not_ON 0x2 – Taillights_ON 0x3 – Battery_SOC<TBD 0x4 - Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	HS3 CAN
			TlghtTestPrecnd_D2_Stat	FTCP Command	Ethernet
0016	Test_Status	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	TlghtTest_D_Stat	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	HS3 CAN
			TlghtTest_D_Stat	FTCP Command	Ethernet
0017	Light_Status	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	TlghtTestLght_D2_Stat	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	HS3 CAN
			TlghtTestLght_D2_Stat	FTCP Command	Ethernet

Table 17: GWM_ECG – Signal Mapping of Published signals

Signal ID	Signal Name	Description
TSG_Trailer_Light_00004	TlghtTest_D_RqArb	This signal indicates user request and acknowledgement of test complete signal

Table 18: GWM_ECG – Publisher signals

6.6.2.4.1.2 Publisher Requirements

###R_CMP_Trailer Light Check_00012### TlghtTest_D_RqArb signal behavior

TlghtTest_D_RqArb signal shall publish values based on the logic mentioned in Table 42 below:

Requirement#	TlightTest_D_RqOta	TlightTest_D_Mnu	TlghtTest_D_Stat	TlghtTest_D_RqArb
R_CMP_Trailer Light Check_00083.1	0x2 (Start test)	Not [0x1]	Not [0x3]	0x2 (Start test)
R_CMP_Trailer Light Check_00083.2	Not [0x1]	0x2 (Start test)	Not [0x3]	0x2 (Start test)
R_CMP_Trailer Light Check_00083.3	0x1 (Stop test)	Don't care	Don't care	0x1 (Stop test)
R_CMP_Trailer Light Check_00083.4	Don't care	0x1 (Stop test)	Don't care	0x1 (Stop test)
R_CMP_Trailer Light Check_00083.5	Not [0x1]	Not [0x1]	0x3 (Test in progress)	0x0 (Null)
R_CMP_Trailer Light Check_00083.6	Don't care	Don't care	0x1 (Test completed) or 0x2 (Test ended)	0x3 (Test end ack)
R_CMP_Trailer Light Check_00083.7	Not [0x1 or 0x2]	Not [0x1 or 0x2]	0x0 (Null)	0x0 (Null)

Table 19: TlghtTest_D_RqArb signal behavior

6.6.2.4.1.3 Subscriber Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < TBD 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	0x0 – Null (Defaulted) 0x1 – Ignition_not_ON 0x2 – Taillights_ON 0x3 – Battery_SOC<TBD 0x4 - Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	HS1 CAN
0016	Test_Status	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	TlghtTest_D_Stat	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	HS1 CAN
0017	Light_Status	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	TlghtTestLght_D2_Stat	0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	HS1 CAN
0001	User_Input	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	TlightTest_D_Mnu	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	HS3 CAN
			TlightTest_D_RqOta	FTCP Command	Ethernet

Table 20: GWM_ECG – Signal Mapping of Subscribed signals

6.6.2.4.1.4 Subscriber Requirements

6.6.2.5 TCU

6.6.2.5.1 Interface Requirements

6.6.2.5.1.1 Publisher Signals

6.6.2.5.1.2 Publisher Requirements

###R_CMP_Trailer Light Check_00013### TCU Pass-Through signals

TCU shall act as a pass-through for the signals indicated in Table 44

Technical Signal Name	From	To
TlightTest_D_RqOta	Remote App (Cellular)	GWM/ECG
TlghtTestPrecnd_D2_Stat	GWM/ECG	Remote App (Cellular)
TlghtTest_D_Stat	GWM/ECG	Remote App (Cellular)
TlghtTestLght_D2_Stat	GWM/ECG	Remote App (Cellular)

Table 21: TCU Pass-Through signals

6.6.2.5.1.3 Subscriber Signals

6.6.2.5.1.4 Subscriber Requirements

6.6.2.6 FordPass

6.6.2.6.1 Function “Trailer Light Check User Request”

6.6.2.6.1.1 Interface Requirements

6.6.2.6.1.1.1 Published Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0001	User_Input	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	TlightTest_D_RqOta	FTCP Command	Ethernet

Table 22: FordPass – Signal Mapping of Published Signals for Trailer Light Check User Request function

6.6.2.6.1.1.2 Publisher Requirements

6.6.2.6.1.1.3 Subscribed Signals

6.6.2.6.1.1.4 Subscriber Requirements

6.6.2.6.1.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00001	User request response (Start test)
00002	Start test message acknowledgement
00003	User request response (Stop test)

6.6.2.6.1 Function “Show Pre-Condition Status”

6.6.2.6.1.1 Interface Requirements

6.6.2.6.1.1.1 Published Signals

6.6.2.6.1.1.2 Publisher Requirements

6.6.2.6.1.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0010	Pre-Condition_Status	0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – Battery SOC < TBD 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	TlghtTestPrecnd_D2_Stat	FTCP Command	Ethernet

Table 23: FordPass – Signal Mapping of Subscribed Signals for Show Pre-Condition Status function

6.6.2.6.1.1.4 Subscriber Requirements

6.6.2.6.1.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00030	Pre-condition status on HMI

6.6.2.6.1 Function “Indicate Test Complete”

6.6.2.6.1.1 Interface Requirements

6.6.2.6.1.1.1 Published Signals

6.6.2.6.1.1.2 Publisher Requirements

6.6.2.6.1.1.3 Subscribed Signals

ID	Logical Signal Name	Value	Mapped to		
			Technical Signal Name	Value	Connection
0016	Test_Status	0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	TlghtTest_D_Stat	FTCP Command	Ethernet

Table 24: FordPass – Signal Mapping of Subscribed Signals for Indicate Test Complete function

6.6.2.6.1.1.4 Subscriber Requirements

6.6.2.6.1.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00024	End of test question
00025	End of test question response behavior
00034	Test complete receipt
00032	Unexpected transition of Test_Status signal

6.6.2.6.1 Function "Trailer Light Check HMI Display"

6.6.2.6.1.1 Interface Requirements

6.6.2.6.1.2 Published Signals

6.6.2.6.1.3 Publisher Requirements

6.6.2.6.1.4 Subscribed Signals

6.6.2.6.1.5 Subscriber Requirements

6.6.2.6.2 Inherited Function Level Requirements

Requirement ID	Requirement Title
00036	Trailer Light Check Main Screen - FordPass / LincolnWay
00038	Test Ended Message
00034	Not Stationary – Automatic Transmission ONLY
00035	Not Stationary – Manual Transmission ONLY
00043	Low 12v Battery Popup
00045	Ignition Is Not ON
00047	Taillights must be Off
00052	Troubleshooting Screen - FordPass
00050	Feature Interaction Present

6.6.3 **Requirements on Connections**

6.6.3.1 Networks

6.6.3.1.1 "CAN Bus xxx"

*#**Hint:** For CAN most requirements are defined by Netcom and referenced in VSEM "Multiplexing Specifications" section. Put in this section only those requirements, which deviate from that standard specification.*
The CAN messages relevant for this feature are listed in the section "Messages" of the "Data Dictionary".

6.6.3.1.1.1 Protocol Requirements

*#**Hint:** For CAN Ford currently mandates FNOS as SW implementation for the CAN protocol stack. This includes the CAN Network Management and Transport Protocol. If you deviate from this assumption or if you have specific requirements on FNOS, which are not contained in the standard package, put requirements in this section. For details the FNOS user guide and application notes could be referenced.*

6.6.3.1.1.2 Electrical Requirements

*#**Hint:** List requirements here, only if they deviate from the SDS CAN.*

6.6.3.1.2 "LIN Bus xxx"

*#**Hint:** Place requirements here, which are common to all LIN nodes, but not covered by some SDS LIN.*
The LIN messages relevant for this feature are listed in the section "Messages" of the "Data Dictionary".

6.6.3.1.2.1 Protocol Requirements

6.6.3.1.2.1.1 Schedule Table

*#**Hint:** The LIN Schedule Table should be documented in the LDF file. The LDF file could be referenced here*

6.6.3.1.2.2 Electrical Requirements

*#**Hint:** The LIN Schedule Table should be documented in the LDF file. The LDF file could be referenced here*

6.6.3.1.3 "Ethernet xxx"

*#**Hint:** On Ethernet (wired or wireless) we will see most likely the DoIP, MQTT or V2x protocols. Those protocols are described in separate specifications and are implemented in the Ford AUTOSAR stack. While DoIP might be not that relevant in this scope, MQTT (together with the Google Protocol Buffer (GPB) serialization of the payload) will become important for all features, which are mapped to a Service Oriented Architecture/Communcation (SoC). Application data (SOA APIs), which is transmitted via MQTT, are listed in the data dictionary section "AUTOSAR Interfaces*
#Hint: Those AUTOSAR *Classic (Sender/Receiver and Client/Server) Interfaces, which are used by the feature but not managed in a central repository yet, should be listed here.*

SOA Service *".*
*#**Link:** http://www.mqtt.org, https://developers.google.com/protocol-buffers/docs/proto*

6.6.3.2 HW I/Os

*#**Hint:** This section lists all hardwired signals relevant for the feature deployment. Those get typically mapped to VSEM EDAS signals – refer to list of connections in corresponding table in chapter "E/E Connections". If any specific protocol is used to send/receive signal information or multiplex/demultiplex signals on the HW circuit.*

6.6.3.2.1 "HW I/O xxx"

6.6.4 **Requirements on Development Process**

7 OPEN CONCERNS

*#**Hint:** The following list presents open concerns, which have to be discussed or clarified over the course of the on-going requirements engineering.*

ID	Concern Description	e-Tracker / Reference	Responsible	Status	Solution
1					
2					
3					
4					
5					
6					
7					
8					
9					

Table 25: Open Concerns

8 REVISION HISTORY

Rev. (revision)	Vers.	Date	Description	Approved by	Responsible
001	*1.3.4*	*3/15/2019*	*Initial release uploaded to VSEM on 3/12/2019*		*Tdunbar4*
002	*1.3.5*	*11/22/19*	*1) Added link to stakeholder list* *2) Modified pre-condition to state "*Vehicle has factory or dealer installed trailer wiring" 3) Updated "Lights In Use" pop-up example 4) Added descriptions to signal states in Table 29 5) Added descriptions to signal states in Appendix for logical signal 24 6)		*Tdunbar4*
003	*1.4*	*05/15/2020*	*Added rear fog lights to check sequence to meet ECE R/48 Rev. 7, ISO 26262:2018.*		
004	*1.5*	*08/24/2020*	*Changes on Cfg parameters for trailer connection precondition, Rearfog lights operation, Changed parking light to tail lamp wording to meet FMVSS 108*		
005	*1.5.1*	*08/20/2021*	*Added text "on vehicle and trailer" in feature description and operation to clarify that sequence of lights will illuminate in both vehicle and trailer*		
		08/20/2021	*Deleted Requirement #008 – Feature behavior with reverse light (Section 2.1.4)*		
		08/20/2021	*Updated Requirement #0029 Publishing light status (tail lights status) adding text "Parklamps_Status should be published on CAN when the parklamps are activated/deactivated as part of the Trailer Light Check sequence".*		
		08/20/2021	*Updated figure 29 – TLC Network Architecture – removed iTRM and merged iTRM/TRM with HS3/MS and kept all TRM connections*		
		08/20/2021	*Updated requirement #001 BCM signal timing for TLC with signals names: Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator (TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)*		
		08/20/2021	*Updated requirement #002 BCM signal latency for TLC with signals names: Pre-Condition_Status (TlghtTestPrecnd_D2_Stat); Test_Status (TlghtTest_D_Stat); Light_Status (TlghtTestLght_D2_Stat); parking lights (Parklamp_Status), reverse lights (RvrseLghtOn_B_Stat), stop lights (StopLghtOn_B_Stat), left indicator*		

			(TurnLghtLeftOn_B_Stat), right indicator (TurnLghtRightOn_B_Stat), fog lights (FogLghtRearOn_B_Stat)		
		08/20/2021	*Added requirement #014 -BCM signal on FMVSS vehicles without iTRM/TRM for Trailer Light Check*		
		08/20/2021	*Added Technical Signal #012 Parklamp_Status in Data Dictionary*		
		08/20/2021	*Added Technical Signal #013 RvrseLghtOn_B_Stat in Data Dictionary*		
		08/20/2021	*Added Technical Signal #014 StopLghtOn_B_Stat in Data Dictionary*		
		08/20/2021	*Added Technical Signal #015 TurnLghtLeftOn_B_Stat in Data Dictionary*		
		08/20/2021	*Added Technical Signal #016 TurnLghtRightOn_B_Stat in Data Dictionary*		
		08/20/2021	*Added Technical Signal #017 FogLghtRearOn_B_Stat in Data Dictionary*		
006	*1.7*	*12/21/21*	*Updated Stakeholder list*		
		12/21/21	*Trailer Light Check VSEM link revised*		
		12/21/21	*Updated Ford Reference and External Documents*		
		12/21/21	*Updated Glossary*		
		12/21/21	*Updated lessons learned and assumptions*		
		12/21/21	*Revised HMI requirements #14, #15, #17 and #18*		
		12/21/21	*Added LincolnWay in all FordPass HMI requirements*		
		12/21/21	*Update Functional Safety with HARA ASIL A rated*		
		12/21/21	*Update Cybersecurity with Cybersecurity Relevance Assessment and TARA*		
		12/21/21	*Updated text ECE R/48 Rev. 6 to Rev. 7*		
		12/21/21	*Revised Function requirements #31, #32, #33*		
		12/21/21	*Added Requirement #33 - User request times out*		
		12/21/21	*Revised Function Requirement Sequence number*		
		12/21/21	*Revised Function requirements #46 and #47*		
		12/21/21	*Updated E/E architecture diagram*		
		12/21/21	*Updated E/E Components and E/E Connections lists*		
		12/21/21	*Revised sequence ID's for BCM, APIM and FordPass / LincolnWay Requirements*		

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9 APPENDIX

9.1 Data Dictionary

9.1.1 Logical Signals

###LSG_Trailer Light Check_00001### User_Input

When user selects Start Test or Stop Test using in-vehicle or FordPass UI, this logical signal notifies if the user is requesting the test to be initiated or cancelled and sends acknowledgement of receipt of test status.

Data Type	Init Value	Default Value (missing signal)
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0 = Null (Defaulted)

###LSG_Trailer Light Check_00002### Stationary_Status

This logical signal indicates the stationary status of the vehicle

Data Type	Init Value	Default Value (missing signal)
0x0 – Not Stationary 0x1 - Stationary	0x0 - Not Stationary	0x0 - Not Stationary

###LSG_Trailer Light Check_00003### Vehicle_Speed

This logical signal publishes the vehicle speed

Data Type	Init Value	Default Value (missing signal)
0 to 655.35 KPH		

###LSG_Trailer Light Check_00004### PrkBrkStatus

This logical signal publishes the status of the EPB state

Data Type	Init Value	Default Value (missing signal)
0x0 Not_Supported 0x1 Rear_Caliper_Closed 0x2 Rear_Caliper_Transition 0x3 RWU_by_EPB_Active 0x4 Rear_Caliper_Open		

0x5 EPM_Limphome_Active 0x6 ECD_by_Brake_ECU_Active 0x7 GeneralFault_MaintenanceMode		

###LSG_Trailer Light Check_00005### GearLvrPos_D_Actl

This logical signal publishes the status of the PRNDL

Data Type	Init Value	Default Value (missing signal)
0x0 Park 0x1 Reverse 0x2 Neutral 0x3 Drive 0x4 Sport/Drive Sport 0x5 Low 0x6 1 0x7 2 0x8 3 0x9 4 0xA 5 0xB 6 0xC undefined 0xD undefined 0xE unknown position 0xF fault		

###LSG_Trailer Light Check_00006### 12v Battery_State_of_Charge

This logical signal indicates if the 12v battery state of charge is too low to perform the Trailer Light Check

Data Type	Init Value	Default Value (missing signal)
0x0 – Battery_SOC_Not_OK 0x1 – Battery_SOC_OK	0x0 – Battery_SOC_Not_OK	0x0 – Battery_SOC_Not_OK

###LSG_Trailer Light Check_00007### Taillight_Status

This logical signal indicates the illumination status of the vehicle and trailer taillights by commands other than Trailer Light Check feature

Data Type	Init Value	Default Value (missing signal)
0x0 – Taillights ON 0x1 – Taillights OFF	0x0 – Taillights ON	0x0 – Taillights ON

###LSG_Trailer Light Check_00008### Ignition_Status

This logical signal indicates the ignition status of the vehicle

Data Type	Init Value	Default Value (missing signal)
0x0 - Unknown 0x1 - Off 0x2 - Accessory 0x4 - Run 0x8 - Start 0xF - Invalid		

###LSG_Trailer Light Check_00009### ElPw_D_Stat

This logical signal indicates the status of whether the 12v battery is supported or not

Data Type	Init Value	Default Value (missing signal)
0x0 - Not_Supported 0x1 - Supported 0x2 – Not_Supported_Imminent 0x3 – LV_Event_In_Progress 0x4 – Fault_Limited 0x5 – NotUsed_1 0x6 - NotUsed_2 0x7 - NotUsed_3		

###LSG_Trailer Light Check_00010### Pre-Condition_Status

This logical signal indicates the status of the pre-conditions for the Trailer Light Check feature

Data Type	Init Value	Default Value (missing signal)
0x0 – Null 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – 12v Battery SOC < 75% with battery not supported 0x4 – Preconditions_Passed 0x5 – Interaction Present 0x6 – Not Stationary 0x7 – Trailer not connected	0x0 – Null	0x0 – Null

###LSG_Trailer Light Check_00011### Activate_Tail_Lights

This logical signal commands the parking lights on the vehicle and trailer ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Turn on parking lights 0x1 – Turn off parking lights		

###LSG_Trailer Light Check_00012### Activate_Right_Turn_Signal

This logical signal commands the right turn signal on the vehicle and trailer ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Turn on right turn signal 0x1 – Turn off right turn signal		

###LSG_Trailer Light Check_00013### Activate_Left_Turn_Signal

This logical signal commands the left turn signal on the vehicle and trailer ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Turn on left turn signal 0x1 – Turn off left turn signal		

###LSG_Trailer Light Check_00014### Activate_Brake_Lights

This logical signal commands the brake lights on the vehicle and trailer ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Turn on brake lights 0x1 – Turn off brake lights		

###LSG_Trailer Light Check_00015### Activate_Reverse_Lights

This logical signal commands the reverse lights on the vehicle and trailer ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Turn on reverse lights 0x1 – Turn off reverse lights		

###LSG_Trailer Light Check_00016### Test_Status

This logical signal indicates when the test is in progress or has completed

Data Type	Init Value	Default Value (missing signal)
0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x0 - Null

###LSG_Trailer Light Check_00017### Light_Status

This logical signal indicates which light is being tested/illuminated

Data Type	Init Value	Default Value (missing signal)
0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	0x0 – Null	0x0 – Null

###LSG_Trailer Light Check_00018### Feature_Interaction

This logical signal indicates if other features that affect exterior lighting are active or not

Data Type	Init Value	Default Value (missing signal)
0x0 – Interaction_Present 0x1 – No_Interaction	0x0	0x0

###LSG_Trailer Light Check_00019### Detect_Trailer_Connection

This logical signal indicates if other features that affect exterior lighting are active or not

Data Type	Init Value	Default Value (missing signal)
0x0 – No 0x1 – Yes	0x0	0x0

###LSG_Trailer Light Check_00020### Activate_Rear_Fog_Lights

This logical signal indicates if other features that affect exterior lighting are active or not

Data Type	Init Value	Default Value

		(missing signal)
0x0 – Off 0x1 – On	0x0	0x0

###LSG_Trailer Light Check_00021### Activate_License_Plate_Lamps

This logical signal commands the license plate lights on the vehicle ON/OFF

Data Type	Init Value	Default Value (missing signal)
0x0 – Off 0x1 – On	0x0	

9.1.2 Logical Parameters

*#**Hint:** Logical Parameters are managed in VSEM in the RE Data Dictionary.*
*#**Link**: RE Wiki – Adding a Logical Signal or Parameter*
*#**Macro:** Add Ins -> Add Requirement macro (select "Logical Parameter" as type)*

9.1.3 Technical Signals

###TSG_Trailer Light Check_00001### TlghtTest_D_Stat

This technical signal indicates when the test is in progress or has completed

Data Type	Init Value	Default Value (missing signal)
0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x0 - Null
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00002### TlghtTestPrecnd_D2_Stat

This technical signal indicates the status of the pre-conditions for the Trailer Light Check feature

Data Type	Init Value	Default Value (missing signal)
0x0 – Null (Defaulted) 0x1 – Ignition not ON 0x2 – Taillights ON 0x3 – 12v Battery SOC < 75% with battery not supported 0x4 – Preconditions_Passed 0x5 – Interaction Present	0x0 – Null (Defaulted)	0x0 – Null (Defaulted)

0x6 – Not Stationary 0x7 – Trailer not connected		
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

Note: This technical signal indicates the status of the pre-conditions for the Trailer Light Check feature (MY22 onwards)

###TSG_Trailer Light Check_00003### TlghtTestLght_D2_Stat

This technical signal indicates which light is being tested/illuminated

Data Type	**Init Value**	**Default Value** (missing signal)
0x0 – Null (Defaulted) 0x1 – Parking lights illuminated 0x2 – Testing right turn signal 0x3 – Testing left turn signal 0x4 – Testing brake lights 0x5 – Testing reverse lights 0x6 – All off 0x7 – Testing Rear Fog Light	0x0 – Null	0x0 - Null
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00004### TlghtTest_D_RqArb

This technical signal contains the arbitrated value of User_Input based on input from APIM and FordPass. It notifies if the user is requesting the test to be initiated or cancelled and sends acknowledgement of receipt of test status.

Data Type	**Init Value**	**Default Value** (missing signal)
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 – Null	0x0 - Null
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00005### TlightTest_D_Mnu

When user selects Start Test or Stop Test using in-vehicle or FordPass UI, this technical signal notifies if the user is requesting the test to be initiated or cancelled and sends acknowledgement of receipt of test status.

Data Type	Init Value	Default Value (missing signal)
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 – Null	0x0 - Null
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00006### TlightTest_D_RqOta

When user selects Start Test or Stop Test using in-vehicle or FordPass UI, this technical signal notifies if the user is requesting the test to be initiated or cancelled and sends acknowledgement of receipt of test status.

Data Type	Init Value	Default Value (missing signal)
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 – Null	0x0 – Null
Transmit Model	**Send Type**	**E2E Latency**
	Ethernet	

###TSG_Trailer Light Check_00007### PrkBrkStatus

This technical signal publishes the status of the EPB state

Data Type	Init Value	Default Value (missing signal)
0x0 Not_Supported 0x1 Rear_Caliper_Closed 0x2 Rear_Caliper_Transition 0x3 RWU_by_EPB_Active 0x4 Rear_Caliper_Open 0x5 EPM_Limphome_Active 0x6 ECD_by_Brake_ECU_Active 0x7 GeneralFault_MaintenanceMode		
Transmit Model	**Send Type**	**E2E Latency**

###TSG_Trailer Light Check_00008### GearLvrPos_D_Actl

This technical signal publishes the status of the PRNDL

Data Type	Init Value	Default Value (missing signal)
0x0 Park 0x1 Reverse 0x2 Neutral 0x3 Drive 0x4 Sport/Drive Sport 0x5 Low 0x6 1 0x7 2 0x8 3 0x9 4 0xA 5 0xB 6 0xC undefined 0xD undefined 0xE unknown position 0xF fault		
Transmit Model	**Send Type**	**E2E Latency**

###TSG_Trailer Light Check_00009### Veh_V_ActlEng

This technical signal publishes the vehicle speed

Data Type	Init Value	Default Value (missing signal)
0 to 655.35 KPH		
Transmit Model	**Send Type**	**E2E Latency**

###TSG_Trailer Light Check_00010### EIPw_D_Stat

This technical signal indicates the status of whether the 12v battery is supported or not

Data Type	Init Value	Default Value (missing signal)
0x0 - Not_Supported 0x1 - Supported		

0x2 – Not_Supported_Imminent 0x3 – LV_Event_In_Progress 0x4 – Fault_Limited 0x5 – NotUsed_1 0x6 - NotUsed_2 0x7 - NotUsed_3		
Transmit Model	**Send Type**	**E2E Latency**

###TSG_Trailer Light Check_00011### TrlrLampCnnct_B_Actl

This technical signal contains the arbitrated value of User_Input based on input from APIM and FordPass. It notifies if the user is requesting the test to be initiated or cancelled and sends acknowledgement of receipt of test status.

Data Type	Init Value	Default Value (missing signal)
0x0 Off 0x1 On		
Transmit Model	**Send Type**	**E2E Latency**
	HS3/MS1	

###TSG_Trailer Light Check_00012### Parklamp_Status

Indicates the desired status of the park lamps relay prior to consideration of 12v battery voltage and Diagnostics PID control. This is identical to the Parklamps_Command internal dataflow which is the command to control the position / park lamps.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On 0x2 – Unknown 0x3 - Invalid	0x1 – On (Default)	0x1 – On (Default)
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00013### RvrseLghtOn_B_Stat

Indicates the status of reverse lights command.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On	0x0 – Off	0x0 - Off

Transmit Model	Send Type	E2E Latency
	Event Periodic	

###TSG_Trailer Light Check_00014### StopLghtOn_B_Stat

Indicates whether status of Brake Lamp activation for any reason.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On	0x0 – Off	0x0 - Off
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00015### TurnLghtLeftOn_B_Stat

Indicates the command for interior left turn signal / hazard indicator.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On	0x0 – Off	0x0 - Off
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00016### TurnLghtRightOn_B_Stat

Indicates the command for interior right turn signal / hazard indicator.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On	0x0 – Off	0x0 - Off
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

###TSG_Trailer Light Check_00017### FogLghtRearOn_B_Stat

Indicates the status of rear fog lamps.

Data Type	Init Value	Default Value (missing signal)
0x0 - Off 0x1 – On	0x0 – Off	0x0 - Off
Transmit Model	**Send Type**	**E2E Latency**
	Event Periodic	

9.1.3.1 GSDB Signals

*#**Hint:** This part of the Data Dictionary lists signals, which should go to the GSDB in VSEM, but do not exist in the GSDB in VSEM yet, but are or will be requested for the GSDB. Those would go temporarily to this section in the RE Data Dictionary in VSEM.*

9.1.3.2 HW I/Os

*#**Hint:** This chapter lists signals, which will be mapped to hardwired I/Os. Those get typically refer to VSEM EDAS signals (or input/output signals of device transmittals in VSEM GDT).*

9.1.3.3 Diagnostic Interfaces

9.1.3.3.1 DTCs

*#**Hint:** This chapter lists DTCs, which get mapped to Logical Signals in context of the Implemented Functions in chapter "**Error! Reference source not found.**" of section "Interface". Those DTC names should match the names in the diagnostics specification (Part 2).*
Create a Word bookmark for the DTC Name of each DTC object in this section. This allows referencing the DTC object in the rest of the document.
*#**Macro:** A macro still needs to be created.*

###<DTC_<ID>>### <DTC Name>

<Some Description of the DTC.
Refer to VSEM document "Diagnostic Fault Coverage and DTC Numbers Design Consideration", what to fill into the attributes below>

Test Period Time	
Test Run Criteria,	
Enable Criteria (EC)	

Applicable	
FailureTypeBytes	
Test Period Time	
Test Run Criteria,	

9.1.3.3.2 DIDs

*#**Hint:** This chapter lists DIDs, which get mapped to Logical Parameters in context of the Technology Functions in chapter "**Error! Reference source not found.**" of section "Interface". Those DID names should match the names in the diagnostics specification (Part 2).*
*#**Macro:** A macro still needs to be created.*

9.1.4 Technical Parameters

*#**Hint:** This section lists all Method 2, Method 3 and calibration parameters relevant for the feature deployment.*
*#**Link**: RE Wiki – Adding a Technical Signal or Parameter*
*#**Macro:** Add Ins -> Add Requirement macro (select "Technical Parameter" as type)*

###TPR_Trailer Light Check_00001### RearFog_Enable_Cfg

This configuration parameter indicates whether the rear fog lights are enabled or disabled. For Ford Europe set this configuration parameter to ENABLED and for Ford North America set this configuration parameter to DISABLED.

Encoding Type Name		RearFog_Enable_Cfg	
Encoding Type Description		NA	
Encoding Type		Numeric	
Value	**Min Value**	NA	
	Max Value	NA	
	Resolution	NA	
	Offset	NA	
	Unit	NA	
Encoding Type		SED	
Value		0x00	Disabled
		0x01	Enabled
Init Default Value		0x01-Enabled	

###TPR_Trailer Light Check_00002### TRM_Available_Cfg

This configuration parameter Determines if vehicle Rear Fog Lamps are allowed to operate when a trailer is connected

Encoding Type Name		TRM_Available_Cfg
Encoding Type Description		NA
Encoding Type		Discrete
Value	**Min Value**	NA
	Max Value	NA
	Resolution	NA
	Offset	NA
	Unit	NA

Encoding Type		
Value	0x00	Abscent
	0x01	Present
Init Default Value	0x01 Present	

###TPR_Trailer Light Check_00003### TLC_ChkTrailerConnected_Cfg

This configuration parameter determines if vehicle Rear Fog Lamps are allowed to operate when a trailer is connected.

Encoding Type Name		TLC_ChkTrailerConnected_Cfg	
Encoding Type Description		NA	
Encoding Type		Discrete	
Value	**Min Value**	NA	
	Max Value	NA	
	Resolution	NA	
	Offset	NA	
	Unit	NA	
Encoding Type			
Value		0x00	Disable
		0x01	Enable
Init Default Value		0x00 Disable	

9.1.5 Mappings

***#Hint**: This section lists mapping objects for Logical Signals / Parameters to their GSDB + GDT + SW counterparts (1:N mapping is supported). Mapping objects are managed in VSEM in the RE Data Dictionary.*
***#Link:** RE Wiki – Adding a Signal or Parameter Mapping*
***#Macro:** Add Ins -> Add Requirement macro (select "Mapping")*

9.1.6 Technical Interfaces

***#Hint:** This section lists port/interface details, which define how network/SW/HW signals are published / subscribed.*
***#Link:** RE Wiki – Adding a Technical Interface*

9.1.6.1 AIS Interfaces

***#Hint:** This chapter lists the AIS subscriber and publisher interface objects (managed in VSEM), which are needed to deploy the feature to the E/E architecture. If AIS interfaces do not yet exist in VSEM, those may temporarily be managed as a workaround in the RE Data Dictionary.*
***#Link:** System Engineering Portal – AIS Release 3.2*
RE Wiki - AIS Interfaces
Publisher Interface AIS in VSEM
Subscriber Interface AIS in VSEM

***#Macro:** Add Ins -> Add Requirement macro (select "AIS Subscriber If" or "AIS Publisher If" as type)*

9.1.6.1.1 Publisher Interfaces

9.1.6.1.2 Subscriber Interfaces

9.1.6.2 Service Oriented Communcation (SoC) Interfaces

9.1.6.3 AUTOSAR Ports (SW Interfaces)

9.1.7 **Messages/APIs**

9.1.7.1 CAN Bus “<Bus Name>”

*#**Hint:** This section gives the relevant extract from the Central Message Database (CMDB) in VSEM .*

###<MSG_MessageID### MessageName

CAN ID	Transmission Mode	Period	Signal Names	Transmitter(s)	Receiver(s)

9.1.7.2 LIN Bus “<Bus Name>”

9.1.7.3 AUTOSAR Interfaces

*#**Hint:** Those AUTOSAR Classic (Sender/Receiver and Client/Server) Interfaces, which are used by the feature but not managed in a central repository yet, should be listed here.*

9.1.7.4 SOA Service Contracts

*#**Hint:** This part of the Data Dictionary lists Service APIs/MQTT messages and embedded data elements, which are used for the Service Oriented Architecture (SOA). If those APIs/MQTT messages already exist e.g. in the Central SW Service Catalog, simply add a reference to those yet.*

Information on FNV2 SOA can be found in the ECG wiki page

- *MQTT Topic Naming: FNV2-SOA: MQTT Topic and Message Structure*
- *message syntax and proper naming can be found SOA API Messaging Guidelines*

For examples what to fill into the table fields below refer to Central SW Service Catalog

###<ServiceContractID>### Service Contract Name

<Service contract purpose/behavior>

Messaging Pattern	Frequency (For Data Broadcast Only)	Message Data Element(s) (Must Match GPB) or applicable CAN signal	Description of Data Element(s)	Topic Name

Choose an item.		GBP Data element / CAN Signal name 1	Detailed encoding of data element 1	
		…		
		GBP Data element / CAN Signal name 1	Detailed encoding of data element 3	

9.1.8 Encoding Types

*#**Link:** RE Wiki – Adding Encoding Types*
*#**Macro:** Add Ins -> Add Requirement macro (select "Encoding Type" as type)*

9.1.9 Data Types

*#**Macro:** Add Ins -> Add Requirement macro (select "Data Type" as type)*

###DT_Trailer Light Check_00001### Test

<Data Type Description>

Data Type	Min Value	Max Value	Resolution	Unit
Continuous				

Data Type	Value Range	Interpretation	Unit
Discrete	Value1		
	Value2		

Document ends here