

Function Group Spec
Trailer Light Check
 <<Feature>>
 (F002052)

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1 INTRODUCTION

1.1 Document Purpose

The Function (Group) Specification (FS) specifies an individual function / a group of functions.

To get more information about the concept of feature, function and component level abstraction refer to the [Ford RE Wiki](#).

1.2 Document Scope

This Feature Specification (FS) specifies the following features:

Feature ID	Feature Name	Owner	Reference
F002052	Trailer Light Check (Program(s): CORE)	Eric Vieira (evieira1)	

Table 1: Features described in this FGS

1.3 Document Audience

The FS is authored by the owners of the individual functions. All Stakeholders, i.e., all people who have a valid interest in the functions and their behavior should read and, if possible, review the FS. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FS.

1.3.1 Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to: [Click here to open the latest Stakeholders List](#).

1.4 Document Organization

1.4.1 Document Context

Refer to the [Specification Structure page](#) in the [Ford RE Wiki](#) to understand how the FS relates to other Ford Requirements Documents and Specifications.

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** – Function Group Description. Gives an overview and the purpose of the function group.
- Section 3** – Functional Architecture: Specifies the overall functional architecture of the function group
- Section 4** – Function Specifications: Specifies the logical functions of the function group in detail
- Section 5** – List of Open Concerns
- Section 6** – Revision history including a list of new or modified requirements. The requirements in this document are tagged, and this section contains different types of tables listing all, new, or changed requirements by their title and page no.
- Section 7** – Appendix: Presenting additional data mainly in a tabular form, e.g., a data dictionary

1.5 Document Conventions

1.5.1 Requirements Templates

Refer to “[How to use the Specification Templates](#)” on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.



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The VBA macro enable the import of the specification to VSEM (refer to ["How to import specifications into VSEM as separate requirements"](#)).

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 a FS 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_FNC_LockArbitrator_00004 This is the fourth requirement on function 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	Title	Doc. ID	Document Location	Revision
Spec 1	Functional Specification Body Control Module	FS-LU5T-14B476-AAA	VSEM	12.02
Spec 2	Functional Specification Body Control Module	FS-MU5T-14B476-ACJ	VSEM	
Spec 3	Functional Specification Body Control Module	FS-NU5T-14B476-AAF	VSEM	
Spec 4	Functional Specification Body Control Module	FS-PU5T-14B476-AGB	VSEM	15.07
Spec 5	AppLink	FDS004146	https://www.vsemweb.ford.com/tc/launchapp? -attach=true&-s=226TCSession&-o=y1hFbbzox3NrTDAAAAAAAAAAAAA&servername=Production_Server	1.31
Spec 6	ECG Infotainment SPSS	VDOC07696 4-Trailer Light Check ECG SPSS	https://www.vsemweb.ford.com/tc/launchapp? -attach=true&-s=226TCSession&-o=NmdxdumXx3NrTDAAAAAAAAAAAAA&servername=Production_Server	1.4



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Reference	Title	Doc. ID	Document Location	Revision
Spec 7	APIM Infotainment SPSS	VDOC07945 7-Trailer Light Check APIM SPSS	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=mZR17lvhx3NrTDAAAAAAAAAAAAA&servername=Production_Server	12.02
Spec 8	Functional Specification TTLM (GEN I)	VDOC01244 7-FS DG9T- 19H517-AB	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=DiQRAOHfx3NrTDAAAAAAAAAAAAA&servername=Production_Server	AB
Spec 9	Functional Specification iTRM (TTLM GEN II)	VDOC08874 9-FS-NU5T- 19H517- AA005	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=DiQRAOHfx3NrTDAAAAAAAAAAAAA&servername=Production_Server	1.4
Spec 10	Functional Specification iTRM	VDOC08187 7-FS-MU5T- 19J294-AC	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=SRX53Gyfx3NrTDAAAAAAAAAAAAA&servername=Production_Server	1.8
Spec 11	BCM MY23 GEN III - FS & Model Releases	FDS051699	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=T8a9llvXx3NrTDAAAAAAAAAAAAAA&servername=Production_Server	R04 ³
Spec 12	BCM MY21 GEN I M - FS & Model Releases	FDS031885	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=CkelYvBXx3NrTDAAAAAAAAAAAAA&servername=Production_Server	RC02 ³
Spec 13	BCM MY22 GEN I M - FS & Model Releases	FDS042133	https://www.vsemweb.ford.com/tc/launchapp?attach=true&s=226TCSession&o=hvcxDa4Qx3NrTDAAAAAAAAAAAAA&servername=Production_Server	RC01.2 ²



Table 2: Ford Documents

1.6.2 External Documents and Publications

The list of external documents could include books, reports and online sources.

Reference	Document / Publication	Document Location
	FMVSS 108 - Lamps, Reflective Devices, And Associated Equipment	
	ECE R/48 Rev.7 - Vehicles with Regard to The Installation of Lighting And Light Signaling Devices	

Table 3: External Documents and Publications

1.7 Glossary

1.7.1 Definitions

Definition	Description
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.
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.
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.
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 Light	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.
Vehicle Stationary	Vehicle is defined as stationary if vehicle speed is less than 4 Kph and vehicle in in the "Parked State".

Table 4: Definitions used in this document

1.7.2 Abbreviations

Abbr.	Stands for
ABS	Anti-lock Braking System - Brake ECU
AFS	Aggregated Feature Spec - Type of this document
AOS	Android on Sync - Mobile phone display and synchronization method for Android type mobile devices
APIM	Application Protocol Interface Module - User interface to vehicle and APIM_CDC (Phoenix Domain Controller)
ARL	Documents vehicle-level characteristics, using RQMTs and DVMs
BCM	Body Control Module - Feature arbitrator
BCM _c	Body control Module "C" (PDB) - Power Distribution Box
BT	Bluetooth - PIM; AppLink; Bluetooth connection for Ford vehicles
CAN	Controller Area Network - Communications method between modules (bi-directional)
ECG	Enhanced Central Gateway - Module that performs any processing or special functions other than gatewaying CAN signals
EOL	End of Line - Manufacturing location where ECU modules are programmed
EPB	Electric Parking Brake - Electronic Park brake feature




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Abbr.	Stands for
FD1	Flexible Data Rate CAN network 1
FDRS	Ford Diagnostics and Repair Systems - Based on Dealer diagnostic tool usage (Near real time to FDSP SQL Server)
FTCP	Ford Telematics Communication Protocol
GWM	Gateway Module- Module that gateways CAN signals between modules
HARA	Hazard Analysis and Risk Assessment - Risk assessment document
HS1	High Speed CAN network 1
HS3	High Speed CAN network 3
IDS	Integrated Diagnostic System - Diagnostic Service Tool
ITRM	Integrated Trailer Module - Module that delivers power to the trailer battery, turn lights and brake lights
LED	Light Emmiting Diode - Diode that emits light when voltage is applied to it
MS1	Medium Speed CAN network 1
PAC	Phoenix Audio Controller - Ford's next generation audio controller post Sync
PCM	Powertrain Control Module - ECU which controls engine and transmission
PDB	Power Distribution box - Box that delivers power to the trailer tail and reverse lights
PDC	Phoenix Domain Controller - Ford's next generation IVI controller for multimedia post Sync
SOC	State of Charge - 12v Battery State of Charge
TCU	Telematics Control Unit - Vehicle modem that communicates with cloud/FordPass/Lincoln Way
TMC	Traffic Management Center
TTLM	Trailer Tow Light Module - Module that delivers power to the trailer battery, turn lights and brake lights
UI	User Interface - HMI interface to user

Table 5: Abbreviations used in this document



2 FUNCTION GROUP DESCRIPTION

This Function Group consists of all functions allocated to  **Trailer Light Check** <<Feature>> including all functions in their corresponding call trees.

Description of Trailer Light Check:

2.1.1 Feature Purpose and Description

The Trailer Light Check feature will allow the vehicle user to visually check the light operation of a towed trailer independently. Upon activation of feature through in-vehicle HMI or via FordPass/LincolnWay the vehicle and the trailer lights will illuminate in the following sequence: parking or position lights (remain on for the entire test), left turn indicator light, right turn indicator light, brake lights, reverse lights and rear fog lights. The lights illumination sequence repeats 5 times until its completion. If a light problem is detected, the user selects the Troubleshooting button to see instructions on how to proceed.

2.1.1.1 Background

2.1.1.1.1 Current State

Visually checking trailer lights function is currently a procedure that must be done before the start of a new adventure. This typically requires a vocal communication between two people, which conscious drivers feel obliged to do every time they hitch a trailer. In the other hand, non-conscious drivers will often skip it. 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 indicator 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 have 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 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.



3 FUNCTIONAL DECOMPOSITION AND ARCHITECTURE

3.1 Description

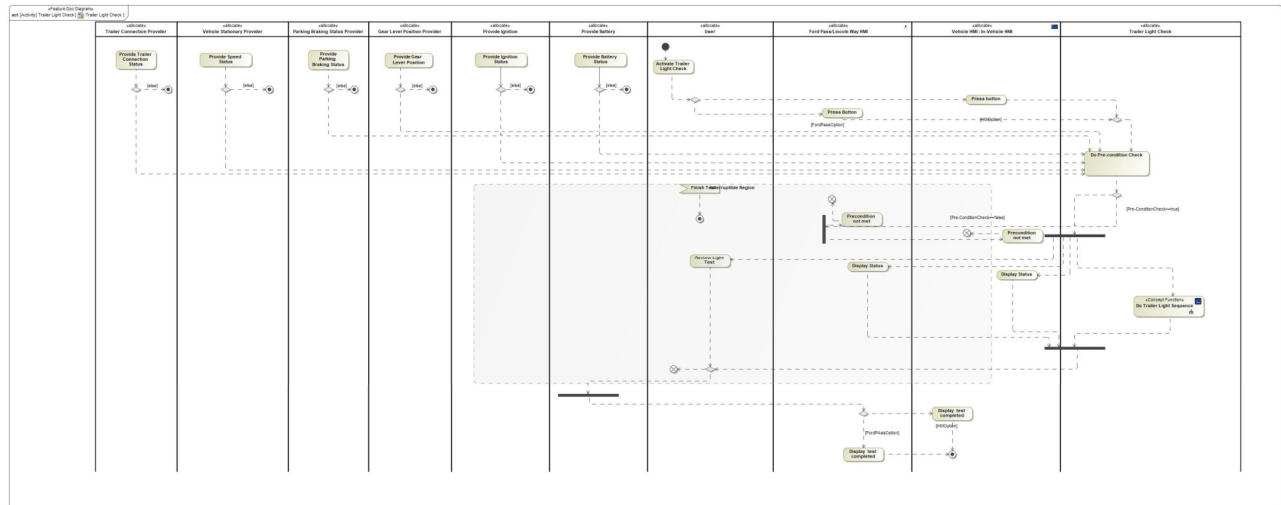








Figure 1 Activity diagram “Trailer Light Check” depicting black box behavior collaboration


3.2 Function List

Function ID	Function Name	Function Description	ASIL
	 <u>Detect Vehicle Stationary Status</u> <<Logical Function>>	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).	
	 <u>Detect Trailer Connection</u> <<Logical Function>>	Indicates the status of whether the trailer is connected to the vehicle or not.	
	 <u>Trailer Light Check HMI Display</u> <<Logical Function>>	This function provides an HMI interface to the user on the APIM HMI display and FordPass / Lincoln Way which describes the test and provides the user a method to Start or Stop the test.	
	 <u>Trailer Light Check User Request</u> <<Logical Function>>	This function allows the user to select to initiate or end Trailer Light Check using in-vehicle HMI or FordPass / Lincoln Way. 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.	
	 <u>Show Publishing Light Status</u> <<Logical Function>>	Displays Light Status on UI while performing Trailer Light Test	
	 <u>Indicate Test Complete</u> <<Logical Function>>	This function will display the test completion status of the feature and potentially troubleshooting information on FordPass / Lincoln Way or in-vehicle HMI. When the Trailer Light Check has completed, the HMI will display a message popup	



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		<p>indicating test has been completed with two buttons – Troubleshooting and Exit. At test completion, the user selects the Exit button and will return to the feature main screen. If a problem has been detected, the user selects the Troubleshooting button to see instructions on how to proceed.</p> <p>Troubleshooting text:</p> <ul style="list-style-type: none"> • Check trailer wiring harness connection at vehicle • Check trailer tow fuses in power distribution box. See owner's manual • Perform an inspection on trailer lamps • Replace faulty bulb or take vehicle/trailer in for service 	
	 <u>Conduct Trailer Light Check</u> <<Logical Function>>	<p>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:</p> <ol style="list-style-type: none"> 1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-8 <ol style="list-style-type: none"> 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 from vehicle and trailer (including front and rear side markers)*** <ol style="list-style-type: none"> 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 <p>* Duration for each step shall be individually calibrated in addition to number of sequence repetitions.</p> <p>**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.</p> <p>*** If parking or position lamps have been turned on through hard switch in vehicle, parking / position lamps shall remain on during this step.</p> <p>The conduct Trailer Light Check will be initiated only when User_Input = Start_Test and TLC_Precondition_Status = Precondition_Ok</p>	



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	 <u>Do Trailer Light Sequence</u> <<Concept Function>>	Executes Trailer Light Check sequence, providing luminance to exterior lights.	
	 <u>Show Pre-condition Status</u> <<Logical Function>>	<p>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.</p> <ul style="list-style-type: none"> • 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 <p>Some vehicles on FMVSS markets have a trailer connection without a TRM or ITRM, In these cases the trailer connection precondition cannot be assessed.</p>	
	 <u>Assess Pre-conditions for Trailer Light Test</u> <<Logical Function>>	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 = RUN, Engine Status = ON OR Engine Status = OFF AND 12v Battery SOC >= 75%, Vehicle Stationary Status = Stationary, Trailer connected, 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.	

Table 6: List of Functions contained in  Trailer Light Check

3.3 Signal List

Refer to the [Data Dictionary](#) - [Logical Signals](#).





4 FUNCTION SPECIFICATIONS




4.1 Logical Function Detect Vehicle Stationary Status

4.1.1 Function Overview

4.1.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  Engine Logical <<Logical>>
-  Trailer Light Check Logical <<Logical>>
-  Vehicle Speed Logical <<Logical>>

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).

4.1.1.2 Function Variants



No Variants identified for Detect Vehicle Stationary Status

4.1.1.3 Assumptions

No assumptions specified for this function.

4.1.2 Function Scope

The  – “**Detect Vehicle Stationary Status**” function is called by the following functions:

-  – “[Do Pre-condition Check](#)”
-  – “[Functional Boundary Behavior](#)”

4.1.2.1 Do Pre-condition Check

No Diagrams found in Do Pre-condition Check

4.1.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.



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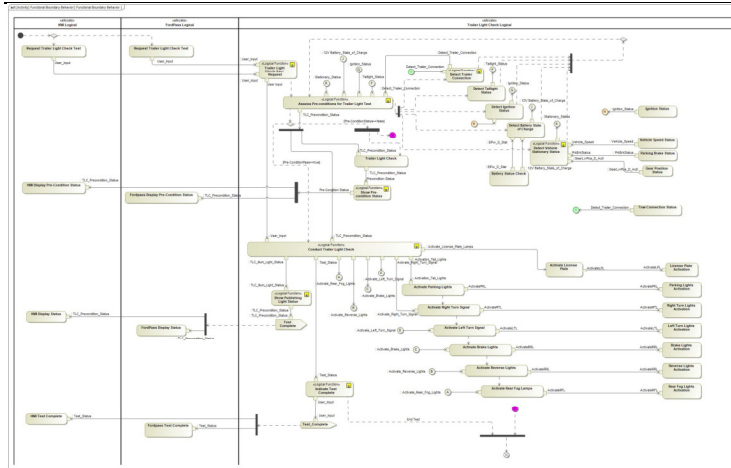






Figure 2: Activity Diagram of  “Functional Boundary Behavior” calling  “Detect Vehicle Stationary Status”


4.1.3 Function Interfaces

4.1.3.1 Logical Inputs

Signal Name	Description						
Type:  PrkBrkStatus	Type Description: This logical signal publishes the status of the EPB state. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>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</td><td></td><td></td></tr></table> Received from: <ul style="list-style-type: none"> Parking Brake Status	Data Type	Init Value		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		
Data Type	Init Value						
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							
Type:  Vehicle Speed	Type Description: This logical signal publishes the vehicle speed. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0 to 655.35 KPH</td><td></td><td></td></tr></table> Received from: <ul style="list-style-type: none"> Vehicle Speed Status	Data Type	Init Value		0 to 655.35 KPH		
Data Type	Init Value						
0 to 655.35 KPH							
input Type:	Type Description:						



Function Specification MyFunction(Group)




[GearLvrPos_D_Actl](#)

This logical signal publishes the status of the PRNDL.



Data Type	Init Value	
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		

Received from:



[Gear Position Status](#)

4.1.3.2 Logical Outputs

Signal Name	Description						
Stationary_Status Type:  Stationary Status	Type Description: This logical signal indicates the stationary status of the vehicle <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Not Stationary 0x1 - Stationary</td><td>0x0 - Not Stationary</td><td>0x</td></tr></table> Sent to: <ul style="list-style-type: none"> Assess Pre-conditions for Trailer Light Test	Data Type	Init Value		0x0 – Not Stationary 0x1 - Stationary	0x0 - Not Stationary	0x
Data Type	Init Value						
0x0 – Not Stationary 0x1 - Stationary	0x0 - Not Stationary	0x					

4.1.3.3 Configuration Parameter

(No parameters have been defined)



4.1.4 Function Modeling

4.1.4.1 State Charts

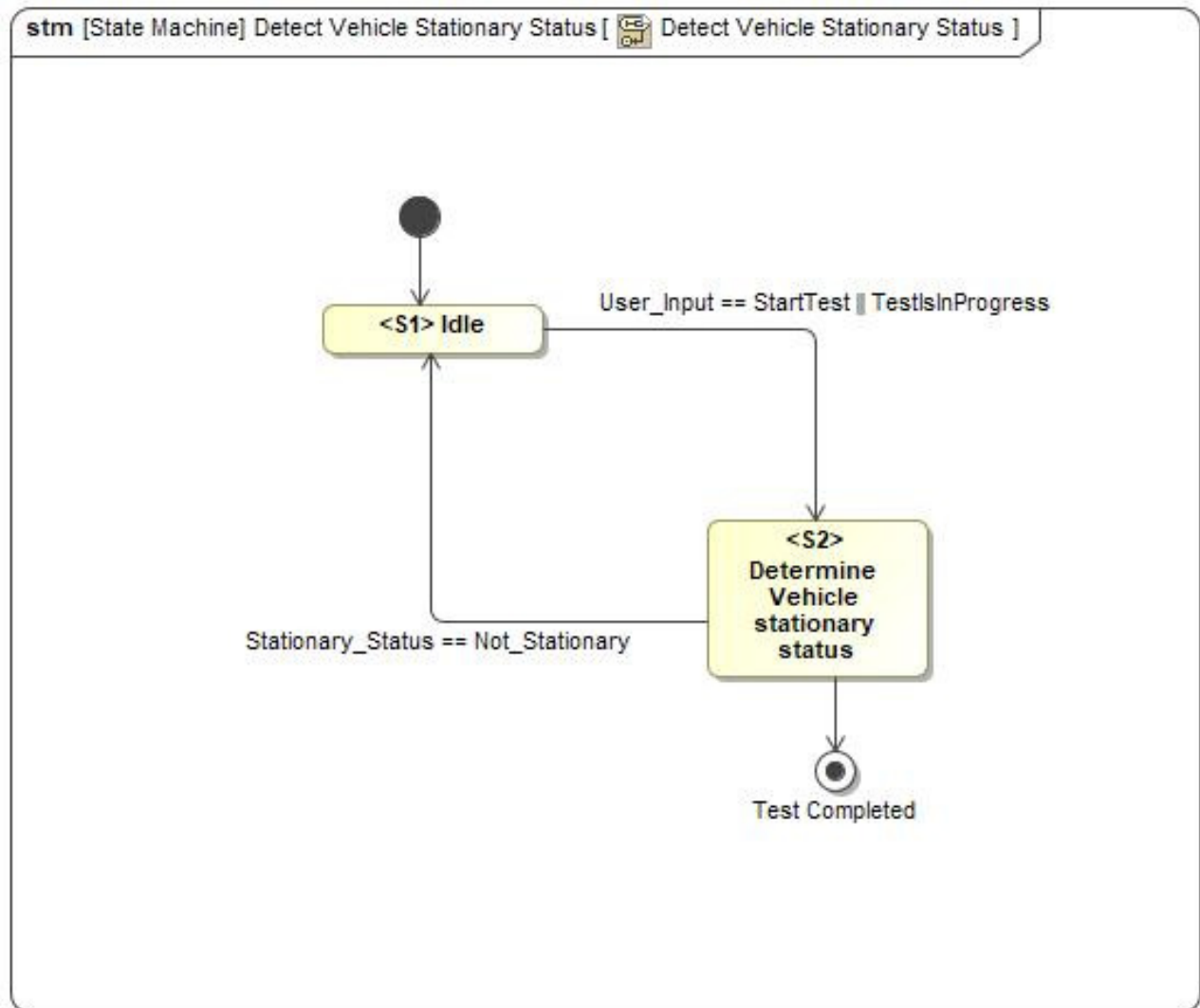


Figure 3: State Machine of Detect Vehicle Stationary Status

4.1.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.1.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.1.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.



4.1.5 Function Requirements

4.1.5.1 Functional Requirements

4.1.5.1.1 Normal Operation

###R_FNC_Trailer Light Check_00004### Vehicle not stationary (automatic transmission ONLY) 1

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_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_00007### 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)

4.1.5.1.2 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).

4.1.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.1.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.1.5.4 Other Requirements

4.1.5.4.1 Design Requirements

No Design Requirements specified.



4.2 Logical Function Detect Trailer Connection

4.2.1 Function Overview

4.2.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  Tow Connector detector <<Logical>>
-  Trailer Light Check Logical <<Logical>>

Indicates the status of whether the trailer is connected to the vehicle or not.

4.2.1.2 Function Variants


No Variants identified for Detect Trailer Connection



4.2.1.3 Assumptions

No assumptions specified for this function.



4.2.2 Function Scope

The  – “Detect Trailer Connection” function is called by the following functions:

-  – “Do Pre-condition Check”
-  – “Functional Boundary Behavior”

4.2.2.1 Do Pre-condition Check

No Diagrams found in Do Pre-condition Check

4.2.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

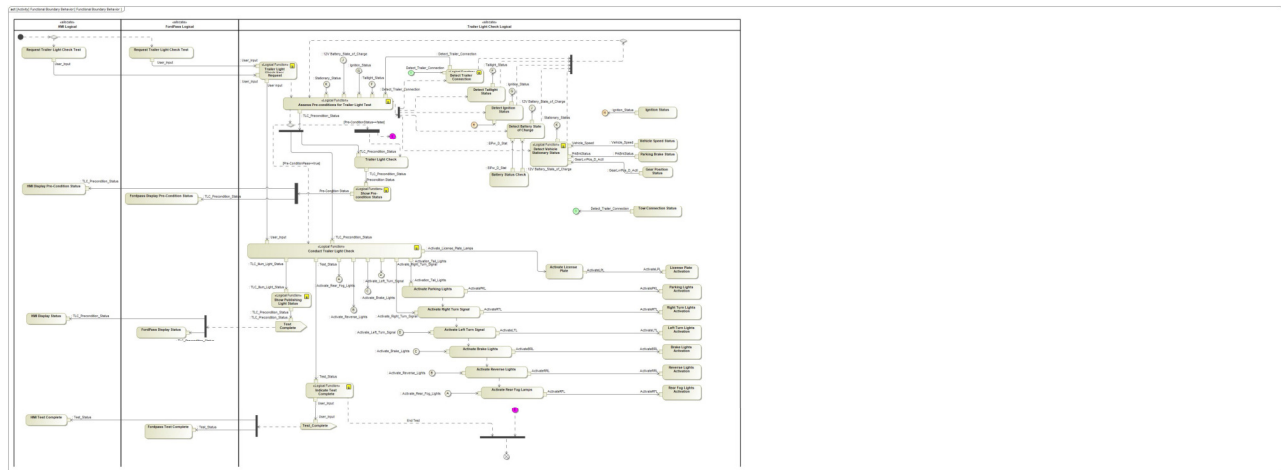




Figure 4: Activity Diagram of  “Functional Boundary Behavior” calling  “Detect Trailer Connection”

4.2.3 Function Interfaces



4.2.3.1 Logical Inputs

Signal Name	Description						
Type:  Detect Trailer Connection	Type Description: This logical signal indicates if other features that affect exterior lighting are active or not. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – No 0x1 – Yes</td><td>0x0</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Tow Connection Status	Data Type	Init Value		0x0 – No 0x1 – Yes	0x0	0x0
Data Type	Init Value						
0x0 – No 0x1 – Yes	0x0	0x0					



Function Specification MyFunction(Group)

4.2.3.2 Logical Outputs

Signal Name	Description						
Trailer_Connection Type:  Detect Trailer Connection	Type Description: This logical signal indicates if other features that affect exterior lighting are active or not. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – No 0x1 – Yes</td><td>0x0</td><td>0x</td></tr></table> Sent to: <ul style="list-style-type: none"> Assess Pre-conditions for Trailer Light Test	Data Type	Init Value		0x0 – No 0x1 – Yes	0x0	0x
Data Type	Init Value						
0x0 – No 0x1 – Yes	0x0	0x					

4.2.3.3 Configuration Parameter

(No parameters have been defined)

4.2.4 Function Modeling

4.2.4.1 State Charts

No state chart associated to specified function.

4.2.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.2.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.2.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.

4.2.5 Function Requirements

4.2.5.1 Functional Requirements

4.2.5.1.1 Normal Operation

No Normal Operation Requirements specified.



4.2.5.1.2 Error Handling

No Error Handling Requirements specified.

4.2.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.2.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.2.5.4 Other Requirements

4.2.5.4.1 Design Requirements

No Design Requirements specified.



4.3 Logical Function Trailer Light Check HMI Display

4.3.1 Function Overview

4.3.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  HMI Logical <<Logical>>
-  Trailer Light Check Logical <<Logical>>

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

4.3.1.2 Function Variants

No Variants identified for Trailer Light Check HMI Display

4.3.1.3 Assumptions

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

4.3.2 Function Scope

The  – “Trailer Light Check HMI Display” function is called by the following functions:

-  – [“Do Trailer Light Sequence”](#)

4.3.2.1 Do Trailer Light Sequence



Function Specification MyFunction(Group)

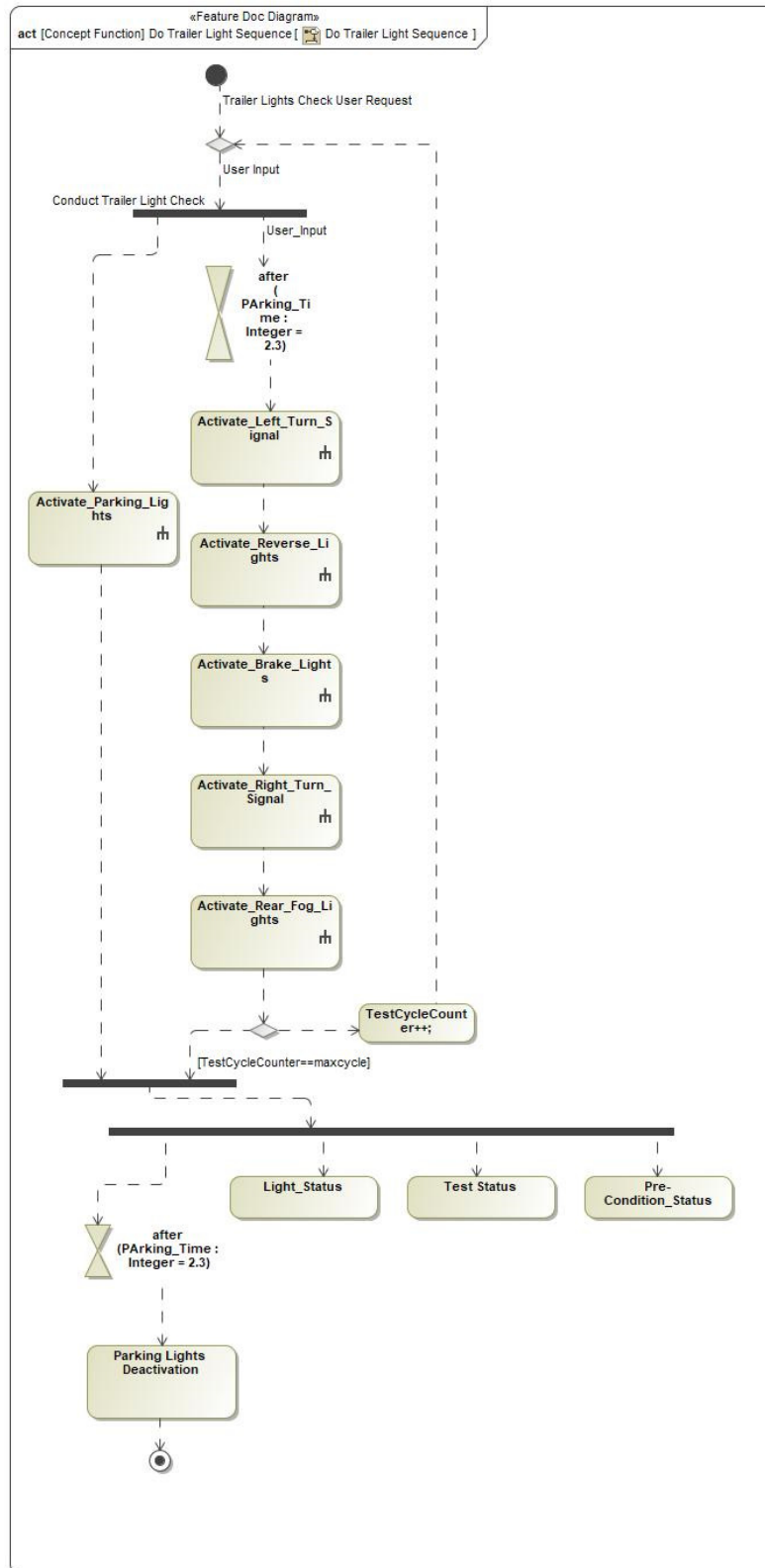


Figure 5: Activity Diagram of “Do Trailer Light Sequence” calling “Trailer Light Check HMI Display”



4.3.3 Function Interfaces

4.3.3.1 Logical Inputs

No Logical Inputs specified.

4.3.3.2 Logical Outputs

No Logical Outputs specified.

4.3.3.3 Configuration Parameter

(No parameters have been defined)

4.3.4 Function Modeling

4.3.4.1 State Charts

No state chart associated to specified function.

4.3.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.3.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.3.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.

4.3.5 Function Requirements

4.3.5.1 Functional Requirements

4.3.5.1.1 Normal Operation

###R_FNC_Trailer Light Check_00024### Not Stationary - Manual Transmission ONLY – FordPass / Lincoln Way

In a manual transmission equipped vehicle, wWhen the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_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 below:



Function Specification MyFunction(Group)

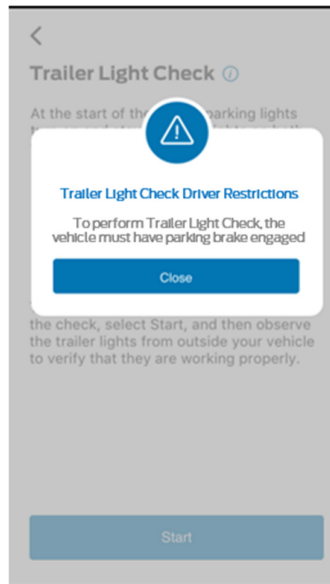


Figure: HMI Not Stationary – Manual Transmission – FordPass / Lincoln Way

###R_FNC_Trailer Light Check_00035### Trailer Light Check Initial Screen - FordPass / Lincoln Way

In order to start Trailer Light Check in FordPass / Lincoln Way UI by selecting the option from the screen menu. See example in Figure 21 below:

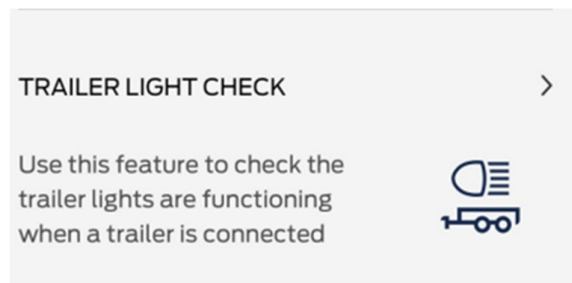


Figure 21: HMI Trailer Light Check Initial Screen – FordPass / Lincoln Way

###R_FNC_Trailer Light Check_00036### Trailer Light Check Main Screen - FordPass / Lincoln Way

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 22 below, (Rear fog lights applicable for ECE homologated markets only):



Function Specification MyFunction(Group)



Trailer Light Check ⓘ

At the start of the check, Tail Lamps turn on and stay on. Then lights on both the vehicle and the trailer turn on and off in the following order:

- Left turn signal
- Right turn signal
- Brake lights
- Reverse lights (if equipped)

The sequence repeats 5 times. To begin the check select Start. Observe the trailer lights outside of your vehicle to verify they illuminate properly. You may stop the light check at any time by pressing the "Stop" button.

Start

Figure 22 : HMI Trailer Light Check Main Screen – FordPass / Lincoln Way

###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 23 below, (5. Rear fog lights are applicable for ECE homologated markets only):

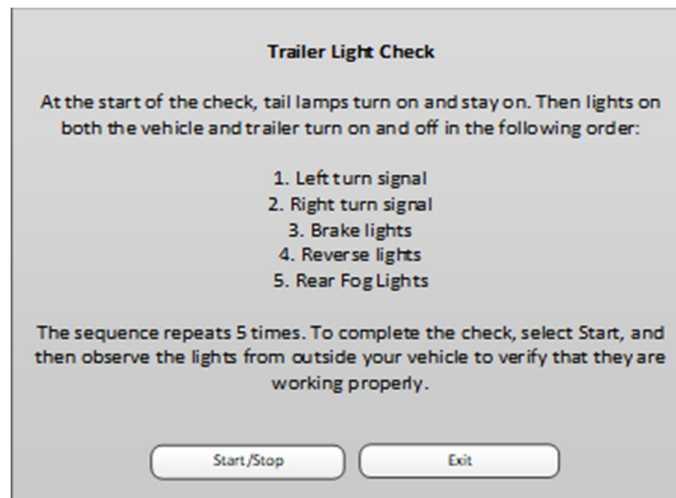


Figure 23 : HMI Trailer Light Check Main Screen – APIM_HMI

###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 24 below:



Function Specification MyFunction(Group)

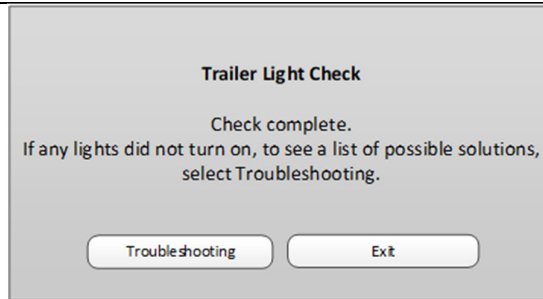


Figure 24: APIM HMI Test Ended Popup Message

###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 TLC_Precondition_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 25 below:

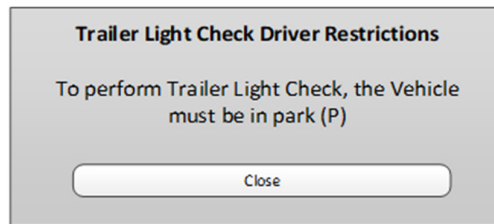


Figure 25 : APIM HMI Not Stationary – Automatic Transmission

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

When the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_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 26 below:

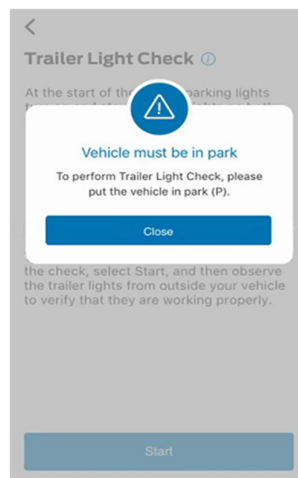


Figure 26 : [HMI](#) Not Stationary – Automatic Transmission – [FordPass](#) / Lincoln Way



Function Specification MyFunction(Group)

###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 TLC_Precondition_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 27 below:

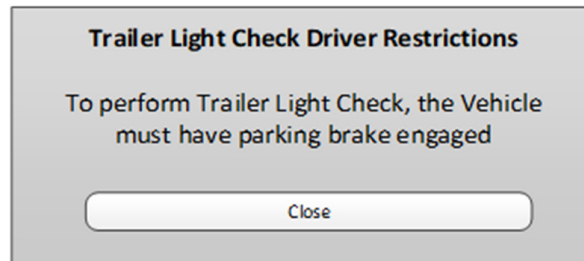


Figure 27 : HMI Not Stationary – Manual Transmission

###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 TLC_Precondition_Status = 0x3 (Start_Engine), the HMI shall display a message that the user must start the vehicle first. See example in Figure 28 below:

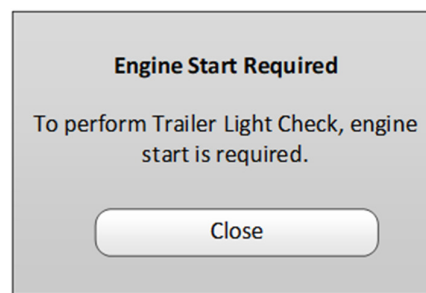


Figure 28 : APIM HMI Low Battery

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

When the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_Status = 0x3 (Start_Engine), the HMI shall display a message that the user must start the vehicle first. See example in Figure 29 below:



Function Specification MyFunction(Group)

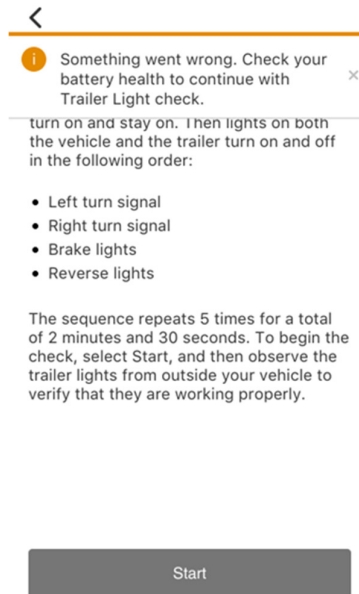


Figure 29 : HMI Low 12v Battery – FordPass / Lincoln Way

###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 TLC_Precondition_Status = 0x1 (Ignition_Not_On), the HMI shall display a message that the user must turn on the vehicle ignition. See example in Figure 30 below:

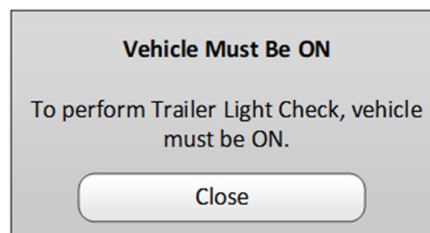


Figure 30 : APIM HMI Ignition Not On

###R_FNC_Trailer Light Check_00045### Ignition Is Not ON – FordPass / Lincoln Way

When the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_Status= 0x1 (Ignition_Not_On), the HMI shall display a message that the user must turn on the vehicle ignition. See example in Figure 31 below:



Function Specification MyFunction(Group)

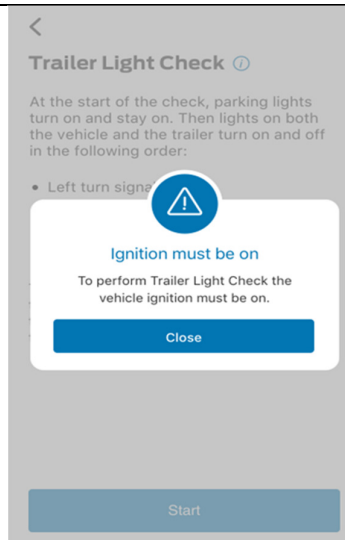


Figure 31 : HMI Ignition Not On – FordPass / Lincoln Way

###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 32 below (Rear fog lights applicable for ECE region only):



Figure 32 : APIM HMI Taillight Interaction

###R_FNC_Trailer Light Check_00047### Taillights must be Off – FordPass / Lincoln Way

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 33 below (Rear fog lights applicable for ECE region only):



Function Specification MyFunction(Group)

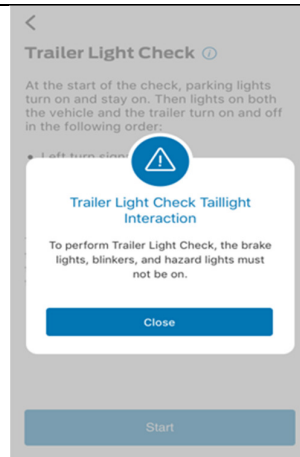


Figure 33 : HMI Taillight Interaction – FordPass / Lincoln Way

###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 TLC_Precondition_Status = 0x7(Trailer_Not_Connected), the HMI shall display a message that the user must connect the trailer with vehicle. See example in Figure 34 below:

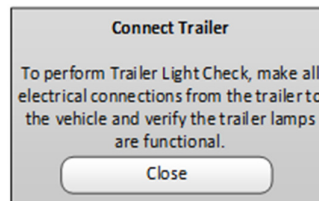


Figure 34 : HMI Trailer not connected

###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 TLC_Precondition_Status = 0x5 (Other_Feature_Interaction), the HMI shall display a message that a feature interaction exists. See example in Figure 35 below:



Figure 35 : HMI Taillight Interaction



Function Specification MyFunction(Group)

###R_FNC_Trailer Light Check_00064### Feature Interaction Present – FordPass / Lincoln Way

When the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_Status = 0x5 (Other_Feature_Interaction), the HMI shall display a message that a feature interaction exists. See example in Figure 36 below:

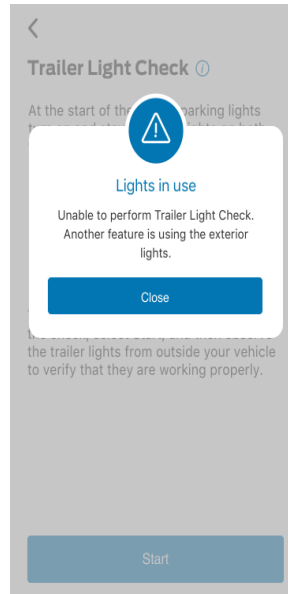


Figure 6: HMI Taillight Interaction – FordPass / Lincoln Way

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_00065### 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 37 below:

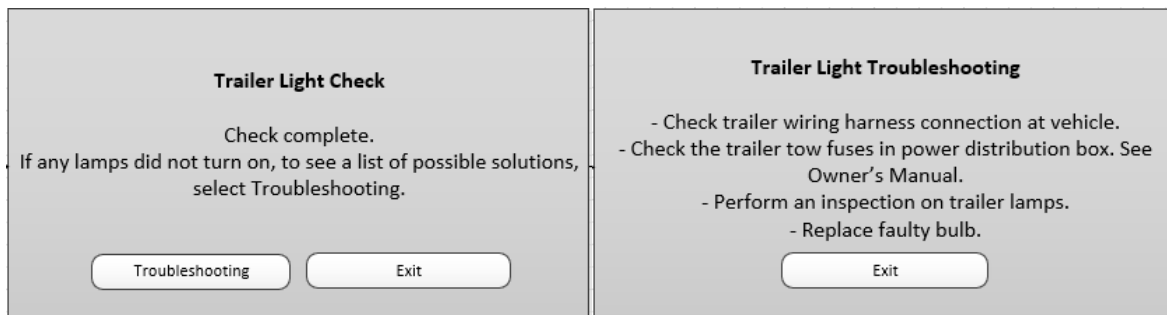


Figure 7: HMI Troubleshooting – APIM



Function Specification MyFunction(Group)

###R_FNC_Trailer Light Check_00066### Troubleshooting Screen – FordPass / Lincoln Way

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 38 below:

Troubleshooting

In order for the test to initiate, please troubleshoot:

- Check Trailer wiring harness connection at vehicle
- Check trailer tow fuses in power distribution box, see owners manual
- Perform an inspection on trailer lamps
- Replace faulty bulb

Figure 8: HMI Troubleshooting – FordPass / Lincoln Way

###R_FNC_Trailer Light Check_00067### 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 39 below:



Figure 9: Test ended due to a precondition not being met – APIM

###R_FNC_Trailer Light Check_00068### Test Status Synchronization between HMI

All the available interfaces for Trailer Light Check shall be synchronized to display the same test status.

###R_FNC_Trailer Light Check_00069### In-vehicle HMI and Remote App HMI Start Test Synchronization - commanded from In-vehicle HMI

When User_Input = 0x2 (Start_Test) from In-vehicle HMI, the Test_Status signal shall be 0x3 (Test_in_Progress) and shall be synchronized with Remote App (Cellular and Applink). The Stop button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00070### In-vehicle HMI and Remote App HMI Stop Test Synchronization - commanded from In-vehicle HMI

When User_Input = 0x1 - (Stop_Test) from In-vehicle HMI, the Test_Status signal shall be 0x2 (Test ended) and shall be synchronized with Remote App (Cellular and Applink). The Start button shall be displayed in both In-vehicle and Remote apps HMI screens.



Function Specification MyFunction(Group)

###R_FNC_Trailer Light Check_00083### Trailer is not connected – FordPass / LincolnWay

When the Trailer Light Check is being requested or is currently in progress and TLC_Precondition_Status = 0x7(Trailer_Not_Connected), the HMI shall display a message that the user must connect the trailer with vehicle. See example in Figure below:

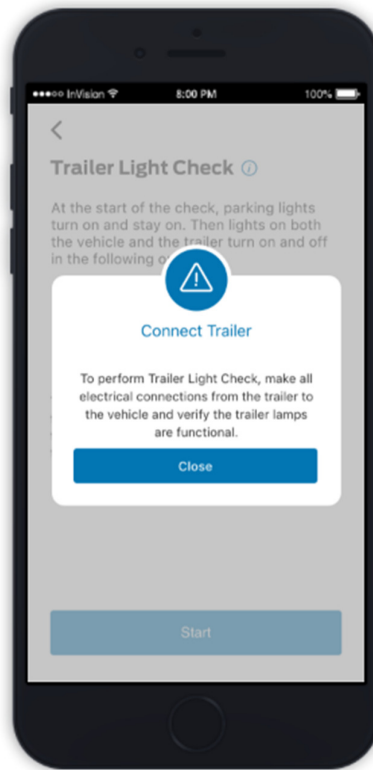


Figure: HMI Trailer not connected – FordPass / Lincoln Way

4.3.5.1.2 Error Handling

No Error Handling Requirements specified.

4.3.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.3.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.3.5.4 Other Requirements

4.3.5.4.1 Design Requirements

No Design Requirements specified.



4.3.5.5 Uncategorized Requirements

No Uncategorized Requirements specified.

4.4 Logical Function Trailer Light Check User Request

4.4.1 Function Overview

4.4.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  Trailer Light Check Logical <<Logical>>

This function allows the user to select to initiate or end Trailer Light Check using in-vehicle HMI or FordPass / Lincoln Way. 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.

4.4.1.2 Function Variants



Variant Name	Variant Description	Variant Condition (optional)
In-vehicle HMI	In-vehicle HMI user interface (SYNC)	
Remote App HMI	Ford Pass or Lincoln Way user interface via Cellular network or Bluetooth	

4.4.1.3 Assumptions

No assumptions specified for this function.

4.4.2 Function Scope

The  – “Trailer Light Check User Request” function is called by the following functions:

-  – “[Do Trailer Light Sequence](#)”
-  – “[Functional Boundary Behavior](#)”

4.4.2.1 Do Trailer Light Sequence

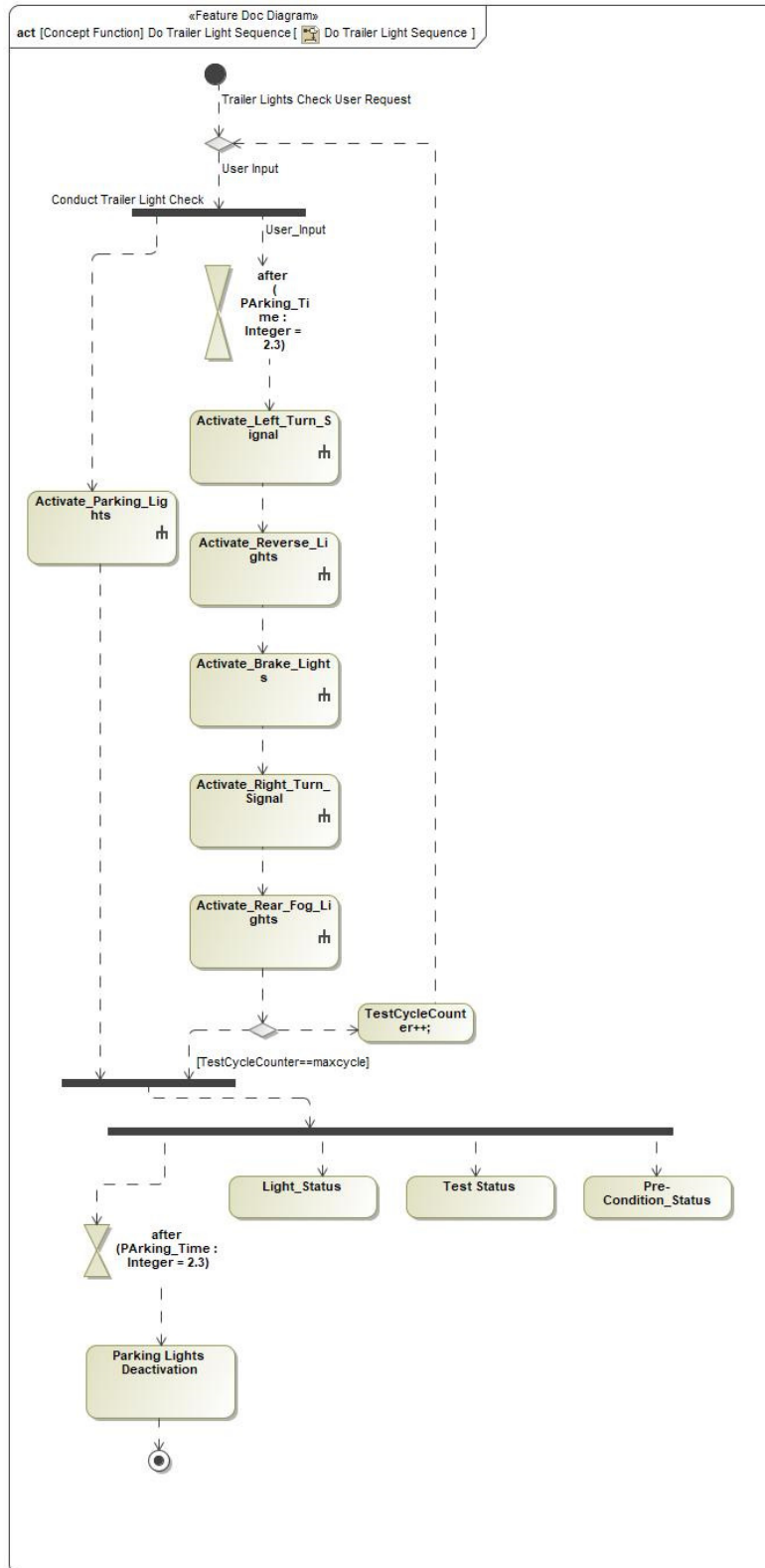
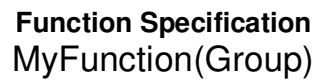


Figure 10: Activity Diagram of  “Do Trailer Light Sequence” calling  “Trailer Light Check User Request”



Function Specification MyFunction(Group)

4.4.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

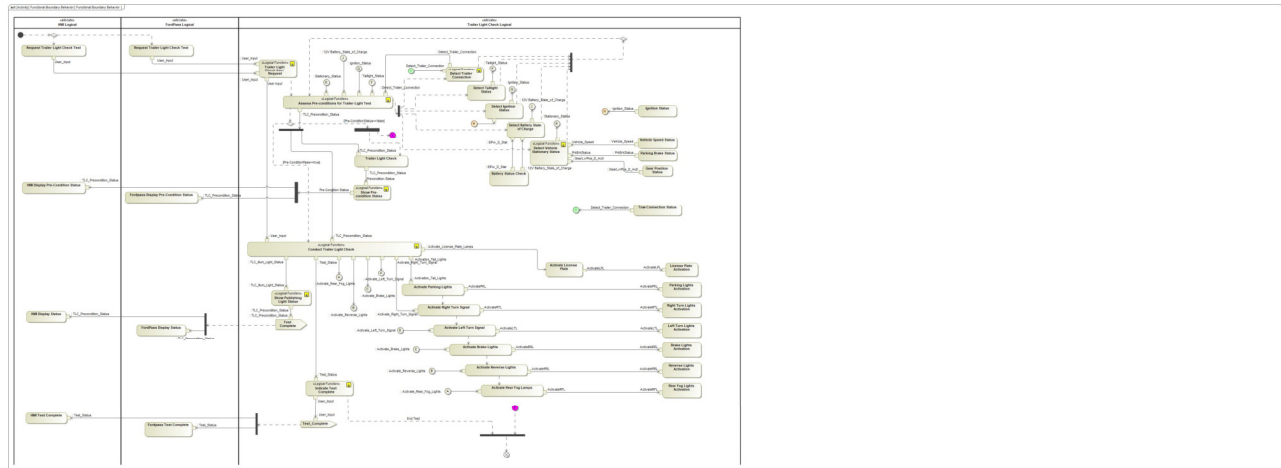





Figure 11: Activity Diagram of “Functional Boundary Behavior” calling “Trailer Light Check User Request”


4.4.3 Function Interfaces

4.4.3.1 Logical Inputs


Signal Name	Description						
User input Type:  User Input	Type Description: 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. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack</td><td>0x0 = Null (Defaulted)</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Request Trailer Light Check Test	Data Type	Init Value		0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0
Data Type	Init Value						
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0					
User input Type:  User Input	Type Description: 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. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr></table>	Data Type	Init Value				
Data Type	Init Value						



Function Specification MyFunction(Group)

	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0 = Null (Defaulted)
	Received from: <ul style="list-style-type: none"> Request Trailer Light Check Test		

4.4.3.2 Logical Outputs

Signal Name	Description
User input	Sent to: <ul style="list-style-type: none"> Conduct Trailer Light Check

4.4.3.3 Configuration Parameter

Parameter Name	Description
TLC_Feature_Enable_Cfg	A configuration parameter which indicates if the Trailer Light Check feature is present or not in a vehicle.



4.4.4 Function Modeling

4.4.4.1 State Charts

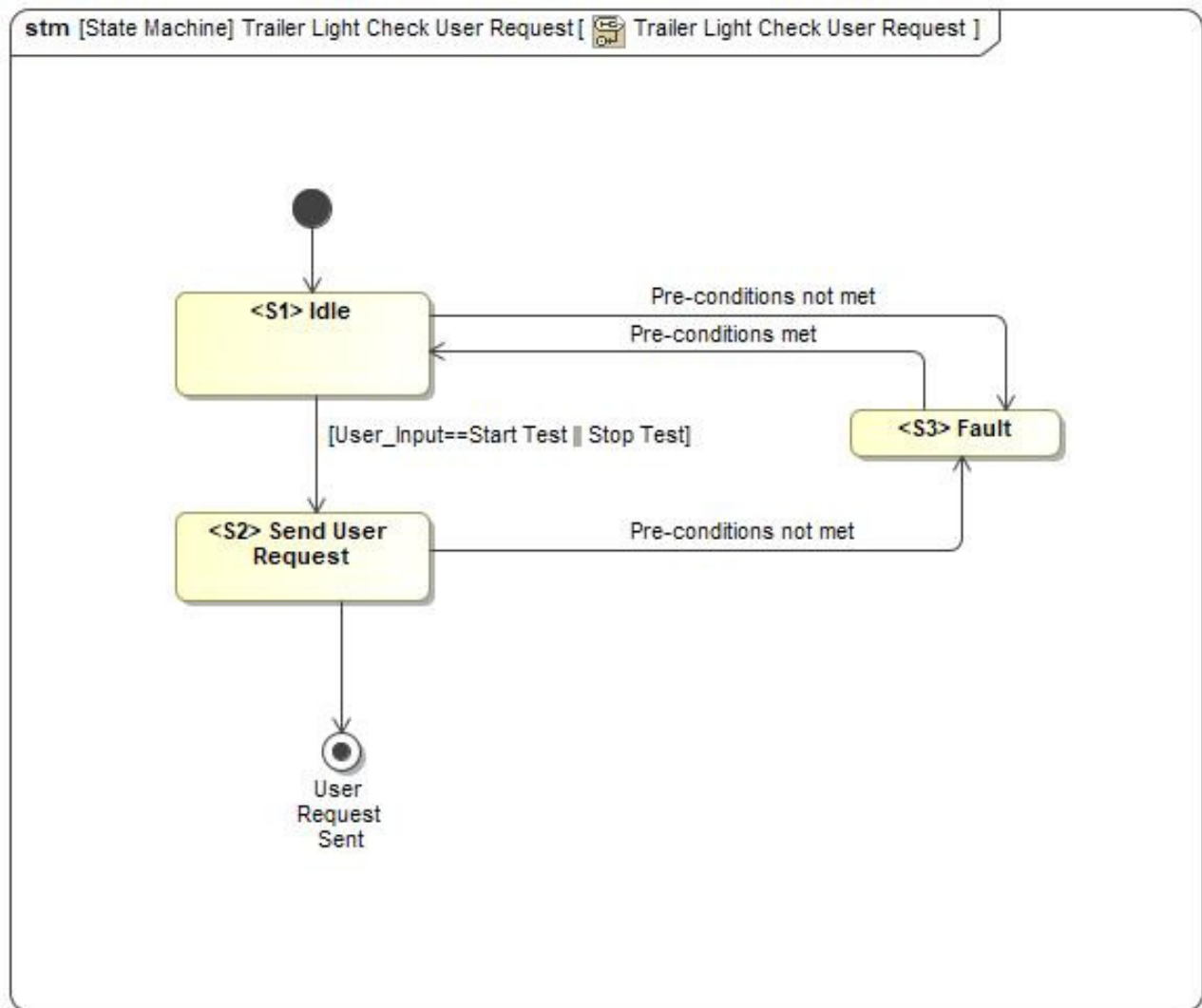


Figure 12: State Machine of Trailer Light Check User Request

4.4.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.4.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.4.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.



4.4.5 Function Requirements

4.4.5.1 Functional Requirements

4.4.5.1.1 Normal Operation

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

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

4.4.5.1.2 Error Handling

No Error Handling Requirements specified.

4.4.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.4.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.4.5.4 Other Requirements

4.4.5.4.1 Design Requirements

No Design Requirements specified.

4.5 Logical Function Show Publishing Light Status


4.5.1 Function Overview

4.5.1.1 Function Description

Represents VSEM Dictionary Function:



Function is allocated to:

-  Trailer Light Check Logical <<Logical>>

Displays Light Status on UI while performing Trailer Light Test


4.5.1.2 Function Variants



No Variants identified for Show Publishing Light Status

4.5.1.3 Assumptions

No assumptions specified for this function.

4.5.2 Function Scope

The  – “**Show Publishing Light Status**” function is called by the following functions:

-  – “[Do Trailer Light Sequence](#)”
-  – “[Functional Boundary Behavior](#)”

4.5.2.1 Do Trailer Light Sequence



Function Specification MyFunction(Group)

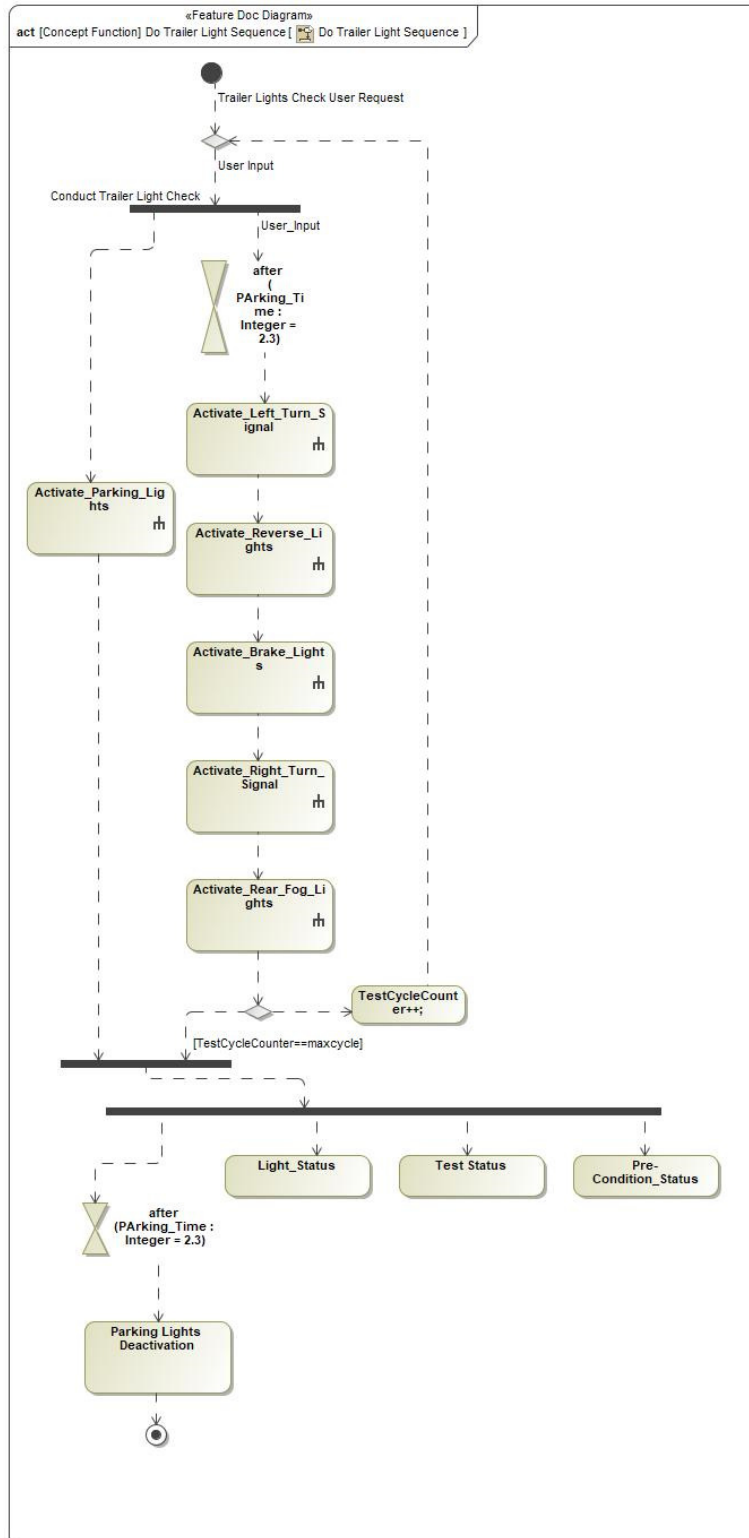


Figure 13: Activity Diagram of “Do Trailer Light Sequence” calling “Show Publishing Light Status”



Function Specification MyFunction(Group)

4.5.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

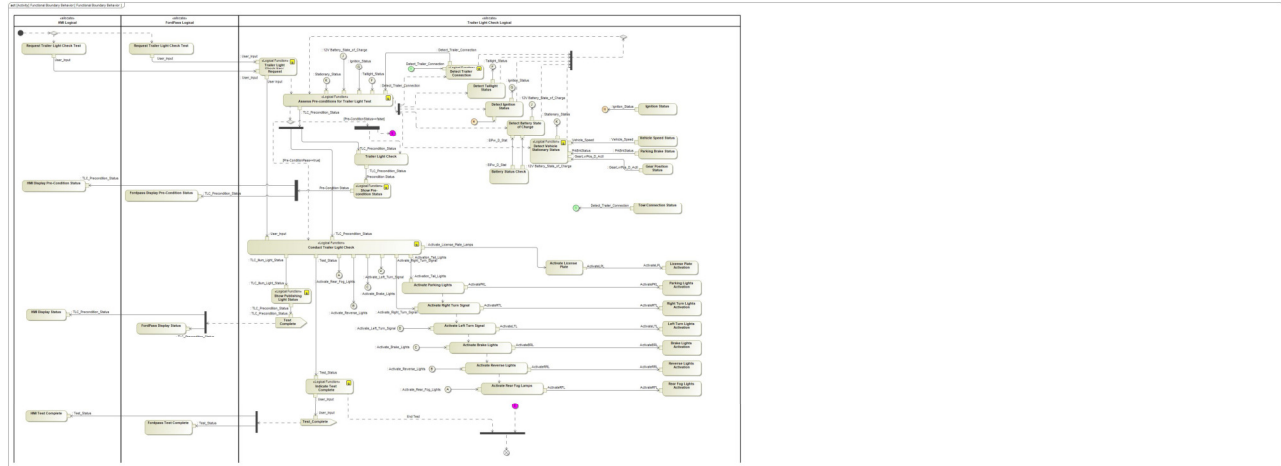




Figure 14: Activity Diagram of  “Functional Boundary Behavior” calling  “Show Publishing Light Status”

4.5.3 Function Interfaces

4.5.3.1 Logical Inputs


Signal Name	Description						
Light_Status Type:  TLC Illum Light Status	Type Description: This logical signal indicates the light that is illuminated at present instant, when Trailer Light Check feature is in progress. Note: When publishing light status, lights other than parking lights shall take highest priority for this signal content since parking lights are illuminated throughout test. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light</td><td>0x0 – Null</td><td>0x0</td></tr></table> <div>Received from:</div> <div><div><div></div><div></div></div><div>Conduct Trailer Light Check</div></div>	Data Type	Init Value		0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light	0x0 – Null	0x0
Data Type	Init Value						
0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light	0x0 – Null	0x0					

4.5.3.2 Logical Outputs

Signal Name	Description
Light_Status Type:	Type Description:



Function Specification MyFunction(Group)



[TLC Precondition Status](#)

This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature.

Data Type	Init Value	
0x0 – Null 0x1 – Ignition_Not_On 0x2 – Tailight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected	0x0 – NULL	0x

Sent to:

-

4.5.3.3 Configuration Parameter

(No parameters have been defined)

4.5.4 Function Modeling

4.5.4.1 State Charts

No state chart associated to specified function.

4.5.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.5.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.5.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.

4.5.5 Function Requirements

4.5.5.1 Functional Requirements

4.5.5.1.1 Normal Operation

No Normal Operation Requirements specified.



4.5.5.1.2 Error Handling

No Error Handling Requirements specified.

4.5.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.5.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.5.5.4 Other Requirements

4.5.5.4.1 Design Requirements

No Design Requirements specified.




4.6 Logical Function Indicate Test Complete

4.6.1 Function Overview

4.6.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  FordPass Logical <<Logical>>
-  HMI Logical <<Logical>>
-  Trailer Light Check Logical <<Logical>>

This function will display the test completion status of the feature and potentially troubleshooting information on FordPass / Lincoln Way or in-vehicle HMI. When the Trailer Light Check has completed, the HMI will display a message popup indicating test has been completed with two buttons – Troubleshooting and Exit.

At test completion, the user selects the Exit button and will return to the feature main screen.

If a problem has been detected, the user selects the Troubleshooting button to see instructions on how to proceed.

Troubleshooting text:

- Check trailer wiring harness connection at vehicle
- Check trailer tow fuses in power distribution box. See owner's manual
- Perform an inspection on trailer lamps
- Replace faulty bulb or take vehicle/trailer in for service

4.6.1.2 Function Variants


No Variants identified for Indicate Test Complete



4.6.1.3 Assumptions

No assumptions specified for this function.



4.6.2 Function Scope

The  – “Indicate Test Complete” function is called by the following functions:

-  – [“Do Trailer Light Sequence”](#)
-  – [“Functional Boundary Behavior”](#)

4.6.2.1 Do Trailer Light Sequence



Function Specification MyFunction(Group)

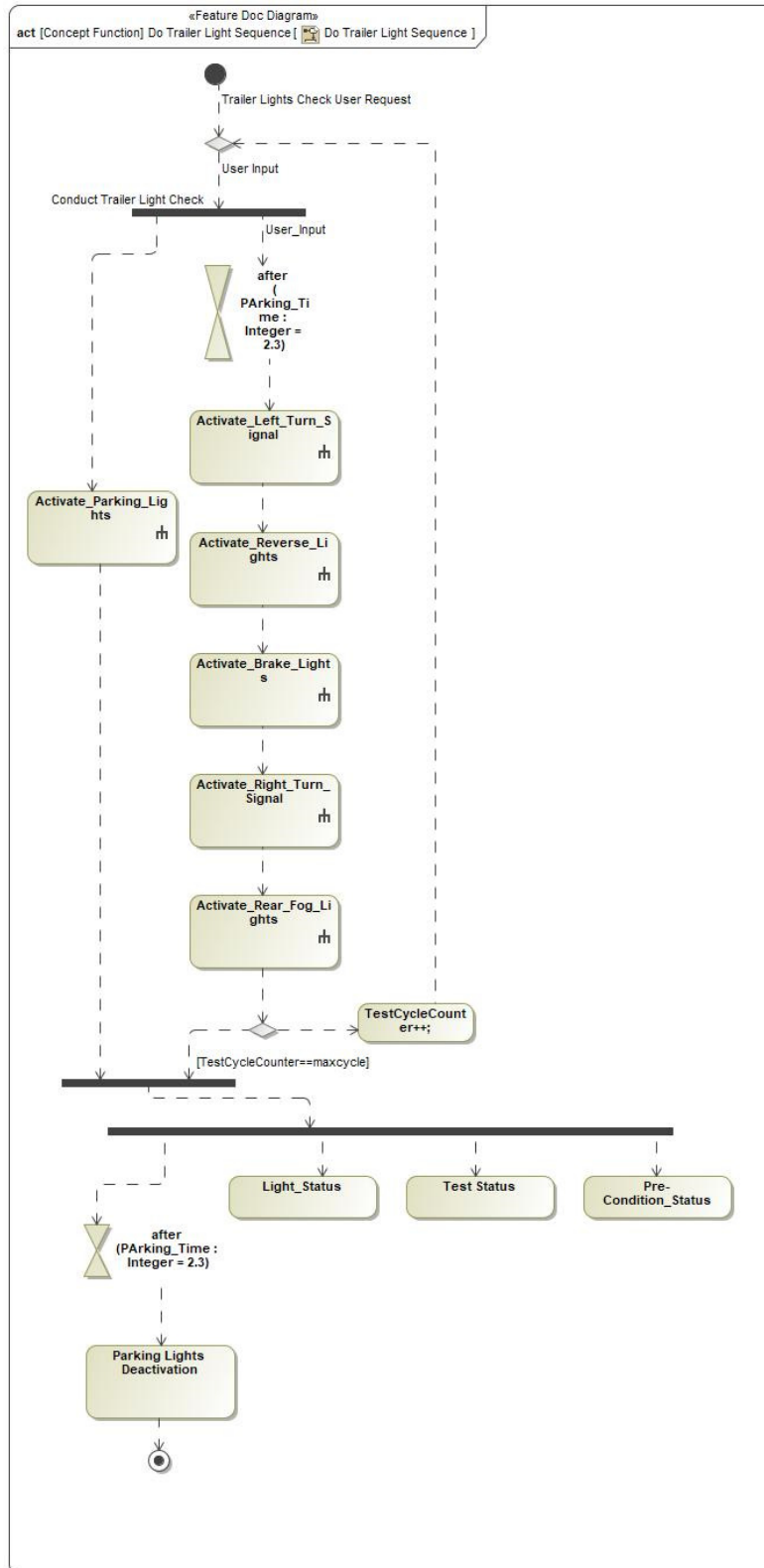


Figure 15: Activity Diagram of “Do Trailer Light Sequence” calling “Indicate Test Complete”



Function Specification MyFunction(Group)

4.6.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

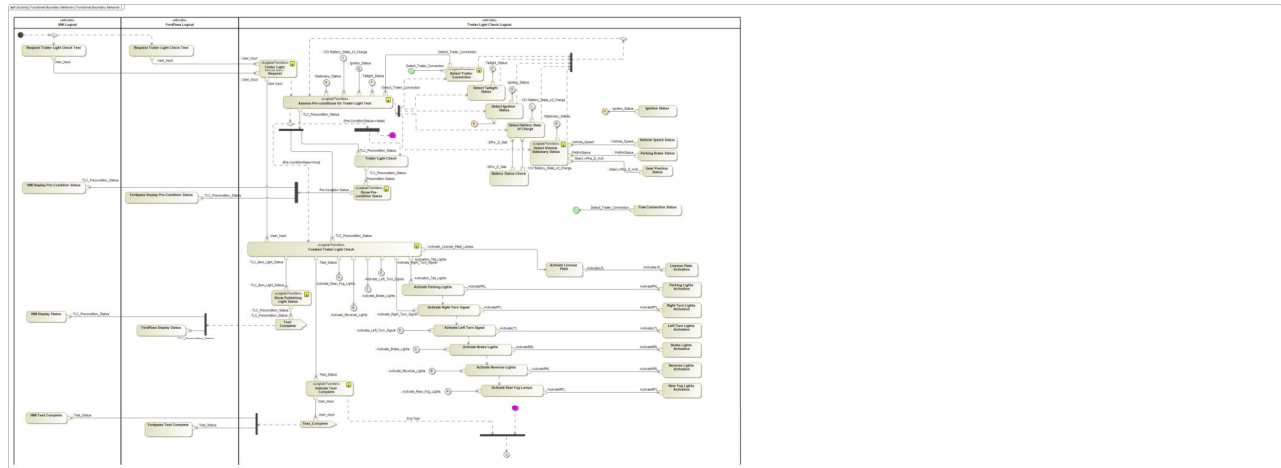





Figure 16: Activity Diagram of “Functional Boundary Behavior” calling “Indicate Test Complete”

4.6.3 Function Interfaces

4.6.3.1 Logical Inputs

Signal Name	Description						
Test_Complete Type:  Test_Status	Type Description: This logical signal indicates when the test is in progress or has completed <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress</td><td>0x0 – Null</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Conduct Trailer Light Check	Data Type	Init Value		0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x0
Data Type	Init Value						
0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x0					

4.6.3.2 Logical Outputs

Signal Name	Description			
Test_Complete Type:  User Input	Type Description: 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. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr></table>	Data Type	Init Value	
Data Type	Init Value			



Function Specification
MyFunction(Group)

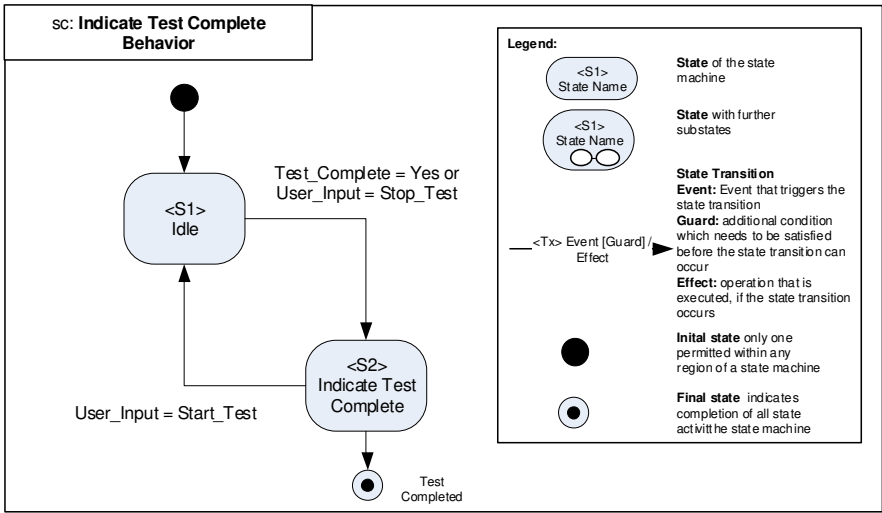
	0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0 = Null (Defaulted)
	Sent to: •		

4.6.3.3 Configuration Parameter

(No parameters have been defined)

4.6.4 Function Modeling

4.6.4.1 State Charts



4.6.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.6.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.6.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.



4.6.5 Function Requirements

4.6.5.1 Functional Requirements

4.6.5.1.1 Normal Operation

###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.

Trailer Light Check	Trailer Light Troubleshooting
Check complete. If any lamps did not turn on, to see a list of possible solutions, select Troubleshooting.	<ul style="list-style-type: none">- Check trailer wiring harness connection at vehicle.- Check the trailer tow fuses in power distribution box. See Owner's Manual.- Perform an inspection on trailer lamps.- Replace faulty bulb.
<input type="button" value="Troubleshooting"/> <input type="button" value="Exit"/>	<input type="button" value="Exit"/>

###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 after 3 seconds

When User_Input = 0x2 (Start_Test), but request times out after 3 seconds, due to lack of response from ECG (TightTest_D_RqArb) or BCM (TightTestPrecond_D_Stat/ D2_Stat, TightTest_D_Stat), 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.

Trailer Light Check Error
Trailer Light Check is unavailable. Try again later. If error persists, take vehicle to dealership.
<input type="button" value="Close"/>



###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).

4.6.5.1.2 Error Handling

No Error Handling Requirements specified.

4.6.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.6.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.6.5.4 Other Requirements

4.6.5.4.1 Design Requirements

No Design Requirements specified.



4.7 Logical Function Conduct Trailer Light Check

4.7.1 Function Overview

4.7.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  FN13 Conduct Trailer Light Check <<Logical>>
-  Trailer Light Check Logical <<Logical>>

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 1-8
 - 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 from vehicle and trailer (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 calibrated in addition to number of sequence repetitions.

**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 TLC_Precondition_Status = Precondition_Ok


4.7.1.2 Function Variants



No Variants identified for Conduct Trailer Light Check

4.7.1.3 Assumptions

No assumptions specified for this function.

4.7.2 Function Scope

The  – “**Conduct Trailer Light Check**” function is called by the following functions:

-  – “[Do Trailer Light Sequence](#)”
-  – “[Functional Boundary Behavior](#)”

4.7.2.1 Do Trailer Light Sequence



Function Specification MyFunction(Group)

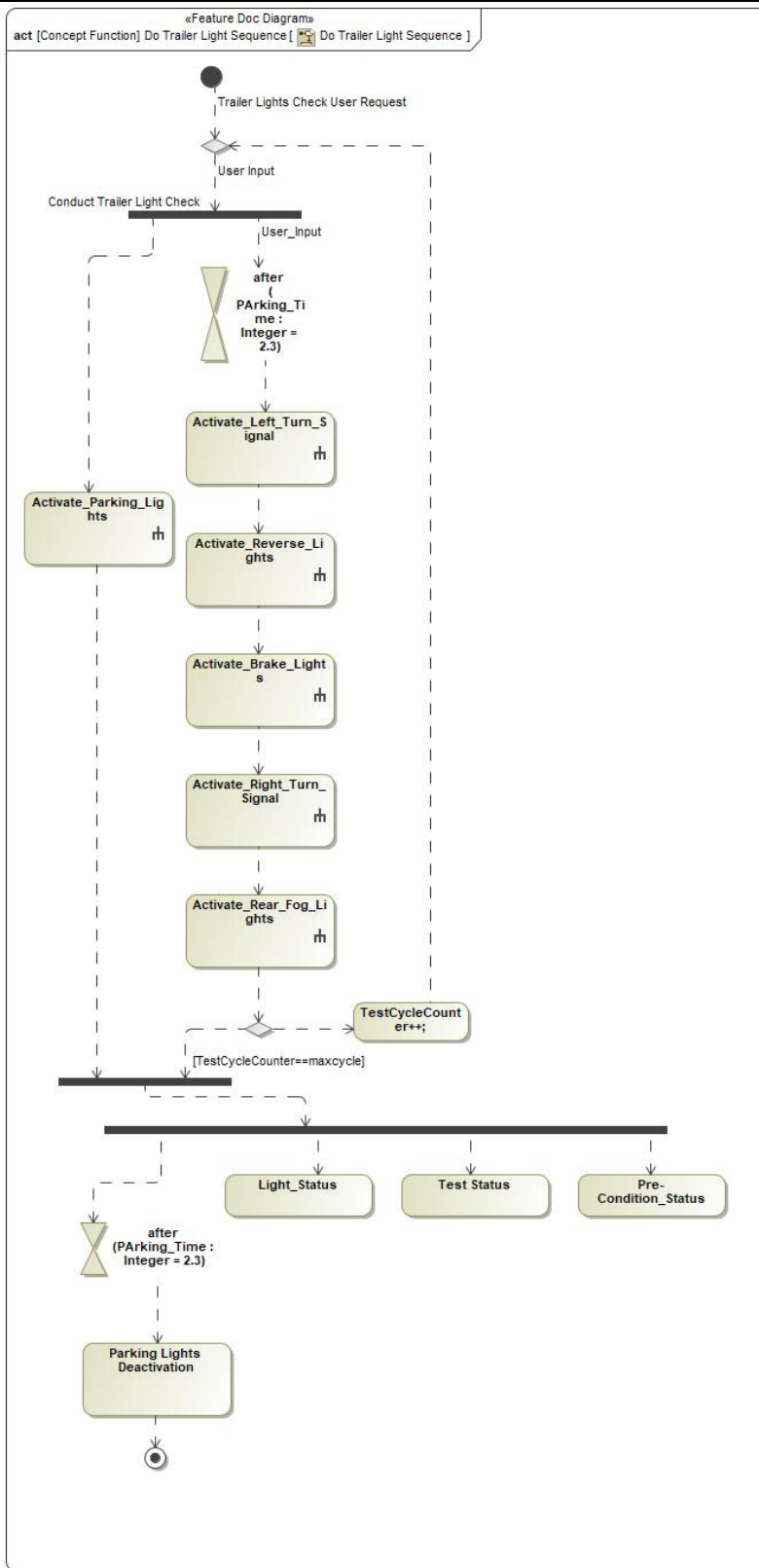


Figure 17: Activity Diagram of “Do Trailer Light Sequence” calling “Conduct Trailer Light Check”



Function Specification MyFunction(Group)

4.7.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

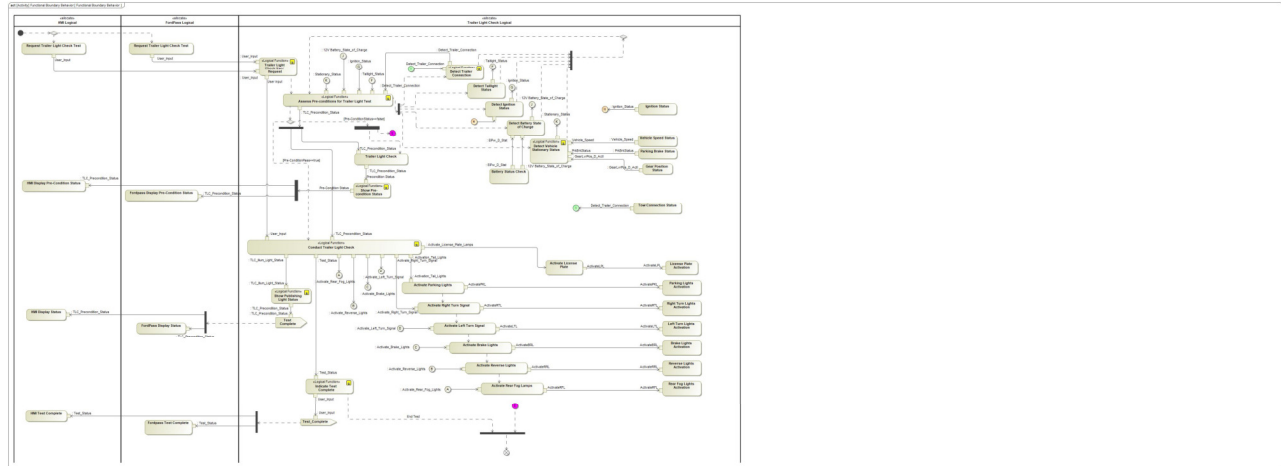





Figure 18: Activity Diagram of  “Functional Boundary Behavior” calling  “Conduct Trailer Light Check”

4.7.3 Function Interfaces

4.7.3.1 Logical Inputs







Signal Name	Description						
input Type:  User Input	<p>Type Description:</p> <p>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.</p> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack</td><td>0x0 = Null (Defaulted)</td><td>0x0</td></tr></table> <p>Received from:</p> <ul style="list-style-type: none"> Trailer Light Check User Request	Data Type	Init Value		0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0
Data Type	Init Value						
0x0 - Null (Defaulted) 0x1 - Stop_Test 0x2 - Start_Test 0x3 - Test_end_ack	0x0 = Null (Defaulted)	0x0					
Pre-condition Status Type:  TLC Precondition Status	<p>Type Description:</p> <p>This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature.</p> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Null</td><td>0x0 – NULL</td><td>0x0</td></tr></table>	Data Type	Init Value		0x0 – Null	0x0 – NULL	0x0
Data Type	Init Value						
0x0 – Null	0x0 – NULL	0x0					



Function Specification MyFunction(Group)








	0x1 – Ignition_Not_On 0x2 – Taillight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected		
	Received from: <ul style="list-style-type: none"> Assess Pre-conditions for Trailer Light Test		

4.7.3.2 Logical Outputs

Signal Name	Description						
Activate_Left_Turn_Signal Type:  Activate Left Turn Signal	Type Description: This logical signal commands the left turn signal on the vehicle and trailer ON/OFF. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Turn on left turn signal 0x1 – Turn off left turn signal</td><td></td><td></td></tr></table> Sent to: <ul style="list-style-type: none"> Activate Left Turn Signal	Data Type	Init Value		0x0 – Turn on left turn signal 0x1 – Turn off left turn signal		
Data Type	Init Value						
0x0 – Turn on left turn signal 0x1 – Turn off left turn signal							
Activate_Reverse_Lights Type:  Activate Reverse Lights	Type Description: This logical signal commands the reverse lights on the vehicle and trailer ON/OFF. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Turn on reverse lights 0x1 – Turn off reverse lights</td><td></td><td></td></tr></table> Sent to: <ul style="list-style-type: none"> Activate Reverse Lights	Data Type	Init Value		0x0 – Turn on reverse lights 0x1 – Turn off reverse lights		
Data Type	Init Value						
0x0 – Turn on reverse lights 0x1 – Turn off reverse lights							
Test_Complete Type:  Test Status	Type Description: This logical signal indicates when the test is in progress or has completed <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress</td><td>0x0 – Null</td><td>0x</td></tr></table> Sent to: <ul style="list-style-type: none"> Indicate Test Complete	Data Type	Init Value		0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x
Data Type	Init Value						
0x0 - Null (Defaulted) 0x1 – Test completed 0x2 – Test ended 0x3 - Test_in_Progress	0x0 – Null	0x					
Activate_Right_Turn_Signa l Type:	Type Description:						







Function Specification MyFunction(Group)

<div></div> <div>Activate Right Turn Signal</div>	<div>This logical signal commands the right turn signal on the vehicle and trailer ON/OFF.</div> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Turn on right turn signal 0x1 – Turn off right turn signal</td><td></td><td></td></tr></table> <div>Sent to:</div> <div><ul style="list-style-type: none"> Activate Right Turn Signal</div>	Data Type	Init Value		0x0 – Turn on right turn signal 0x1 – Turn off right turn signal		
Data Type	Init Value						
0x0 – Turn on right turn signal 0x1 – Turn off right turn signal							
<div>Activate_Rear_Fog_Lamps</div> <div>Type:</div> <div></div> <div>Activate Rear Fog Lights</div>	<div>Type Description:</div> <div>This logical signal indicates if other features that affect exterior lighting are active or not.</div> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Off 0x1 – On</td><td>0x0</td><td>0x0</td></tr></table> <div>Sent to:</div> <div><ul style="list-style-type: none"> Activate Rear Fog Lamps</div>	Data Type	Init Value		0x0 – Off 0x1 – On	0x0	0x0
Data Type	Init Value						
0x0 – Off 0x1 – On	0x0	0x0					
<div>Activate_Brake_Lights</div> <div>Type:</div> <div></div> <div>Activate Brake Lights</div>	<div>Type Description:</div> <div>This logical signal commands the brake lights on the vehicle and trailer ON/OFF.</div> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Turn on brake lights 0x1 – Turn off brake lights</td><td></td><td></td></tr></table> <div>Sent to:</div> <div><ul style="list-style-type: none"> Activate Brake Lights</div>	Data Type	Init Value		0x0 – Turn on brake lights 0x1 – Turn off brake lights		
Data Type	Init Value						
0x0 – Turn on brake lights 0x1 – Turn off brake lights							
<div>output</div> <div>Type:</div> <div></div> <div>Activate License Plate Lamps</div>	<div>Type Description:</div> <div>This logical signal commands the license plate lights on the vehicle ON/OFF.</div> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Off 0x1 – On</td><td>0x0</td><td></td></tr></table>	Data Type	Init Value		0x0 – Off 0x1 – On	0x0	
Data Type	Init Value						
0x0 – Off 0x1 – On	0x0						



Function Specification MyFunction(Group)

	<table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Off 0x1 – On</td><td>0x0</td><td></td></tr></table>	Data Type	Init Value		0x0 – Off 0x1 – On	0x0	
Data Type	Init Value						
0x0 – Off 0x1 – On	0x0						
Activate_Parking_Lights Type:  Activation Tail Lights	<p>Type Description:</p> <p>This logical signal commands the parking lights on the vehicle and trailer ON/OFF</p> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Turn on parking lights 0x1 – Turn off parking lights</td><td></td><td></td></tr></table> <p>Sent to:</p> <ul style="list-style-type: none"> Activate Parking Lights	Data Type	Init Value		0x0 – Turn on parking lights 0x1 – Turn off parking lights		
Data Type	Init Value						
0x0 – Turn on parking lights 0x1 – Turn off parking lights							
Light_Status Type:  TLC Illum Light Status	<p>Type Description:</p> <p>This logical signal indicates the light that is illuminated at present instant, when Trailer Light Check feature is in progress. Note: When publishing light status, lights other than parking lights shall take highest priority for this signal content since parking lights are illuminated throughout test.</p> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light</td><td>0x0 – Null</td><td>0x</td></tr></table> <p>Sent to:</p> <ul style="list-style-type: none"> Show Publishing Light Status	Data Type	Init Value		0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light	0x0 – Null	0x
Data Type	Init Value						
0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light	0x0 – Null	0x					



Function Specification MyFunction(Group)

4.7.3.3 Configuration Parameter

Parameter Name	Description
RearFog_Enable_cfg	BCM Configuration parameter required ECE markets vs FMVSS markets (with/ without fog lamps).
RearFogWithTrailer_Cfg	Determines if vehicle Rear Fog Lamps are allowed to operate when a trailer is connected. ALLOW - Vehicle Rear Fog Lamps are allowed to operate when the trailer module reports that a trailer is connected. This is required for Brazilian applications. The ECE regulation sentence allowing the Vehicle Rear Fog Lamps to turn off is missing from the Brazilian regulations. INHIBIT - Vehicle Rear Fog Lamps are not allowed to operate when the trailer module reports that a trailer is connected. This is required for European applications and allowed by ECE regulations.

4.7.3.4 Tunable Parameter

Parameter Name	Description
TLC_ParkingLight_OnTime_Cfg	A configuration parameter which indicates the time duration for which only Position / Parking Lights are illuminated because of Trailer Light Check feature. The Parking Lights are ON throughout the Trailer Light Check feature.
TLC_TurnLamps_NoOfFlash_Cfg	A configuration parameter which indicates the maximum number of flashes allowed when Trailer Light Check feature requests the Left/Right Turn lamps to be flashed.
TLC_StopLamp_OnTime_Cfg	A configuration parameter which indicates the time duration for which Stop / Brake lamps are illuminated because of Trailer Light Check feature.
TLC_ReverseLamp_OnTime_Cfg	A configuration parameter which indicates the time duration for which Reverse lamps are illuminated because of Trailer Light Check feature.
TLC_RearFogLamp_OnTime_Cfg	A configuration parameter which indicates the time duration for which Rear Fog lamps are illuminated because of Trailer Light Check feature.
TLC_AllLamps_OffTime_Cfg	A configuration parameter which indicates the time duration for which position / parking lights, turn lamps, stop / brake lamps and reverse lamps are turned OFF while Trailer Light Check feature is in progress. If parking lights have been turned on through hard switch in vehicle, parking lights shall remain on during this step. If MLS is HeadLamps/Auto & Darkout, then parkposition & lowbeam are on for entire test period.
TLC_Seq_Cnt_Cfg	A configuration parameter which indicates the number of times the Trailer Light Check feature is to be repeated, in order to accomplish the testing of the feature.



4.7.4 Function Modeling

4.7.4.1 State Charts

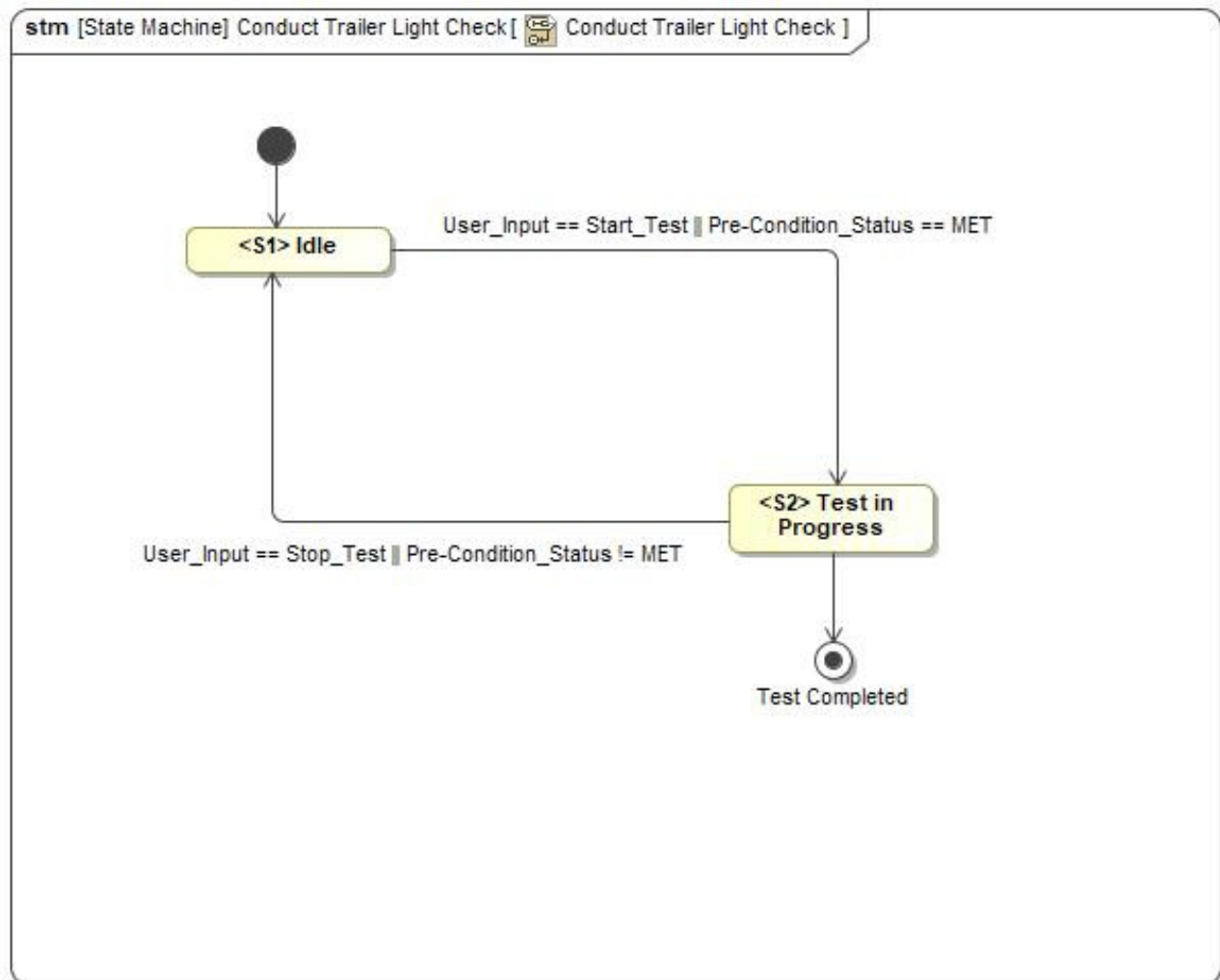


Figure 19: State Machine of Conduct Trailer Light Check

4.7.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.7.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.7.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.



4.7.5 Function Requirements

4.7.5.1 Functional Requirements

4.7.5.1.1 Normal Operation

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

When User_Input = 0x2 (Start_Test) and TLC_Precondition_Status = 0x4 (Precondition_Ok), 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 1-8
 - 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 from vehicle and trailer (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 calibrated in addition to number of sequence repetitions.

**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 TLC_Precondition_Status != 0x4 (Precondition_Ok) 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 TLC_Precondition_Status != 0x4 (Precondition_Ok) 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 TLC_Illum_Light_Status signal content since parking / position lamps are illuminated throughout test (i.e. if parking / position lamps and right turn signal are on, TLC_Illum_Light_Status signal will publish 0x2 - Right_Turn). 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_00068### Test Status Synchronization between HMI

All the available interfaces for Trailer Light Check shall be synchronized to display the same test status.

###R_FNC_Trailer Light Check_00069### In-vehicle HMI and Remote App HMI Start Test Synchronization - commanded from In-vehicle HMI

When User_Input = 0x2 (Start_Test) from In-vehicle HMI, the Test_Status signal shall be 0x3 (Test_in_Progress) and shall be synchronized with Remote App (Cellular and Applink). The Stop button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00070### In-vehicle HMI and Remote App HMI Stop Test Synchronization - commanded from In-vehicle HMI

When User_Input = 0x1 - (Stop_Test) from In-vehicle HMI, the Test_Status signal shall be 0x2 (Test ended) and shall be synchronized with Remote App (Cellular and Applink). The Start button shall be displayed in both In-vehicle and Remote apps HMI screens.



###R_FNC_Trailer Light Check_00071### In-vehicle HMI and Remote App HMI Test Completed Synchronization - commanded from In-vehicle HMI

When the Conduct Trailer Light Check function has completed via In-vehicle command, the Test_Status signal shall be 0x1 (Test completed) and shall be synchronized with Remote App (Cellular and Applink). The Start button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00072### Remote App HMI and In-vehicle HMI Start Test Synchronization - commanded from Remote app HMI

When User_Input = 0x2 (Start_Test) from Remote App (Cellular and Applink), the Test_Status signal shall be 0x3 (Test_in_Progress) and shall be synchronized with In-vehicle HMI. The Stop button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00073### Remote App HMI and In-vehicle HMI Stop Test Synchronization - commanded from Remote app HMI

When User_Input = 0x1 - (Stop_Test) from Remote App (Cellular and Applink), the Test_Status signal shall be 0x2 (Test ended) and shall be synchronized with In-vehicle HMI. The Start button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00074### Remote App HMI and In-vehicle HMI Test Completed Synchronization - commanded from Remote app HMI

When the Conduct Trailer Light Check function has completed via Remote App command (Cellular and Applink), the Test_Status signal shall be 0x1 (Test completed) and shall be synchronized with In-vehicle HMI. The Start button shall be displayed in both In-vehicle and Remote apps HMI screens.

###R_FNC_Trailer Light Check_00081### 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_00082### 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.

4.7.5.1.2 Error Handling

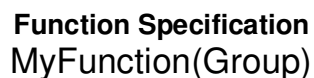
No Error Handling Requirements specified.

4.7.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.7.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.



4.7.5.4.1 Design Requirements

No Design Requirements specified.

4.8.1 Function Overview

4.8.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

- Trailer Light Check <<Feature>>

Executes Trailer Light Check sequence, providing luminance to exterior lights.

4.8.1.2 Function Variants

No Variants identified for Do Trailer Light Sequence

4.8.1.3 Assumptions

No assumptions specified for this function.

4.8.2 Function Scope

The – **“Do Trailer Light Sequence”** function is called by the following functions:

- – “Trailer Light Check”

4.8.2.1 Trailer Light Check

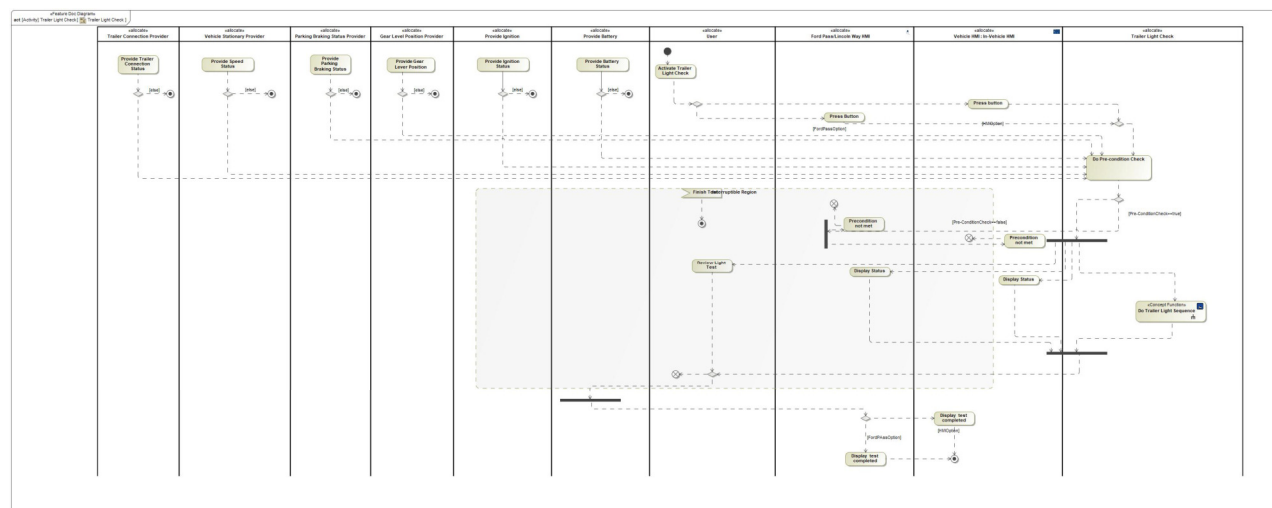




Figure 20: Activity Diagram of  “Trailer Light Check” calling  “Do Trailer Light Sequence”

4.8.3 Function Interfaces

4.8.3.1 Logical Inputs

No Logical Inputs specified.

4.8.3.2 Logical Outputs

No Logical Outputs specified.

4.8.3.3 Configuration Parameter

(No parameters have been defined)

4.8.4 Function Modeling

4.8.4.1 Use Cases

Use Case Name	Description
User requests on demand to activate/deactivate Trailer Light Check	Driver requests on demand to initiate Trailer Light Check

4.8.4.2 State Charts

No state chart associated to specified function.

4.8.4.3 Activity Diagrams



Function Specification MyFunction(Group)

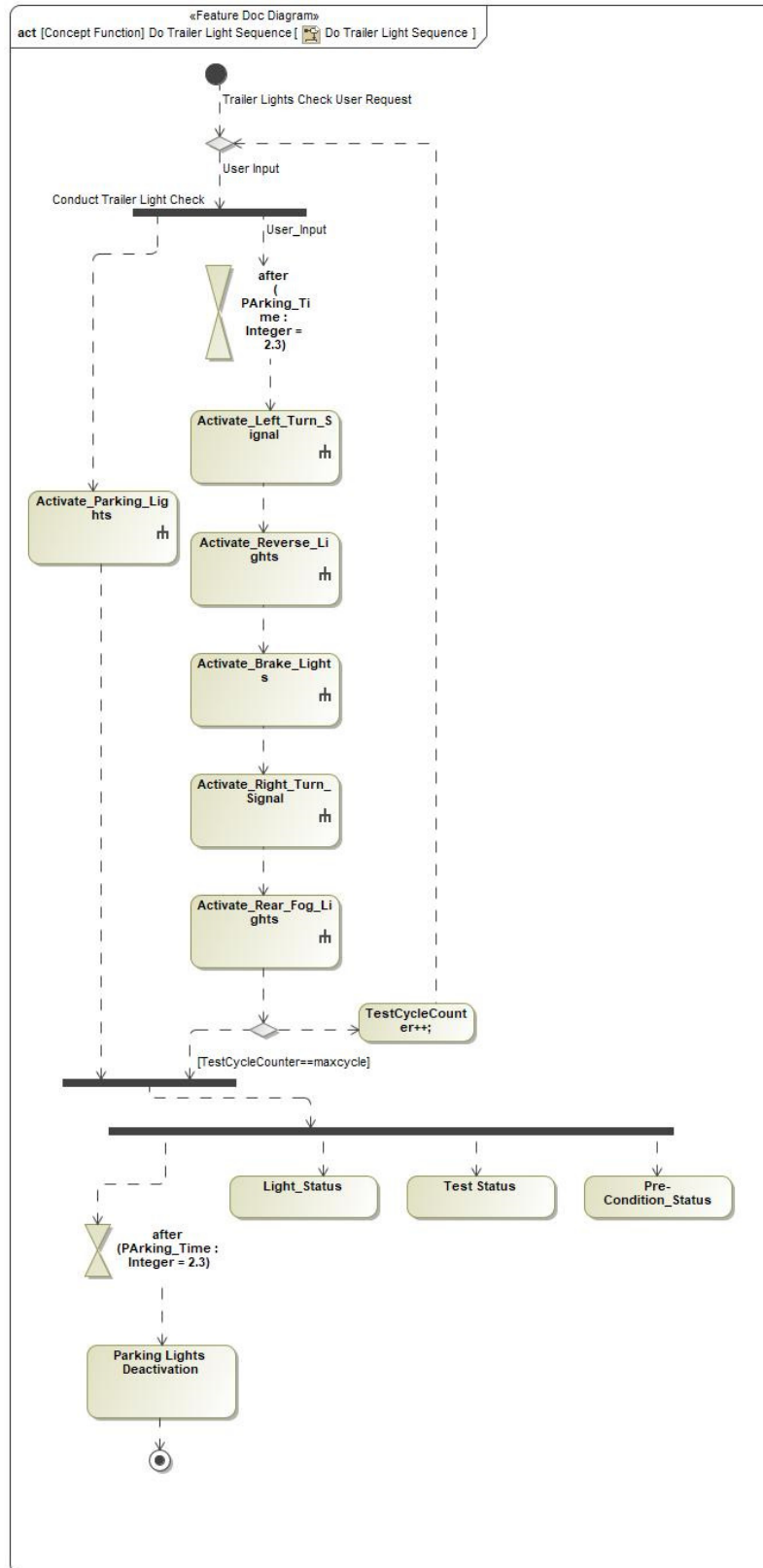


Figure 21: Do Trailer Light Sequence



4.8.4.4 Sequence Diagrams

No sequence diagram associated to specified function.

4.8.4.5 Decision Tables

No Decision Tables found in the Magicdraw model.

4.8.5 Function Requirements

4.8.5.1 Functional Requirements

4.8.5.1.1 Normal Operation

No Normal Operation Requirements specified.

4.8.5.1.2 Error Handling

No Error Handling Requirements specified.

4.8.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.8.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.8.5.4 Other Requirements

4.8.5.4.1 Design Requirements

No Design Requirements specified.




4.9 Logical Function Show Pre-condition Status

4.9.1 Function Overview

4.9.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  FordPass Logical <<Logical>>
-  HMI Logical <<Logical>>
-  Trailer Light Check Logical <<Logical>>



Function Specification MyFunction(Group)

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.


4.9.1.2 Function Variants



No Variants identified for Show Pre-condition Status

4.9.1.3 Assumptions

No assumptions specified for this function.

4.9.2 Function Scope

The  – “**Show Pre-condition Status**” function is called by the following functions:

-  – “[Do Pre-condition Check](#)”
-  – “[Functional Boundary Behavior](#)”

4.9.2.1 Do Pre-condition Check

No Diagrams found in Do Pre-condition Check

4.9.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.



Function Specification MyFunction(Group)

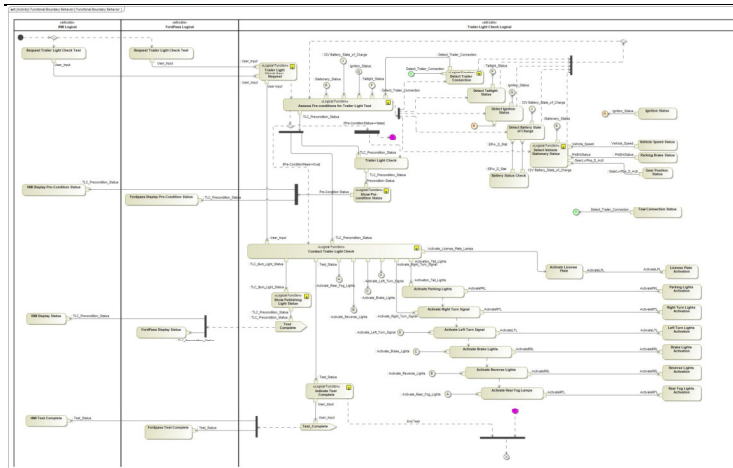





Figure 22: Activity Diagram of “Functional Boundary Behavior” calling “Show Pre-condition Status”

4.9.3 Function Interfaces

4.9.3.1 Logical Inputs

Signal Name	Description						
Precondition Status Type:  TLC Precondition Status	Type Description: This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Null 0x1 – Ignition_Not_On 0x2 – Taillight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected</td><td>0x0 – NULL</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Trailer Light Check	Data Type	Init Value		0x0 – Null 0x1 – Ignition_Not_On 0x2 – Taillight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected	0x0 – NULL	0x0
Data Type	Init Value						
0x0 – Null 0x1 – Ignition_Not_On 0x2 – Taillight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected	0x0 – NULL	0x0					

4.9.3.2 Logical Outputs

Signal Name	Description					
Pre-Condition Status Type:  TLC Precondition Status	<p>Type Description:</p> <p>This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature.</p> <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr></table>			Data Type	Init Value	
Data Type	Init Value					



Function Specification
MyFunction(Group)

			(missing s
	0x0 – Null 0x1 – Ignition_Not_On 0x2 – Tailight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected	0x0 – NULL	0x0 – NULL
	Sent to: <ul style="list-style-type: none"> <u>HMI Display Pre-Condition Status</u> <u>Fordpass Display Pre-Condition Status</u>		

4.9.3.3 Configuration Parameter

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.
Trailer Light Check Pre-Condition Signal	Determines which pre-condition signal the ECG should consider 0-TightTestPrecnd_D_Stat or 1-TightTestPrecnd_D2_Stat

4.9.4 Function Modeling

4.9.4.1 State Charts

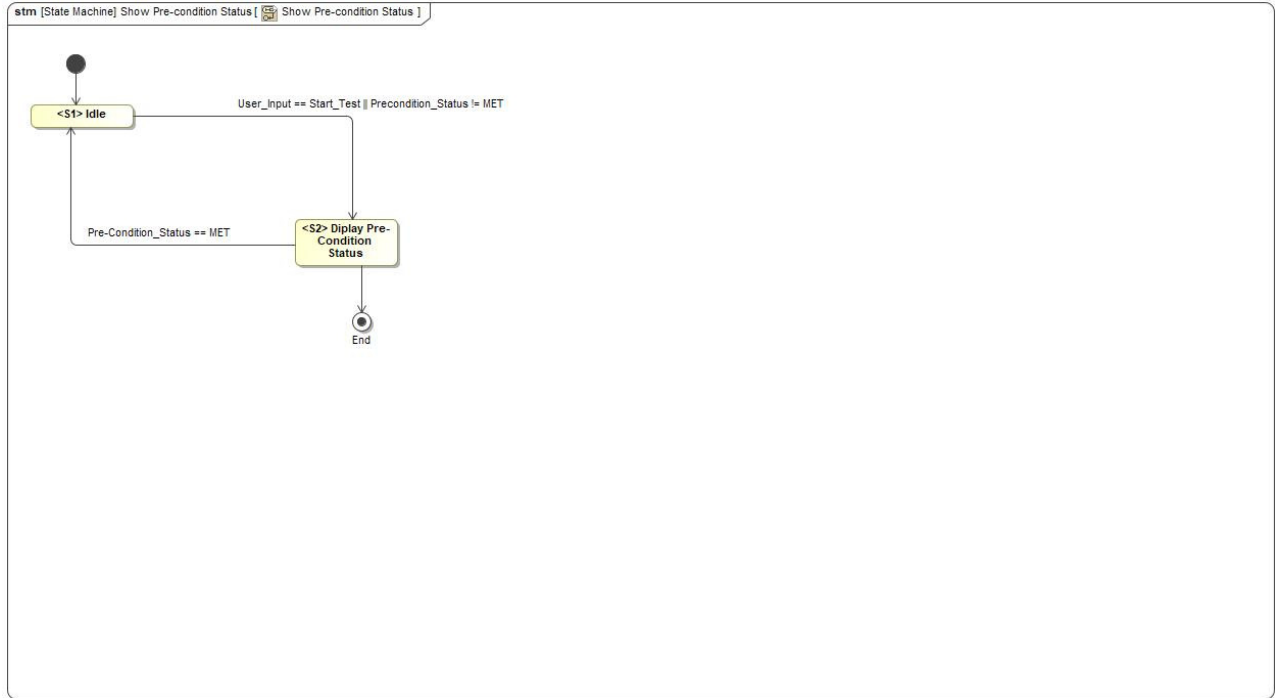


Figure 23: State Machine of Show Pre-condition Status



4.9.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.9.4.3 Sequence Diagrams

No sequence diagram associated to specified function.

4.9.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.

4.9.5 Function Requirements

4.9.5.1 Functional Requirements

4.9.5.1.1 Normal Operation

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

If TLC_Precondition_Status != Precondition_Ok 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:

- TLC_Precondition_Status = 0x1 (Ignition_Not_On): HMI shall state "Vehicle Must Be On - Light check stopped. To perform Trailer Light Check, vehicle must be on"
- TLC_Precondition_Status = 0x2 (Taillight_Active): HMI shall state "Taillamps Must Be Off - To perform Trailer Light Check, brake lamps, turn signals, hazard lamps and reversing lamps must be off"
- TLC_Precondition_Status = 0x3 (Start_Engine): HMI shall state "Engine Start Required - To perform Trailer Light Check, engine start is required"
- TLC_Precondition_Status = 0x5 (Other_Feature_Interaction): HMI shall state "To conduct Trailer Light Check, turn off other features that may interact with vehicle lighting"
- TLC_Precondition_Status = 0x6 (Not_Stationary): HMI shall state "Trailer Light Check Driver Restrictions - To perform Trailer Light Check, the vehicle must be in Park (P)" for AT vehicles or "Trailer Light Check Driver Restrictions - To perform Trailer Light Check, parking brake must be engaged." for MT vehicles.
- TLC_Precondition_Status = 0x7 (Trailer_Not_Connected): HMI shall state "Connect Trailer - To perform Trailer Light Check, make all electrical connections from trailer to the vehicle and verify the trailer lamps are functional"

4.9.5.1.2 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).

4.9.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.9.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.9.5.4 Other Requirements

4.9.5.4.1 Design Requirements

No Design Requirements specified.





4.10 Logical Function Assess Pre-conditions for Trailer Light Test

4.10.1 Function Overview

4.10.1.1 Function Description

Represents VSEM Dictionary Function:

Function is allocated to:

-  FN06 Asses Pre-conditions for trailer Light Check <<Logical>>
-  Trailer Light Check Logical <<Logical>>

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 = RUN, Engine Status = ON OR Engine Status = OFF AND 12v Battery SOC >= 75%, Vehicle Stationary Status = Stationary, Trailer connected, 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.

4.10.1.2 Function Variants



No Variants identified for Assess Pre-conditions for Trailer Light Test

4.10.1.3 Assumptions

No assumptions specified for this function.

4.10.2 Function Scope

The  – “Assess Pre-conditions for Trailer Light Test” function is called by the following functions:

-  – “[Do Pre-condition Check](#)”
-  – “[Functional Boundary Behavior](#)”

4.10.2.1 Do Pre-condition Check

No Diagrams found in Do Pre-condition Check

4.10.2.2 Functional Boundary Behavior

Description: Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.



Function Specification MyFunction(Group)

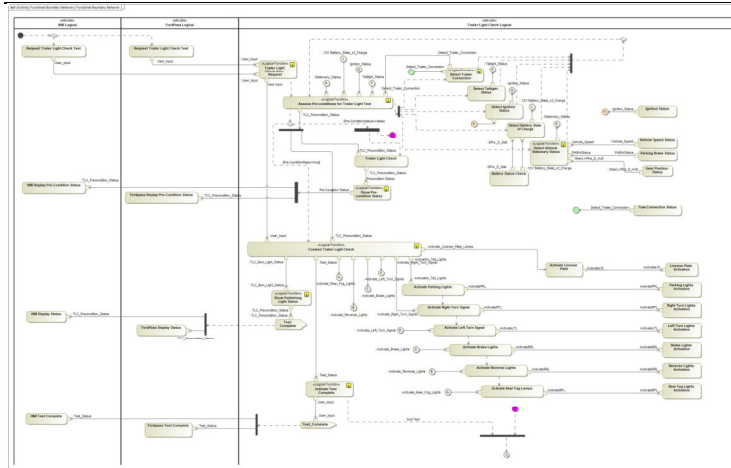







Figure 24: Activity Diagram of  “Functional Boundary Behavior” calling  “Assess Pre-conditions for Trailer Light Test”

4.10.3 Function Interfaces

4.10.3.1 Logical Inputs


Signal Name	Description						
Battery_State_of_Charge Type:  12V Battery State of Charge	Type Description: This logical signal indicates if the 12v battery state of charge is too low to perform the Trailer Light Check. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – Battery_SOC_Not_OK 0x1 – Battery_SOC_OK</td><td>0x0 – Battery_SOC_Not_OK</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Detect Battery State of Charge	Data Type	Init Value		0x0 – Battery_SOC_Not_OK 0x1 – Battery_SOC_OK	0x0 – Battery_SOC_Not_OK	0x0
Data Type	Init Value						
0x0 – Battery_SOC_Not_OK 0x1 – Battery_SOC_OK	0x0 – Battery_SOC_Not_OK	0x0					
Trailer_Connection Type:  Detect Trailer Connection	Type Description: This logical signal indicates if other features that affect exterior lighting are active or not. <table><tr><th>Data Type</th><th>Init Value</th><th></th></tr><tr><td>0x0 – No 0x1 – Yes</td><td>0x0</td><td>0x0</td></tr></table> Received from: <ul style="list-style-type: none"> Detect Trailer Connection	Data Type	Init Value		0x0 – No 0x1 – Yes	0x0	0x0
Data Type	Init Value						
0x0 – No 0x1 – Yes	0x0	0x0					
Ignition_Status Type:  Ignition Status	Type Description: This logical signal indicates the ignition status of the vehicle.						



Function Specification MyFunction(Group)

	Data Type	Init Value		Default Value (missing signal)
	0x0 - Unknown 0x1 - Off 0x2 - Accessory 0x4 - Run 0x8 - Start 0xF - Invalid			
	Received from: <ul style="list-style-type: none"> Detect Ignition Status			
Taillight_Status Type: Taillight_Status	Type Description: 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		
	0x0 – Taillights ON 0x1 – Taillights OFF	0x0 – Taillights ON	0x0	
	Received from: <ul style="list-style-type: none"> Detect Taillight Status			
Stationary_Status Type: Stationary_Status	Type Description: This logical signal indicates the stationary status of the vehicle			
	Data Type	Init Value		
	0x0 – Not Stationary 0x1 - Stationary	0x0 - Not Stationary	0x0	
	Received from: <ul style="list-style-type: none"> Detect Vehicle Stationary Status			

4.10.3.2 Logical Outputs

Signal Name	Description		
Pre-condition Status Type:  TLC Precondition Status	Type Description: This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature.		
	Data Type	Init Value	
	0x0 – Null 0x1 – Ignition_Not_On 0x2 – Taillight Active	0x0 – NULL	0x



Function Specification MyFunction(Group)

	0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected		
	Sent to: <ul style="list-style-type: none"> Trailer Light Check Conduct Trailer Light Check		

4.10.3.3 Configuration Parameter

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.
Trailer Light Check Pre-Condition Signal	Determines which pre-condition signal the ECG should consider 0-TightTestPrecnd_D_Stat or 1-TightTestPrecnd_D2_Stat

4.10.4 Function Modeling

4.10.4.1 State Charts



Figure 25: State Machine of Assess Pre-conditions for Trailer Light Test

4.10.4.2 Activity Diagrams

No activity diagram associated to specified function.

4.10.4.3 Sequence Diagrams



No sequence diagram associated to specified function.

4.10.4.4 Decision Tables

No Decision Tables found in the Magicdraw model.

4.10.5 Function Requirements

4.10.5.1 Functional Requirements

4.10.5.1.1 Normal Operation

###R_FNC_Trailer Light Check_00008### Pre-condition status signal with user input

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

###R_FNC_Trailer Light Check_00009### Pre-condition status changes signal

If TLC_Precondition_Status != 0x4 (Precondition_Ok) while conduct Trailer Light Check function is in progress, the function shall send TLC_Precondition_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)



Function Specification MyFunction(Group)

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 TLC_Precondition_Status shall publish values based on the logic mentioned in Table 2312 below:

Requirement#	Stationary_Status	Ignition_Status	Battery_State_of_Charge	ELPw_D_State	Taillight_Status	Feature_Interaction	Detect_Trailer_Connection	TLC_Precondition_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 (Precondition_Ok)
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 (Start_Engine)
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 (Taillight_Active)
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 (Other_Feature_Interaction)



Function Specification MyFunction(Group)

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_C onnected)
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Table 23 : TLC_Precondition_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_00078### 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.

4.10.5.1.2 Error Handling

###R_FNC_Trailer Light Check_00079### 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_00080### 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).

4.10.5.2 Non-Functional Requirements

No Non-Functional Requirements specified.

4.10.5.3 Functional Safety Requirements

No Functional Safety Requirements specified.

4.10.5.4 Other Requirements

4.10.5.4.1 Design Requirements



Function Specification MyFunction(Group)

No Design Requirements specified.



5 OPEN CONCERNS

ID	Concern Description	e-Tracker Reference	Status	Solution
	Modeling Action Item Example		Not Started	

Table 7: Open Concerns



6 REVISION HISTORY

Rev. (revision)	Date	Description	Approved by	Responsib le
FS1	2022-10-13	Variants per function will be added manually in the FGS.		gmorei16



7 APPENDIX

7.1 Data Dictionary

7.1.1 Logical Signals

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

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section

Table: Signal Details of 12V Battery_State_of_Charge

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		
ASIL	Choose an item.	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Activate_Brake_Lights

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		
ASIL	Choose an item.	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Activate_Left_Turn_Signal

Activate_License_Plate_Lamps



Function Specification MyFunction(Group)

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	

Data Type	Init Value	Default Value (missing signal)
0x0 – Off 0x1 – On	0x0	
ASIL		Choose an item.
Encoding Type Name		Refer to the following Section

Table: Signal Details of Activate_License_Plate_Lamps

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
ASIL		Choose an item.
Encoding Type Name		Refer to the following Section



Function Specification MyFunction(Group)

Table: Signal Details of Activate_Rear_Fog_Lights

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		
ASIL	Choose an item.	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Activate_Reverse_Lights

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		
ASIL	Choose an item.	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Activate_Right_Turn_Signal

Activation_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		
ASIL	Choose an item.	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Activation_Tail_Lights

Detect_Trailer_Connection

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



Function Specification MyFunction(Group)

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

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section

Table: Signal Details of Detect_Trailer_Connection

EIPw_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		
ASIL	Choose an item. A	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of EIPw_D_Stat

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
ASIL	Choose an item. A	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Feature_Interaction

GearLvrPos_D_Actl

This logical signal publishes the status of the PRNDL.

Data Type	Init Value	Default Value (missing signal)
0x0 Park 0x1 Reverse		



Function Specification MyFunction(Group)

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			
ASIL			Choose an item. A
Encoding Type Name			Refer to the following Section

Table: Signal Details of GearLvrPos_D_Actl

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			
ASIL			Choose an item. A
Encoding Type Name			Refer to the following Section

Table: Signal Details of Ignition_Status

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		

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section



Function Specification MyFunction(Group)

Table: Signal Details of PrkBrkStatus

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

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section

Table: Signal Details of Stationary_Status

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

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section

Table: Signal Details of Taillight_Status

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
ASIL	Choose an item. A	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Test_Status

TLC_Illum_Light_Status



Function Specification MyFunction(Group)

This logical signal indicates the light that is illuminated at present instant, when Trailer Light Check feature is in progress. Note: When publishing light status, lights other than parking lights shall take highest priority for this signal content since parking lights are illuminated throughout test.

Data Type	Init Value	Default Value (missing signal)
0x0 – Null (defaulted) 0x1 – Park_Light 0x2 – Right_Turn 0x3 – Left_Turn 0x4 – Stop_Light 0x5 – Reverse_Light 0x6 – All_Off 0x7 – Rearfog_Light	0x0 – Null	0x0 – Null
ASIL		Choose an item. A
Encoding Type Name		Refer to the following Section

Table: Signal Details of TLC_Illum_Light_Status

TLC_Precondition_Status

This logical signal contains information about a particular error or fault states while determining the preconditions for Trailer Light Check feature.

Data Type	Init Value	Default Value (missing signal)
0x0 – Null 0x1 – Ignition_Not_On 0x2 – Taillight_Active 0x3 – Start_Engine 0x4 – Precondition_Ok 0x5 – Other_Feature_Interaction 0x6 – Not_Stationary 0x7 – Trailer_Not_Connected	0x0 – NULL	0x0 – NULL
ASIL		Choose an item. A
Encoding Type Name		Refer to the following Section

Table: Signal Details of TLC_Precondition_Status

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)



Function Specification MyFunction(Group)

ASIL	Choose an item. A
Encoding Type Name	Refer to the following Section

Table: Signal Details of User_Input

Vehicle_Speed

This logical signal publishes the vehicle speed.

Data Type	Init Value	Default Value (missing signal)
0 to 655.35 KPH		
ASIL	Choose an item. A	
Encoding Type Name	Refer to the following Section	

Table: Signal Details of Vehicle_Speed

7.1.2 Logical Parameters

7.1.3 Encoding Types



Document ends here.