|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | | |  |
|  |  | | |  |
|  | Driver Selectable Idle (DSI)  <<Feature>>  (F000760 Automatic Engine Idle Shutdown (AEIS))  <<Function>>  (Fn013423 AEIS - Driver Selectable Idle - PCM Function) | | |  |
|  |  | | |  |
| Document Type | **Feature Document (FD)** | | |  |
| Template Version | **6.0b / FFSD 8.0** | | |  |
| SysML Report Template Version | **O (11/12/2019)** | | |  |
| Document ID | **dsi feature document\_v1.docx** | | |  |
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| Document Approval | | | | |
| Person | Role | | Email Confirmation | Date |
|  |  | |  |  |
|  |  | |  |  |

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# Introduction

## Document Purpose

A Feature Document (FD) document specifies **what** the feature shall do and how it shall behave from customer perspective. It should also provide reasoning and background **why** we have the feature in the vehicle.

The FD also serves as an Item Definition as defined by ISO26262 for those features, which follow the Ford Functional Safety process.

To get more information about the concept of feature, function and component level abstraction refer to the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features). For details on the Ford Functional Safety (ISO26262) process refer to the [Ford Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx).

## Document Scope

This Feature Document (FD) specifies the following features:

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature ID** | **Feature Name** | **Owner** | **Reference** |
| F000760 | Automatic Engine Idle Shutdown (AEIS) | CP Engelbrecht (cengelb5) | Incorporating Driver selectable idle system shutdown |

Table 1: Features described in this FD

## Document Audience

The FD is written by the feature owner of CP Engelbrecht (cengelb5). All Stakeholders, i.e., all people who have a valid interest in the feature should read and, if possible, review the FD. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FD.

**#Hint:** The FD template has the IP Classification “Proprietary” by default. IP Classification “Confidential” might be required in some cases, e.g. by Ford Functional Safety.

### Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to <Put VSEM Link here>.

**#Hint:** Refer to [Ford RE Wiki – Stakeholder List](http://wiki.ford.com/display/RequirementsEngineering/Stakeholder+Analysis) on how to create a stakeholder list. The stakeholder list should be stored in VSEM in the pseudo folder “General Data Artifacts” of the corresponding feature.

## Document Organization

### Document Context

Refer to the [Specification Structure page](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features) to understand how the FD relates to other Ford Requirements Documents and Specifications.

### Document Structure

The structure of this document is explained below:

**Section 1** – Introduction how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.

**Section 2** – Feature Description. States briefly the background and the purpose of the feature, feature variants and corresponding regions and markets. Also includes input requirements, assumptions and constraints.

**Section 3** – Feature Context describes all external entities, which have an influence on the feature.

**Section 4** – Feature Modeling. Contains Use Case, Driving Scenarios, State Charts to describe the functional behavior of the feature.

**Section 5** – Safety. Lists System Behaviors and Safety Goals of the feature.

**Section 6** – Feature Requirements. Lists functional and non-functional requirements of the feature.

**Section 7** – Architecture. Shows the coarse architecture, which the feature requirements are deployed to. Describes the elements and the boundary of the feature as well as the decomposition and distribution of associated functions.

**Section 8** – List of Open Concerns

**Section 9** – Document Change 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 10** – Appendix

**#Hint:** All sections are mandatory, unless explicitly marked by the tag “#Classification” as “optional” or as applicable e.g. to certain domains like “Functional Safety”.

## Document Conventions

### Requirements Templates

Each requirement, use case or scenario in this specification shall follow the corresponding template given in the document template *Specification\_Macros.dotm* at [RE Wiki - Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates?src=contextnavpagetreemode).

#### Identification of requirements

#### 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](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes?src=contextnavpagetreemode).

## References

### Ford Documents

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

| **Reference** | **Title** | **Doc. ID** | **Document Location** | **Revision** |
| --- | --- | --- | --- | --- |
| Ford GIS Standard | Ford GIS Standard |  |  |  |

Table 2: Ford internal Documents

### External Documents and Publications

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

**#Hint:** You may refer to [IEEE Citation Reference](http://www.ieee.org/documents/ieeecitationref.pdf) on how to format a reference.

| **Reference** | **Document / Publication** | **Document Location** |
| --- | --- | --- |
| IEEE Std 1012-2004 IEEE Standard for Software Verification and Validation |  |  |
| ISO/IEC 19500-2:2003 | Information technology -- Open Distributed Processing -- Part 2 |  |
| UML Testing Profile (UTP), v1.2 |  |  |
| Wikipedia |  |  |

Table 3: External documents and publications

## Glossary

**#Hint**: Terms, concepts and abbreviations used in the document shall be defined and illustrated here. Note that changes to terms and/or concepts described in this section tend to cause major updates to this document.

The tables below have feature specific definitions and abbreviations. For additional, non-feature specific terms please refer to the [RE Glossary](http://wiki.ford.com/display/RequirementsEngineering/Glossary?src=contextnavpagetreemode)

See **Error! Reference source not found.** for Definitions and Abbreviations.

### Parameters / Values

| **Name** | **Description** | **Range / Resolution** |
| --- | --- | --- |
|  |  |  |

Table 4: Parameters / Values used in this document *(Not supported by MagicDraw report generation)*

# Feature Overview

## Purpose and Description of Feature

**#Hint:** Some descriptive text to explain the purpose and functionality of the feature.

Driver Selectable Idle is a sub-feature of Automatic Engine Idle Shutdown (AEIS).

The purpose of the feature is to allow the driver to alter the vehicle’s maximum idle time. The vehicle will idle for that selected time (after driver makes a selection) and then shutdown, entering a non-motive mode and all accessories offline.

The times available will range from 1 minute to 30 minutes, in 1- or 5-minute increments depending on the application.

Optional functionality

1. Indefinite timer - The driver can also select (for some variants) and indefinite time where the powerpack will turn off only when fuel is low, battery depleted to a low level.
2. For Buttonless Start - DSI to manage normal shutdown vs timed shutdown
   1. Normal vehicle behaviour is to shutdown the vehicle systems when driver exits (with key) and closes the door
   2. Timer behaviour – driver selects a time before vehicle system shutsdown allowing the vehicle to remain on after the driver leaves the vehicle.

DSI Activate/Deactivate button – allows the driver to activate or deactivate the feature with the shutdown after the last selected time

In the context of AEIS/DSI, no "Intent to Drive" is defined as there being no driver interaction with the pedals and the drivetrain is disengaged.

Any usage of the term 'BCM' will be construed to mean or include any Control Module of similar functionality

Any usage of the term 'Engine' shall be construed to mean or include any relevant Powerpacks with regards to HEV/BEV Applications.

DCO delay shutdown feature: Driver Selectable Idle System (DSIS) 
When the vehicle is shifted to "Park" and the 
driver's seatbelt is removed, the interface above 
is offered to the user, either as a pop-up or 
(preferably) as a contextual tile on the 
centerstack screen. 
If the user does not interact with the DSIS 
the vehicle will shutdown after driver exit. 
HMI, 
If a user interacts with the previous screen, by selecting 
"set timer", the delayed shutdown settings menu 
(above) appears. Shutdown settings are latching from 
the previous feature use. 
The menu contains the options to delay the vehicle 
shutdown for up-to 30 minutes, in 5-minute increments, 
or set a shutdown delay until a HV battery low SOC 
threshold is reached (—20% state-of-charge). If a timer 
is set, the countdown begins at driver's door close. 
80f6 

Figure 1: Example Display (not representative of final implementation)

## Feature Variants

**#Hint:** Definitions for different variants of the feature (if applicable). Give each variant a descriptive name by which it can be referenced further on in the document. If no variant exists, state “No Feature Variants”.

The Variant Description should give a short informative text which describes the variants of the feature.

|  |  |  |
| --- | --- | --- |
| **Variant Name** | **Variant Description** | **Remarks** |
| **Keyless** | Standard 30minute Max Idle Timer for all pushbutton start vehicles | Applicable for all powerpacks |
| **Driver Selectable Idle for Fleet (Keyed/Keyless)** | Provides HMI for a 1 to 30 minute Idle Timer available to Fleet customers. | Applicable for all powerpacks for fleet vehicles (generally CV/Truck) |
| **Driver Selectable Idle for Buttonless Start** | Provides Buttonless Start vehicles HMI to extend the vehicle idle so the vehicle does not shutdown immediately when the driver exits with the key. | Applicable for BEV only |

Table 5: Feature Variants

### Regions & Markets

**#Hint:** Description of purpose and functionality of the feature. If there is no variant, give feature name in first column.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Market /**  **Region**  Variant Name | **North America** | **South America** | **Europe** | **Middle East/Africa** | **Asia / Pacific** | **China** |
| **All** | Mandatory | Mandatory | Mandatory | Mandatory | Mandatory | Mandatory |

Table 6: Regions & Markets

## Input Requirements

**#Hint:** List all input requirements, which are relevant for the feature. Typically, attribute requirements, legal requirements as well as national and international standards have to be considered.

### Legal Requirements

No Legal Requirements specified.

### Trustmark Requirements

* : Trustmark
  + RQT-031400-714303-Automatic Engine Idle Shutdown (AEIS) is a Primary (Trustmark) Requirement - Location in [FEDE](https://www.fedewb.ford.com/#/object-viewer?uid=xSY9LdkloPHwuB&tab=Overview)

### Industry Standards

* : ISO 26262
  + The system should be developed according to Ford's implementation of Functional Safety.

### Attribute Requirements

## Lessons Learned

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

**#Functional Safety:** In context of Functional Safety Lessons Learned and similar information will be used to check the completeness of the Functional Safety Goals and assumptions in the Hazard Analysis and Risk Assessment (HARA).

**#Link:** [Ford Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

1. Text used in the Vehicle Owner's Manual needs to be consistent
2. There have been issues with the method used for configuring the APIM, IPC and BCM to know that AEIS should be enabled. Each module being configured separately takes time and if one is configured incorrectly then AEIS will not work

## Assumptions

**#Classification**: Optional

**#Hint:** A list of known assumptions concerning the effects of the feature’s behaviour on other features or elements (i.e., dependencies) as well as assumptions on the behaviour expected by the feature (e.g. known limitations). During the course of the feature development most of those assumptions are typically either converted into actual requirements or discarded at some point – such that this chapter remains mostly empty. For assumptions, which are relevant for the Functional Safety process refer to chapter 6.2 “Safety Assumptions”

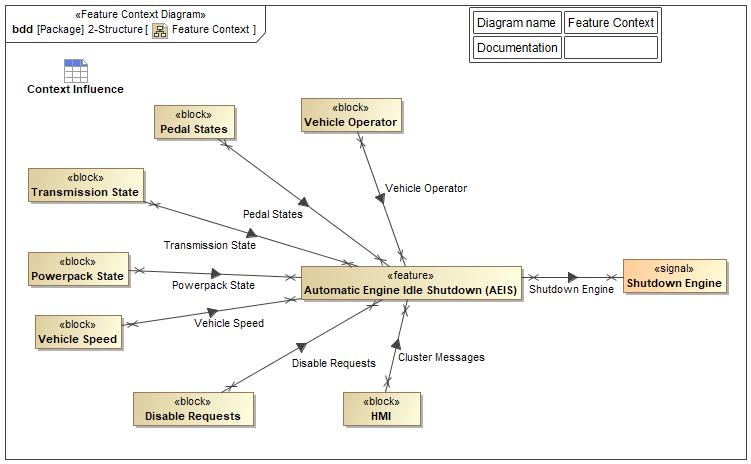
No Assumptions specified.

# Feature Context

## Feature Context Diagram

**#Hint:** High level diagram of feature interactions with the environment, people or other feature or other external entities.

**#Link:** [RE Wiki - Context Diagram](http://wiki.ford.com/pages/viewpage.action?pageId=107676234&src=contextnavpagetreemode)



Sutdown powerpack / vehicle

AEIS/ DSI feature

Figure 2: Feature Context

## List of Influences

|  |  |  |
| --- | --- | --- |
| **ID** | **External Entity** | **Influence Description** |
| Cluster Messages | HMI To Automatic Engine Idle Shutdown (AEIS) |  |
| Disable Requests | Disable Requests To Automatic Engine Idle Shutdown (AEIS) |  |
| Pedal States | Pedal States To Automatic Engine Idle Shutdown (AEIS) |  |
| Powerpack State | Powerpack State To Automatic Engine Idle Shutdown (AEIS) |  |
| Shutdown Engine | Automatic Engine Idle Shutdown (AEIS) To |  |
| Transmission State | Transmission State To Automatic Engine Idle Shutdown (AEIS) |  |
| Vehicle Operator | Vehicle Operator To Automatic Engine Idle Shutdown (AEIS) |  |
| Vehicle Speed | Vehicle Speed To Automatic Engine Idle Shutdown (AEIS) |  |

Table 7: List of Influences

# Feature Modeling

## Operation Modes and States

**#Classification:** Optional (Mandatory for Functional Safety)

**#Link:** [RE Wiki – State Charts](http://wiki.ford.com/display/RequirementsEngineering/State+Charts?src=contextnavpagetreemode)

**#Hint:** State Charts are a popular means to express feature behaviour in terms of states and modes. An advantage of this state machine like approach is that consistency can be easily verified.

Figure 3: Logical Operating Modes DSI

|  |  |  |
| --- | --- | --- |
| **State** | **Description** | **Requirements Reference** (optional) |
| AEIS Disabled | AEIS Feature has been disabled by any one of the disabling conditions. The Vehicle will NOT shutdown through AEIS. |  |
| AEIS Display shutdown message | Timer has reached shutdown time minus 30 seconds. signal sent to cluster to show shutdown message |  |
| AEIS Enabled | No disabling conditions are TRUE so AEIS timer is active and will shutdown the Engine when it reaches max count. |  |
| DSI Activated | User has selected a new maximum idle time, or chosen to delay vehicle powerdown |  |
| DSI Deactivated | DSI State has been deactivated by user or state conditions are no longer met |  |
| Run Mode | Vehicle is in a state where it can be driven.  This includes Engine On for vehicles with an engine and Drive Ready for HEV/BEVs |  |
| Vehicle Off | Vehicle is in an OFF state, where it cannot be driven. |  |

Table 8: Operation Modes and States on Logical Operating Modes DSI

|  |  |  |
| --- | --- | --- |
| **Transition ID** | **Description** | **Requirements Reference**  (optional) |
| T1 |  |  |
| T2 | Trigger signal: ACTIVATE\_DSI |  |
| T3 | Trigger signal: DEACTIVATE\_DSI |  |
| T4 | Trigger signal: AEIS\_SHUTDOWN\_COUNT |  |
| T5 |  |  |
| T6 | Trigger signal: Vehicle Start |  |
| T7 | Name: Engine Shutdown  Trigger signal: AEIS\_ENGINE\_SHUTDOWN |  |
| T8 | Trigger signal: AEIS\_RESETSHUTDOWN\_COUNTER |  |
| T9 |  |  |
| T10 | Guard: =  Trigger signal: AEIS\_FEATURE\_DISABLE |  |
| T11 | Trigger signal: AEIS\_RUNNING |  |

Table 9: Transitions between Operation Modes and States on Logical Operating Modes DSI

## Use Cases

**#Classification:** Optional

**#Link:** [RE Wiki – Use Cases](http://wiki.ford.com/display/RequirementsEngineering/Use+Cases+Overview?src=contextnavpagetreemodehttp://wiki.ford.com/display/RequirementsEngineering/Use+Cases?src=contextnavpagetreemode)

### Use Case Diagram

Diagram will be added in future version that can be generated from MagicDraw model

Figure 4: Feature Use Cases

### Actors

| **Actor** | **Description** |
| --- | --- |
| Driver | Actor description on Documentation field. |

Table 10: List of Actors

### Use Case Descriptions for Driver Selectable Idle

**#Classification:** Optional

UC14 Driver Selects a New Idle Time and Leaves the Vehicle

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
| **Triggers** | T1 | Driver selects a new Max Idle time on the HMI or enables DSI |
| **Main Flow Description** |  | The Max Idle time will change when the Driver selects a new time on the HMI |
| **Main Flow** | M1 | Idle Timer restarts from zero when selection is made |
|  | M2 | The Vehicle idles for the new requested time |
|  | M3 | After specified time elapses, message appears on cluster informing of impending shutdown |
|  | M4 | Driver takes no action within that specified time |
|  | M5 | Vehicle shutsdown |
| **Postconditions** | PostC1 | The Driver can restart the vehicle and engine restarts smoothly |

### Use Case Descriptions for DSI for Buttonless Start

**#Classification:** Optional

UC15 Vehicle enters an Idle state

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
| **Triggers** | T1 | Driver shifts to Park |
|  | T2 | Driver seatbelt is unbuckled |
| **Main Flow Description** |  | DSI options are shown when the vehicle enters an Idle state |
| **Main Flow** | M1 | DSI options appear on the HMI |
| **Postconditions** | PostC1 | The Driver can select to deactivate DSI through the HMI |
|  | PostC2 | Shifting out of Park hides the DSI options on the HMI |

UC16 Driver shows intent to drive after requesting extended Idle time

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
|  | PreC3 | Driver has selected a new Max Idle time on the HMI |
| **Triggers** | T1 | Driver presses Brake pedal or |
|  | T2 | Driver presses Accelerator pedal |
| **Main Flow Description** |  | DSI timer will be reset to zero when the driver shows intent to drive |
| **Main Flow** | M1 | DSI HMI transitions from an active state to an inactive state (time options greyed out) |
| **Postconditions** | PostC1 | The Driver can select to activate DSI through the HMI |

UC17 Driver does not choose extended Idle time when leaving the vehicle

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
|  | PreC3 | Driver has not selected a new Max Idle time on the HMI |
| **Triggers** | T1 |  |
| **Main Flow Description** |  | Vehicle will powerdown depending on key detection |
| **Main Flow** | M1 | Driver leaves vehicle with key |
|  | M2 | Driver door transitions to closed |
| **Alternate Flow 1** | A1 | Driver leaves vehicle with key |
|  | A2 | Driver door does not transition to closed |
|  | A3 | AEIS powersdown vehicle after timer expires |
| **Alternate Flow 2** | B1 | Driver leaves the vehicle without the key |
|  | B2 | Driver door can be either open or closed |
|  | B3 | AEIS powersdown vehicle after timer expires |
| **Postconditions** | PostC1 | Vehicle powers down |

UC18 Driver does not choose extended Idle time and remains in the vehicle

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
|  | DSI is not active |
| PreC2 | Engine is running |
| **Triggers** | T1 | Vehicle is stationary |
| **Main Flow Description** |  | Vehicle successfully powersdown after a specified time of no user interaction |
| **Main Flow** | M1 | Driver does not indicate any [intent to drive](#_Feature_Overview) (see Feature Overview) |
| M2 | After specified time elapses, message appears on cluster informing of impending shutdown |
| M3 | Driver takes no action within that specified time |
| M4 | Vehicle shutsdown |
| **Postconditions** | PostC1 | The Driver can restart the vehicle and engine restarts smoothly |

UC19 Driver chooses to activate an Indefinite extended idle time

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
|  | PreC3 | Vehicle SOC is above minimum threshold |
| **Triggers** | T1 | Driver selects an Unlimited/Indefinite Idle time on the HMI |
| **Main Flow Description** |  | The vehicle will idle indefinitely |
| **Main Flow** | M1 | Idle Timer is disabled when selection is made |
|  | M2 | The Vehicle idles while vehicle SOC is above minimum threshold |
|  | M3 | Vehicle does not powerdown |

UC20 Driver deactivates DSI after choosing an extended idle time

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
|  | PreC3 | Driver has selected a new Max Idle time on the HMI |
| **Main Flow Description** |  | DSI is deactivated when the Driver selects that option through the HMI |
| **Main Flow** | M1 | Driver selects the deactivate DSI option on the HMI |
| **Postconditions** | PostC1 | The Driver can select to activate DSI through the HMI |
|  | PostC2 | Vehicle will Powerdown under Primary Shutdown Method |

UC21 Driver overrides DSI shutdown with cluster message

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
| PreC3 | Driver has selected a new Max Idle time on the HMI |
| **Triggers** | T1 | Message appears on cluster informing of impending shutdown |
| **Main Flow Description** |  | DSI is deactivated when the Driver selects to override the pending shutdown on the cluster |
| **Main Flow** | M1 | Driver does not indicate any intent to drive |
|  |  | Driver chooses option to keep engine running |
|  |  | DSI HMI transitions from an active state to an inactive state (time options greyed out) |
|  |  | Vehicle remains powered on |
| **Postconditions** | PostC1 | The Driver can select to activate DSI through the HMI |
|  | PostC2 | Vehicle will powerdown |

UC22 Driver overrides AEIS shutdown with cluster message then leaves vehicle

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Engine is running |
| PreC3 | Vehicle is stationary |
| **Triggers** | T1 | Message appears on cluster informing of impending shutdown |
| **Main Flow Description** |  | Vehicle powersdown when the driver leaves with the key |
| **Main Flow** | M1 | Driver does not indicate any intent to drive |
| M2 | After specified time elapses, message appears on cluster informing of impending shutdown |
| M3 | Driver chooses option to keep engine running |
| M4 | Driver leaves the vehicle with the key as in Primary Shutdown Method |
|  |  | Vehicle Powersdown |

UC23 Driver overrides AEIS shutdown with cluster message then chooses extended idle time

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 | Vehicle is in an idle state |
| **Triggers** | T1 | Vehicle shutdown is imminent |
| **Main Flow Description** |  | Driver activates extended idle and Vehicle does not powersdown when the driver leaves with the key |
| **Main Flow** | M1 | Driver does not indicate any intent to drive |
| M2 | After specified time elapses, message appears on cluster informing of impending shutdown |
| M3 | Driver chooses option to keep engine running |
| M4 | Driver then chooses to extend idle as in “UC14 Driver Selects a New Idle Time and Leaves the Vehicle” |
|  |  | Driver leaves the vehicle with the key |
|  |  | Vehicle remains powered ON until specified time elapses |
|  |  | Vehicle Powersdown |

UC24 Driver enters vehicle but does not show intent to drive (ignition ON, Powerpack OFF)

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS/DSI is not disabled |
| PreC2 |  |
| **Triggers** | T1 | Driver enters the vehicle |
| **Main Flow Description** |  | DSI cannot be activated as Powerpack is off. Vehicle Powersdown on driver exit |
| **Main Flow** | M1 | Driver does not indicate any intent to drive |
| M2 | Vehicle non-motive systems are online |
| M3 | AEIS is not active so vehicle will not power down |
| M4 | Driver leaves the vehicle with the key |
| M5 | Vehicle Powersdown |

UC7 Driver Disables AEIS in Vehicle Settings

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| **Triggers** | T1 | Vehicle is on |
| **Main Flow Description** |  | Vehicle does not shutdown automatically for that keycycle |
| **Main Flow** | M1 | Driver navigates through vehicle settings and chooses to disable Feature |
| M2 | Driver does not leave vehicle with Key |
| M3 | Engine stays on |
| **Postconditions** | PostC1 | After a key cycle the Feature is automatically re-enabled |
|  | PostC2 | DSI is still available if conditions are met |
|  | PostC3 | If driver leaves vehicle with key the vehicle powersdown |

UC25 Leaving Remote Start mode after Driver Presence and AEIS Shutdown Occurs

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Remote Start has been activated |
|  | PreC3 | Vehicle is stationary |
| **Triggers** | T1 | Driver presses brake |
| **Main Flow Description** |  | Vehicle leaves Remote Start mode on brake press and shuts down after satisfying AEIS conditions |
| **Main Flow** | M1 | Driver had key/PAAK, car locked, driver outside vehicle; powerpack on, torque not available |
|  | M2 | Driver remains in vehicle |
|  | M3 | Driver closes door |
|  | M4 | After specified time elapses, message appears on cluster informing of impending shutdown |
|  | M5 | Driver takes no action within that specified time |
|  | M6 | Vehicle shutsdown |

UC26 Leaving Remote Start mode after Driver Enters Vehicle and AEIS Shutdown Occurs

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Powerpack is on /Engine is running with remote start |
| **Triggers** | PreC3 | Vehicle is stationary |
| **Triggers** | T1 | Driver closed door |
| **Main Flow Description** |  | Vehicle leaves Remote Start mode on door close with key detected and shuts down after satisfying AEIS conditions |
| **Main Flow** | M1 | Driver had key/PAAK, car locked, driver outside vehicle |
|  | M2 | Driver enters opens then close the door |
|  | M3 | Valid Key is detected |
|  | M4 | After specified time elapses, message appears on cluster informing of impending shutdown |
|  | M5 | Driver takes no action within that specified time |

UC27 Delayed Shutdown activated after an NFC Vehicle Start

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Powerpack is on /Engine is running with remote start |
|  | PreC3 | Vehicle is stationary and in Park |
| **Triggers** | T1 | Driver had started the vehicle with NFC, no PAAK, vehicle in motive mode |
| **Main Flow Description** |  | Driver activates DSI after an NFC Vehicle Start and vehicle shutsdown after specified time |
| **Main Flow** | M1 | Driver unfastens seat belt |
|  | M2 | Driver selects a new Max Idle time on the HMI or enables DSI |
|  | M3 | Idle Timer restarts from zero when selection is made |
|  | M4 | Driver opens door |
|  | M5 | Driver leaves vehicle with or without the NFC card |
|  | M6 | Driver closes door |
|  | M7 | The Vehicle idles for the new requested time |
|  | M8 | After specified time elapses, message appears on cluster informing of impending shutdown |
|  | M9 | Driver is not present to override shutdown |
|  | M10 | Vehicle shutsdown |

UC28 Delayed Shutdown not activated after an NFC Vehicle Start

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Powerpack is on /Engine is running with remote start |
|  | PreC3 | Vehicle is stationary and in Park |
| **Triggers** | T1 | Driver had started the vehicle with NFC, no PAAK, vehicle in motive mode |
| **Main Flow Description** |  | Driver leaves vehicle after an NFC Vehicle Start and vehicle shutsdown immediately |
| **Main Flow** | M1 |  |
|  | M2 | Driver unfastens seat belt |
|  | M3 | Driver does not select a time on HMI |
|  | M4 | Driver opens door |
|  | M5 | Driver leaves vehicle with or without the NFC card |
|  | M6 | Driver closes door |
|  | M7 | Vehicle shuts down |

### Use Case Descriptions

**#Classification:** Optional

These use cases are carry-over use cases from the base AEIS feature.

UC2 Driver Requests Remote Start

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | Vehicle is stationary |
| **Triggers** | T1 | Vehicle is started Remotely |
| **Main Flow Description** |  | Vehicle successfully shutsdown after a specified time of no user interaction |
| **Main Flow** | M1 | Vehicle is left unattended for specified time |
| M2 | Vehicle shutsdown |

UC5 Vehicle Enters Secure Idle Mode

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Vehicle is not configured for buttonless start |
| PreC3 | Engine is running |
| PreC4 | Vehicle is stationary |
| **Triggers** | T1 | Driver Leaves Vehicle Idling |
| **Main Flow Description** |  | Vehicle successfully shutsdown after a specified time of no user interaction |
| **Main Flow** | M1 | Driver leaves the vehicle and locks the doors |
| M2 | After specified time elapses, message appears on cluster informing of impending shutdown |
| M3 | Vehicle shutsdown |

UC7 Driver Disables Feature in Vehicle Settings

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| **Triggers** | T1 | Vehicle is on |
| **Main Flow Description** |  | Vehicle does not shutdown automatically for that keycycle |
| **Main Flow** | M1 | Driver navigates through vehicle settings and chooses to disable Feature |
| M2 | Engine stays on |
| **Postconditions** | PostC1 | After a key cycle the Feature is automatically re-enabled |

UC8 Driver Shows Intent to Drive

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Engine is running |
| PreC3 | Vehicle is stationary |
| **Triggers** | T1 | Driver presses Brake pedal or |
| T2 | Driver presses Clutch pedal or |
| T3 | Driver presses Accelerator pedal or |
| T4 | Driver puts transmission in Drive |
| **Main Flow Description** |  | Vehicle does not shutdown automatically while Intent to Drive is being shown |
| **Main Flow** | M1 | Driver shows intent to drive |
| M2 | Engine stays on |

UC9 Driver is Driving the Vehicle

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** |  |  |
| **Triggers** | T1 | Vehicle Speed is above "Stationary" limit |
| **Main Flow Description** |  | Vehicle does not shutdown automatically while in motion |
| **Main Flow** | M1 | Engine stays on |

UC12 System Disables Feature

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Engine is running |
| **Triggers** | T1 | Input Signal Fault is Detected |
| T2 | DPF Regen Requested or |
| **Main Flow Description** |  | Vehicle does not shutdown automatically while in Particulate Filter Regen is active  or  an Input Signal Fault is detected |
| **Main Flow** | M1 | Engine stays on |

UC13 Interfacing Feature Disables Idle Shutdown

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  |  |
| **Preconditions** | PreC1 | AEIS is not disabled |
| PreC2 | Engine is running |
| **Triggers** | PreC3 | Vehicle is stationary |
| **Triggers** | T1 | Feature Disable Request is Activated |
| **Main Flow Description** |  | Vehicle does not shutdown automatically while Disable Request is active |
| **Main Flow** | M1 | Engine stays on |

## Driving and Operation Scenarios

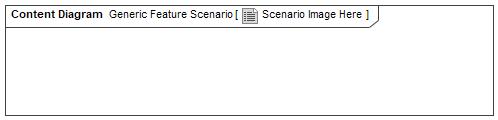
**#Classification:** Optional (Mandatory for Functional Safety)

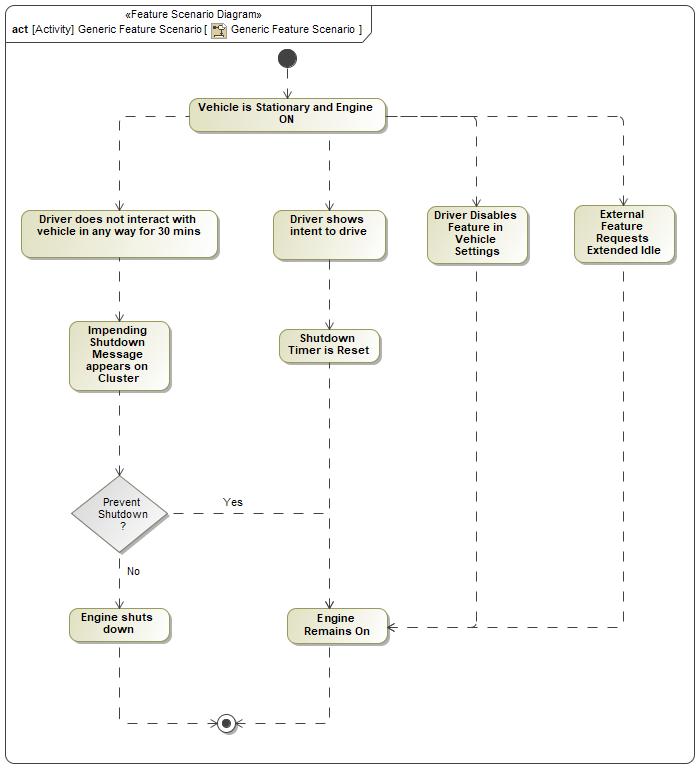
**#Functional Safety:** Driving and operating scenarios which impact the functionality of the feature can be used to check, if the situation analysis in the HARA is complete

**#Link:** [RE Wiki – Driving Scenarios](http://wiki.ford.com/display/RequirementsEngineering/Driving+Scenarios?src=contextnavpagetreemode)

Generic Feature Scenario

Description of the scenario in the Documentation field on the Feature Scenario Diagram.





|  |  |
| --- | --- |
| **Flow of Actions** | |
| 1 | Vehicle is Stationary and Engine ON |
| 2 | Driver shows intent to drive |
| 3 | Shutdown Timer is Reset |
| 4 | Engine Remains On |
| 5 | Driver does not interact with vehicle in any way for 30 mins |
| 6 | Impending Shutdown Message appears on Cluster |
| 7 | External Feature Requests Extended Idle |
| 8 | Driver Disables Feature in Vehicle Settings |

## Decision Tables

**#Classification:** Optional

**#Link:** [RE Wiki – Decision Tables](http://wiki.ford.com/display/RequirementsEngineering/Decision+Table).

**#Hint:** Use decision table, if behavior is not state based (in that case prefer state chart from ch. 4.1) and based purely on current inputs.

*Not supported by MagicDraw report generation.*

# Feature Requirements

**#Functional Safety:** In general, safety requirements are not listed here. However, it is possible that later in the development process, a non-safety requirement becomes a safety requirement. In such a case it may remain on this list.

**#Link:** [RE Wiki – How to write good requirements](http://wiki.ford.com/display/RequirementsEngineering/How+to+write+better+requirements?src=contextnavpagetreemode).

## DSI Functional Requirements

REQ-397064/A Auto Engine Idle Shutdown (AEIS)

a) The Feature shall detect an extended idle condition and automatically shutdown the powerpack after a calibratable time (up to 3600 seconds).

b) The feature shall notify the Driver Information Display 30 seconds before automatic shutdown will occur.

c) The ‘BCM’ shall be continuously notified when the automatic shutdown has completed.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397064/A | | | | | | | |
| **Rationale** | To automatically shutdown the engine when it is left running unattended to save fuel. | | | | | | |
| **Acceptance Criteria** | Powerpack has successfully shutdown | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** |  |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397756/A Key type enablement of AEIS

The System shall detect if the key type is Push Button/Passive Start and the Feature shall be enabled.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397756/A | | | | | | | |
| **Rationale** | To not execute the feature if the vehicle key configuration is not the type calibrated to use AEIS. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** |  |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397757/A Shutoff Electrical Loads

The ‘BCM’ shall power down the vehicle electrical systems after the Feature has shutdown the powerpack.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397757/A | | | | | | | |
| **Rationale** | To shutoff the vehicle power when AEIS shuts off the powerpack to save the battery charge. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** |  |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397758/A Determine shutdown entry conditions

The Feature shall be enabled when no "Driver Presence" and no "Intent to Drive" conditions are met.

This is defined as there being no Pedal Inputs, Transmission is in Park/Neutral, Ignition is “ON”, and Vehicle is stationary. When these conditions are not met, the Feature shall be disabled.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397758/A | | | | | | | |
| **Rationale** | To determine when the vehicle is stationary and inferred to be unintended. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397759/A Initialize AEIS feature

The Feature shall initialize after powerpack start, shall not inhibit powerpack start and the shutdown timer shall be reset to zero.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397759/A | | | | | | | |
| **Rationale** | To schedule when the AEIS feature shall be initialized | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397761/A Inhibit AEIS due to input fault

The Feature shall be inhibited when any of the following inputs are faulted.

Brake Pedal Position, Clutch Pedal Position, Accelerator Pedal Position, Vehicle Speed, Transmission Shift Lever.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397761/A | | | | | | | |
| **Rationale** | It allows the feature to be disabled in the event of an input fault which would prevent the feature from operating reliably. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397762/A Inhibit AEIS when DPF Regen is active

The Feature will be inhibited when DPF service regeneration is running in order to prevent interrupting the DPF regeneration.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397762/A | | | | | | | |
| **Rationale** | To prevent interrupting the DPF regeneration | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | ICE | | | **Priority** |  | **Status** | Approved |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397763/A Start AEIS feature

The Feature shall be enabled when the power pack status indicates the vehicle is only in ‘Run Mode’.

‘Run Mode’ includes engine pull up/pull down events, Stop/Start and BEV.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397763/A | | | | | | | |
| **Rationale** | To actively monitor the entry conditions for the AEIS feature once the powerpack is running. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397764/A Shutdown timer mode

The Feature shall increment a timer in seconds starting from zero while all enable conditions are met.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397764/A | | | | | | | |
| **Rationale** | To start to track the time since the vehicle has met the stationary and unattended requirements. This is the start of the automatic engine idle shutdown process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397765/A Request Powerpack Shutdown

The Feature shall request an automatic powerpack shutdown when the timer exceeds the calibratable shutdown time.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397765/A | | | | | | | |
| **Rationale** | To indicate to other engine features that an powerpack shutdown shall occur when the allowed unattended idle time is reached. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397766/A Track shutdown time

The shutdown time shall be tracked in seconds. It shall start/initialize at zero and increment when the feature entry conditions are met.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397766/A | | | | | | | |
| **Rationale** | To track the time that the AEIS shutdown entry conditions have been met. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397767/B Timer reset

The timer shall reset to the initialization value of zero when the Feature is initialized, temporarily disabled, permanently disabled, or enable conditions are no longer met.

The timer shall reset when the Feature receives a new idle time request from the vehicle operator.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397767/A | | | | | | | |
| **Rationale** | To clear the shutdown conditions. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397768/A Shutdown Powerpack

The powerpack shall shutdown when the AEIS feature requests a shutdown. The shutdown shall be conducted in the same manner as a customer key-off and shall require a key cycle to restart. When the powerpack shutdown is complete a signal must be sent to indicate the powerpack was shutdown. The CAN communication must continue a calibratable time after the powerpack shutdown to notify the ‘BCM’ (typically 60 seconds).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397768/A | | | | | | | |
| **Rationale** | To coordinate the automatic powerpack shutdown sequence of shutting down the powerpack, blocking an powerpack restart until key is cycled, notifying AEIS that the powerpack shutdown is complete (powerpack has turned off), and keeping the powerpack control unit CAN communication "awake" to notify other modules that the shutdown occurred. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397769/A Start blocking

The Feature shall request the starter motor control to block a crank event, forcing a key cycle to restart the engine after an AEIS requested shutdown.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397769/A | | | | | | | |
| **Rationale** | To prevent the customer from re-cranking the engine after an automatic engine idle shutdown which might prevent some engine features from initializing as intended. This will force the customer to cycle the key off then back to the run/crank position. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | ICE | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397770/A Send Shutdown State

The Feature shall send a continuous CAN message to the Driver Information Display and ‘BCM’ indicating whether the feature is in the following states:

“normal operation” - The Feature is disabled or more than 30 seconds away from shutting down.

“initiated countdown” - 30 seconds before and until shutdown.

“engine shutdown” - The powerpack has successfully shutdown.

“delay shutdown active” - the vehicle operator does not want the vehicle to powerdown immediately once they leave

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397770/A | | | | | | | |
| **Rationale** | To encode the AEIS operating states into the necessary CAN communication signals to the cluster and body control module / load shed device. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397771/A Inhibit AEIS for OSC Channel

The Feature shall be inhibited when the AEIS OSC channel is active.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397771/A | | | | | | | |
| **Rationale** | Allow a technician to perform maintenance that requires a vehicle to idle longer than the AEIS shutdown time | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

~~REQ-397772/A Inhibit AEIS for Eco Inhibit~~

~~The Feature shall be inhibited when Eco Inhibit is active.~~

~~(see Eco Inhibit requirements for details)~~

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ~~Requirement ID: REQ-397772/A~~ | | | | | | | |
| **~~Rationale~~** | ~~EcoInhibit disables various eco-related functions such as Stop/Start, SRC and AEIS.~~  ~~Eco Inhibit is typically enabled on commercial vehicles, such as an ambulance, that require uninterrupted engine idle.~~ | | | | | | |
| **~~Acceptance Criteria~~** |  | | | | | | |
| **~~Notes~~** |  | | | | | | |
| **~~Source~~** |  | | | | | **~~Owner~~** |  |
| **~~Source Req.~~** |  | | | | | **~~V&V Method~~** |  |
| **~~Type~~** |  | | | **~~Priority~~** |  | **~~Status~~** | ~~In-Progress~~ |
| [~~Req. Template~~](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) ~~Version~~ | | ~~6.0~~ | ~~End of Requirement~~ | | | | |

REQ-397773/A Inhibit AEIS for Pro Power Onboard

The Feature shall be inhibited when the user requests extended vehicle idling while the Pro Power Onboard (PPO) feature is active.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397773/A | | | | | | | |
| **Rationale** | High power mode may be used for long periods of time when the vehicle is parked. It is undesirable for AEIS to interrupt PttB by shutting down the vehicle after 30 minutes.  This is a convenience feature. The customer must push a button to enable “High Power Mode”, which inhibits AEIS and provides uninterrupted use of PttB. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397775/A AEIS configuration mis-match DTC

The System shall ensure that the Driver Information Display is correctly configured for AEIS.

If the CAN signal from the Driver Information Display says the feature is disabled at start up and it is keyless, then a DTC shall be set.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397775/A | | | | | | | |
| **Rationale** | This ensures that a mis-configured IPC will not disable AEIS on a keyless vehicle. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397776/A Write DID information

The Feature shall require a DID to track the following information:

• The number of times the Feature has shutdown the vehicle over its lifetime.

• The number of times the Timer increments

• The mileage in kilometers since the last AEIS shutdown event.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397776/A | | | | | | | |
| **Rationale** | To write information that gives a technician the ability to determine if an AEIS initiated shutdown occurred so they can explain to the customer when a powerpack was shutdown. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397777/A Inhibit AEIS for Power Take Off

The Feature shall be inhibited when the Power Take Off (PTO) feature is active.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397777/A | | | | | | | |
| **Rationale** | PTO may be used for long periods of time when the vehicle is parked. It is undesirable for AEIS to interrupt PTO by shutting down the vehicle after 30 minutes. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397780/A AEIS Permanant Disable

The Feature shall be able to be disabled permanently during production based on program agreement through the use of an MFAL code.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397780/A | | | | | | | |
| **Rationale** | To allow certain vehicles such as emergency vehicles to have AEIS permanantly disabled. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397777/A Inhibit AEIS for interfacing feature

The Feature shall be inhibited when certain features are active and require the vehicle to idle for extended periods of time.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397777/A | | | | | | | |
| **Rationale** | Features such as PTO or PPO may be used for long periods of time when the vehicle is parked. It is undesirable for AEIS to interrupt them by shutting down the vehicle after the max idle time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

### Error Handling

No Error Handling Requirements specified.

## Non-Functional Requirements

***#Hint:*** *Non-functional requirements specify some performance criteria in addition to the functional behavior given defined by the functional requirements. Timing (if not already included in the functional requirements), security details (e.g. how secure does an algorithm have to be) reliability (e.g. mean time between failure) or maintainability could be specified in this section.*

### Safety

**#Hint:** Only those safety requirements, which are not related to Functional Safety (ISO26262) should go here. For Functional Safety refer to chapter 6 “Functional Safety”.

*Not supported by MagicDraw report generation.*

### Security

No Security Requirements specified.

### Reliability

No Reliability Requirements specified.

## HMI Requirements

**#Hint:** Requirements in this section could specify details of e.g. the icons, the GUI or the sounds.

REQ-397755/A Display Shutdown Message

The Driver Information Display shall display a message to the driver 30 seconds before automatic shutdown will occur. The shutdown message shall give the driver the option to prevent the shutdown and disable the Feature (for that key cycle) through use of a “Driver Information Display Acknowledgement”.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397755/A | | | | | | | |
| **Rationale** | To notify the customer when a shutdown will occur and allow the customer to override the feature. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397760/A Disable AEIS feature through Vehicle Settings

The vehicle operator shall have the capability to disable the Feature for the key cycle using the vehicle settings in the Driver Information Display.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397760/A | | | | | | | |
| **Rationale** | To prevent the AEIS feature from turning off the powerpack when the customer or technician has a reason for leaving the vehicle running unattended. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Non-buttonless | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397778/A AEIS Autoconfiguration

The Feature shall inform the Driver Information Display by CAN signal of the vehicle configuration type for it to automatically set the correct message configurations.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397778/A | | | | | | | |
| **Rationale** | This allows the Driver Information Display to choose the appropriate display messages for the vehicle type e.g. keytype/fleet | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-397779/A Determine user messages

The Driver Information Display shall determine the correct message configuration for AEIS based on a received CAN signal.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the Driver Information Display to choose the appropriate display messages for the vehicle type | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

## Driver Selectable Idle Requirements

**#Hint:** Requirements in this section could specify details of e.g. the icons, the GUI or the sounds.

REQ-000001/A Driver Selectable Idle Time HMI

The Driver Information Display shall allow the vehicle operator to change the vehicle’s Max Idle time.

When the vehicle operator selects a new idle time, the Driver Information Display shall send this information to the PCM.

When the HMI sends a new idle time, the inhibit AEIS CAN signal shall be reset to no inhibit.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the Vehicle Operator to choose a new maximum idle time | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-000002/A Driver Selectable Idle Time HMI Autoconfigure

When the Driver Information Display receives a valid value from the module storing the vehicle configuration, it shall determine the correct display configuration in conjunction with “REQ-397779/A Determine user messages”.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the Driver Information Display to choose the appropriate display for the vehicle type | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-000003/A DSI - Receive New Selected Time

The PCM shall receive the vehicle operator requested idle time information from the HMI.

The Feature shall update the max idle time when it receives a new request from the HMI.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the Vehicle Operator to choose a new maximum idle time | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-000004/A DSI - Current Selected Time

The Feature shall inform the HMI what idle time it should display as being selected.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the Vehicle Operator to choose a new maximum idle time | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Common | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

## DSI Requirements for Fleet Idle Shutdown

**#Hint:** Requirements in this section could specify details of e.g. the icons, the GUI or the sounds.

REQ-000005/A Driver Selectable Idle Shutdown for Fleet

The vehicle operator shall not be able to disable the Feature through the HMI for Fleet applications.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This prevents Fleet Vehicle Operators from disabling the Feature and potentially wasting fuel. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** | Non-buttonlss | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

## DSI Requirements for Buttonless Start

REQ-000006/A DSI HMI Menu- buttonless

The HMI shall display the DSI menu under the following conditions:

* Vehicle is in Park
* Seatbelt is unbuckled.

REQ-000007/A Driver Selectable Idle Time- buttonless

When the DSI menu is displayed, the vehicle operator shall be able to keep the vehicle systems ON after leaving with the key, by selecting a time they would like the vehicle to remain ON for.

REQ-000008/A DSI Indefinite Idle Time - buttonless

The vehicle operator shall be able to select an Indefinite Idle Time on the Driver Information Display.

REQ-000009/A AEIS and DSI - buttonless

AEIS shall run normally while Driver Selectable Idle is not active and all other feature preconditions are met.

REQ-0000010/A Deactivate DSI - buttonless

The vehicle operator shall be able to deactivate DSI through the HMI.

When the vehicle is no longer in Park, DSI shall be deactivated.

REQ-0000011/A DSI States - buttonless

The PCM shall inform the BCM of the state of the Feature.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the BCM to know if the vehicle operator wishes the vehicle to shutdown immediately (on door close and no key detected) or keep the vehicle systems ON. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

REQ-0000012/A DSI and Driver Exit Vehicle Shutdown - buttonless

While DSI is active, the BCM shall not powerdown the vehicle as it would for a Primary Vehicle Powerdown scenario.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: REQ-397779/A | | | | | | | |
| **Rationale** | This allows the vehicle to to remain powered on after the driver exits the vehicle with the key. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** | If seatbelt remains buckled, then normal AEIS will shutdown the vehicle after 30mins | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | In-Progress |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0 | End of Requirement | | | | |

## Other Requirements

### Design Requirements

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

*Not supported by MagicDraw report generation.*

### Manufacturing Requirements

No Manufacturing Requirements specified.

### Service Requirements

**#Hint:** Requirements in this section could specify, e.g. what needs to be considered, if individual ECUs are replaced or new SW is flashed to ECUs (parameter set in non-volatile memory might get inconsistent and needs also to be updated).

No Service Requirements specified.

### After Sales Requirements

**#Hint:** Requirements in this section could specify, e.g. input for the Owner’s Manual could be gathered.

No After Sales Requirements specified.

### Process Requirements

**#Hint**: Requirements in this section are relevant for the development process of the feature, e.g. ISO26262 compliance.

No Process Requirements specified.

# Functional Safety

**#Classification**: Functional Safety only

**#Hint:** This section is dedicated to the Ford Functional Safety (ISO26262) process. For details of this process refer **#Link:** [Ford Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

**#Contact:** [*RE Wiki Roles & Responsibilities page – Role: Application Functional Safety Engineer*](http://wiki.ford.com/display/RequirementsEngineering/Default+Contacts+for+Stakeholder+Roles#ApplicationFunctionalSafetyEngineer)

## System Behaviours for HARA

**#Classification**: Functional Safety only

**#Hint:** List of selected system behaviours is an input to the Hazard Analysis and Risk Assessment (HARA). There needs to be a rationale why other system behaviours / functions are not considered.

|  |  |
| --- | --- |
| **ID** | **Name** |
|  | Disable AEIS for the key cycle |
|  | Keep powerpack running |
|  | Powerpack shutdown upon satisfying AEIS condition |

Table 11: System Behaviours for HARA

## Safety Assumptions

**#Hint:** Copy the assumptions from the document "FFSD 02 Hazard Analysis and Risk Assessment”, Tab. “2 - Assumptions” with “Ref/ID”, “Name”, “Category”, “Description”, “Purpose”. In this document, additionally a reference to the requirement ID is inserted.

**#Link:** [Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx) – HARA

|  |  |  |
| --- | --- | --- |
| ID | Assumption | |
|  | **Name** | The user controls vehicle power up |
| **Description** | Powering on the vehicle through 3rd party means such as after-market remote start, over-the-air software updates, or remote park assist is excluded from the scope of this analysis. |
| **Purpose** |  |
| **Category** | Other Systems |
| **Related Requirement IDs** |  |
|  | **Name** | Ignition button failures |
| **Description** | Unintended start or shutdown due to E/E failures of the ignition button are excluded from the scope of this analysis. |
| **Purpose** |  |
| **Category** | Other Systems |
| **Related Requirement IDs** |  |

Table 12: Functional Safety Assumptions

## Safety Goals

**#Classification**: Functional Safety only

**#Hint:** The list of Functional Safety Goals is an output of the Hazard Analysis and Risk Assessment (HARA) and therefore not required during the initial creation of the Feature Document.

**#Link:** [Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx) – HARA

No Safety Goal specified.

## Functional Safety Requirements

**#Classification**: Functional Safety only

**#Hint:** The section lists the Functional Safety Requirements (FSRs) derived from

* a Safety Goal (list in subsections 6.4.1 and following)

in this case each FSR should trace back to a safety goal in ch. 6.3

* and Assumptions (list in subsection 6.4.2).

in this case each FSR should trace back to an assumption in ch. 6.2.

In section 6.5**Error! Reference source not found.** “ASIL Decomposition of Functional Safety Requirements” the initial FSRs from chapters 6.4.1 to 6.4.2 may be decomposed, if required.

**#Link:** [Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx) – Functional Safety Concept

[RE Wiki - Requirements Attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes)

**#Classification**: Functional Safety only

**#Hint:** The section lists the Functional Safety Requirements (FSRs) derived from a Safety Goal and Assumptions.

The following should be noted for the use of the attribute fields for FSRs

- The “Source Req” trace link field in each FSR should have a reference to

- a safety goal in ch. 6.3 “Safety Goals” or

- an assumption in ch. 6.2 “Safety Assumptions”

**#Link:** [Functional Safety SharePoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx) – Functional Safety Concept

[RE Wiki - Requirements Attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes)

No Safety Goal specified.

### Derivation of Functional Safety Requirements on Assumptions

**#Classification**: Functional Safety only

**#Hint:** Derive requirements from the Assumptions (refer to section “Safety Assumptions”

No Functional Safety Requirements tracing to Assumptions specified.

## ASIL Decomposition of Functional Safety Requirements

***#Classification:*** *Functional Safety Only*

***#Hint:*** *For ASIL D features additional measures like a requirements decomposition might be required. Fill out the following table for each ASIL D decomposition applied in the feature. The decomposition rationale is the reason why the decomposition was performed, whereas the rationale for each requirement expresses the reason and thought behind that particular requirement and should include how the requirement is able to independently fulfil the needs of the parent requirement.*

***#Link:***[*Functional Safety SharePoint*](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx) *- Functional Safety Concept*

No Functional Safety Requirements with ASIL Decompositions specified.

# Cybersecurity

**#Classification**: Cybersecurity only – leave a statement “Not Applicable” otherwise and remove subchapters.

## Security Goals

**#Hint:** The list of Cybersecurity Goals are an output of the Threat Model. The CAL attribute is not used yet.

**#Link:** [Alignment with Cybersecurity](http://wiki.ford.com/display/RequirementsEngineering/Alignment+with+Cybersecurity) – RE Wiki

|  |  |  |
| --- | --- | --- |
| ID | Goal | |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |

Table 13: Cybersecurity Goals

## Cybersecurity Requirements

**#Hint:** Cybersecurity requirements derived from the Cybersecurity Goals. Those requirements should be granular enough to be satisfied by a single Logical Function in the Functional Architecture.

**#Link:** [Alignment with Cybersecurity](http://wiki.ford.com/display/RequirementsEngineering/Alignment+with+Cybersecurity) – RE Wiki

**#Macro:** [Add Ins -> Add Requirement macro](https://wiki.ford.com/pages/viewpage.action?pageId=174654231) (select “**Requirement**” as type)

# Architecture

## Functional Decomposition

**#Hint:** Techniques like Activity Diagrams, Data Flow or Function Tree Diagrams help the feature owner to analyze the behavior of the feature. The goal of functional decomposition is to gain a complete understanding of the desired functionality, independent of technological solutions. The Feature Owner may group the requirements in chapter “Feature Requirements” according to the functions derived from this decomposition. The Feature Owner may take the Functional Architecture for related features (if it exists) into consideration for this decomposition. This would ease cascading of feature requirements later on. Since feature requirements are input requirements for the Logical Functions, it helps, if the feature requirements are grouped by functions when cascaded to Logical Functions of the Functional Architecture.

**#Link:**

* [Stages - RE Model the Functional Analysis](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_4KsyQPmOkqGMg85u0m-tig))
* [SysML – Activity Diagrams](https://azureford.sharepoint.com/sites/SystemsEngineering/SEC/sysml-teamsite/SysML%20Wiki/Activity%20Diagram%20Basics.aspx)

**#Classification:** Mandatory for Functional Safety – otherwise optional

**#Hint**: This section depicts the coarse Functional Architecture. This architectural step is needed to find the right functional partitioning for the function level. The function shown here are those, which are specified on function level. Either SysML activity diagrams or Data Flow Diagrams could be used to depict such a Functional Architecture. For bigger features, which are decomposed in a hierarchical manner down to atomic functions (and which do not follow the Functional Safety process), a function tree could be given here.

**#Links:**

* Functional Decomposition: [RE Wiki – Functional Decomposition](http://wiki.ford.com/display/RequirementsEngineering/Functional+Decomposition)
* SysML - Activity Diagrams or [RE Wiki - Data Flow Diagrams](http://wiki.ford.com/display/RequirementsEngineering/Data+Flow+Diagram?src=contextnavpagetreemodehttp://wiki.ford.com/display/RequirementsEngineering/Data+Flow+Diagram?src=contextnavpagetreemode)
* Data Flow Diagram: [RE Wiki – Data Flow Diagram](http://wiki.ford.com/display/RequirementsEngineering/Functional+Decomposition)

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

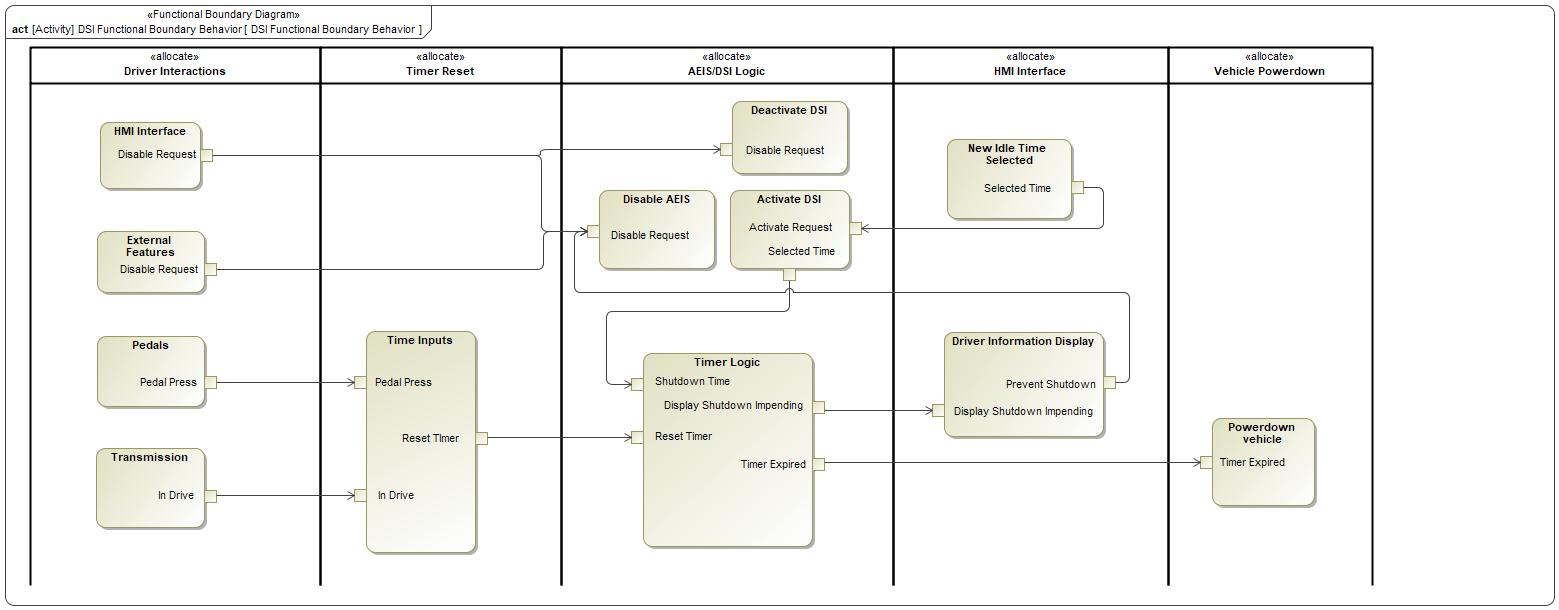


Figure 5: DSI Functional Boundary Behaviour

### List of Functions

**#Hint:** The functions shown in the Functional Architecture should be listed and described in the table below

| **Function Name** | Description | Comments |
| --- | --- | --- |
| *(action)* Activate DSI | *(action)* The Feature has been activated by the driver choosing a new idle time on the HMI |  |
| *(action)* Deactivate DSI | *(action)* The Feature has been disabled either by the driver or enable conditions are no longer met |  |
| *(action)* Disable AEIS | *(action)* The Feature has been disabled either by the driver or by another feature that requires extended idling |  |
| *(action)* Driver Information Display | *(action)* Displays a message to the driver warching of an impending engine shutdown, providing the option to prevent the shutdown and disable the Feature for the rest of the keycycle |  |
| *(action)* External Features | *(action)* There are other features that require extended idling so are able to request AEIS to be disabled |  |
| *(action)* HMI Interface | *(action)* The Driver can disable AEIS through the vehicle settings |  |
| *(action)* New Idle Time Selected | *(action)* The Driver has selected a new idle time on the HMI |  |
| *(action)* Pedals | *(action)* Any pedal interaction resets the AEIS Timer - effectively disabling the feature  When none of the pedals are being pressed then the timer will increment |  |
| *(action)* Powerdown vehicle | *(action)* The engine will be shutdown after the timer expires |  |
| *(action)* Time Inputs |  |  |
| *(action)* Timer Logic | *(action)* The main Feature Logic.  The Timer will count up to a specified value, display an impending shutdown message and then shutdown the engine |  |
| *(action)* Transmission | *(action)* The transmission must be Park or Neutral or the timer will be reset |  |

Table 14: List of Functions

## Logical Architecture

**#Classification:** Functional Safety Analysis only

**#Hint:** FS Analysis requires a description of the boundary of the feature and its elements. A simple block diagram or a SysML Internal Block Diagram could be used to depict the Logical Architecture

***#Link:*** [*Ford Functional Safety SharePoint*](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

Description of diagram and content on logical architecture in Documentation field of Structural Boundary Diagram.



Figure 6: Logical Boundary Diagram

### Logical Elements

**#Hint:** Lists the elements of the Logical Architecture and the functions from the Functional Architecture, which are allocated to those elements.

No Logical Elements specified.

### Logical Interfaces

**#Hint:** Describe the interactions of the feature with other features or elements.

**#Classification:** Functional Safety only

**#Hint:** Describe (or reference):

* the logical boundary (if known)
* the elements/components/subsystems within the boundary of the item/feature.
* The interaction of features with other features or elements

The logical boundary of the item/feature can be described by using a boundary diagram, block diagram, etc. The elements of the feature can also be based on other technology.

**#Link:** [Ford Functional Safety Sharepoint](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

Shutdown time

Figure 7: Logical Boundary Diagram

### Logical Elements

**#Hint:** Lists the elements of the Logical Architecture and the functions from the Functional Architecture, which are allocated to those elements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Element Name** | **Description** | **Allocated Functions** | **Comments** |
| e.g. Active Tilt Controller | … | e.g. Control Value |  |
|  |  |  |  |
|  |  |  |  |

Table 15: Logical Elements

### Logical Interfaces

**#Hint:** Describe the interactions of the feature with other features or elements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Interface Name** | **Direction** | **Description** | **Value Range** |
| e.g. Vehicle tilt angle | e.g. Tilt angle sensor to ATC | … | e.g. -45deg to +45deg |
|  |  |  |  |
|  |  |  |  |

Table 16: Logical Interfaces

# Traceability Matrix

**#Hint:** The traceability matrix is ideally generated from a Requirement Management tool (e.g. VSEM RM) once the specification is imported to the tool and all trace links are drawn in the tool.

**#Link:** Refer to “Backward Traceability” at [Stages – RE Traceabilty Record](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/artifact/_ZbIhsK4EkzaN49uPh7SLuQ))

# Open Concerns

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

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

Table 17: Open Concerns

# Revision History

| Revision | | Date | | Description | | Approved by | | Responsible |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | | 31 Mar 2021 | | Initial version | | PBRAITH1 | | CENGELB5 |
|  | |  | |  | |  | |  |
| 6 | 1b | | 2020-25-11 | | * Reference to process definition in Stages added to “How to Use” section on cover sheet. User hints removed from “Document Purpose” chapter. * RE-Wiki links mostly replaced by Stages links, links to Functional Safety Sharepoint updated | | Jbaden1 | |

# Appendix

## DSI Functional Matrix – steady state

<https://azureford.sharepoint.com/sites/Systems-And-SW-Int/Starting/Starting%20feature/1.%20Feature%20Documents/Buttonless%20start/DSI_States_V1.xlsx?d=wd35ea275432e463fb23a5e7a8e17375e>

Document ends here.