

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – Frunk Softswitch**

**Interface Client v2**

**Infotainment Subsystem Part Specific Specification (SPSS)**

Version 1.0

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**FORD CONFIDENTIALF**

**Revision History**

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|  |  |  |  |

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# Overview

The Frunk Softswitch feature allows a customer to:

* request an open/close/pause if the Frunk is Automatic/Powered
* view the ajar status of the Frunk

This second variant (v2) of the Frunk Softswitch SPSS is applicable to those programs whose release module does not support feature precondition evaluation and the accompanying restriction signal for use by the HMI (ex. P702 BEV). For this variant, the display module is required to evaluate all preconditions internally to enable/disable this feature’s HMI.

## Terminology and Abbreviations

|  |  |
| --- | --- |
| **Abbreviation** | **Description** |
| CAN | Controller Area Network |
| DID | Data Identifier |
| FHCM | Front Hatch Control Module |
| BCM | Body Control Module |

|  |  |
| --- | --- |
| **Term** | **Description** |
| Frunk | Front trunk |
|  |  |
|  |  |

# Architectural Design

## FKSSv2-CLD-REQ-372050/A-Frunk Softswitch Interface Client

The Frunk Softswitch Interface Client (FKSSInterfaceClient) is responsible for the tasks listed below:

* Providing a user interface for the Frunk Softswitch feature
* Transmitting user input to FKSSServer1
* Managing feature restricted status
* Displaying active feature state on user interface

Please review the implementation guide/block diagram to locate the FKSSInterfaceClient class.

## FKSS-CLD-REQ-323814/B-Frunk Softswitch Server1

The Frunk Softswitch Server1 (FKSSServer1) is responsible for the tasks listed below:

* Receiving user request from FKSSInterfaceClient
* Transmitting request to FKSSServer2

Please review the implementation guide/block diagram to locate the FKSSServer1 class.

## FKSSv2-CLD-REQ-372051/A-Frunk Softswitch Server2

The Frunk Softswitch Server2 (FKSSServer2) is responsible for the tasks listed below:

* Receiving release request from FKSSServer1
* Releasing the Frunk

Please review the implementation guide/block diagram to locate the FKSSServer2 class.

## Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the Frunk Softswitch feature can be mapped into physical modules. This mapping is an example only and does not necessarily carryover to other carlines or vehicle architectures.

|  |  |
| --- | --- |
| **Logical Class** | **Physical Module (ECU)** |
| FKSSInterfaceClient | SYNC |
| FKSSServer1 | BCM |
| FKSSServer2 | FHCM |

## FKSSInterfaceClient Interface

### FKSSv2-IIR-REQ-372052/A-FKSSInterfaceClient\_Tx

#### MD-REQ-328279/A-FrunkReleaseCounter\_Rq

Message Type: Request

This signal is used to request a release of the Frunk. This signal increments by 1 everytime it is sent to request a release.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Type | - | - | Unit: SED  Resolution: 1  Offset: 0 |
|  | Initial Value | 0x0 | Reserved for transmitter reset |
|  | Code Value | 0x1 To 0x6 |  |
|  | Not Used | 0x7 |  |

### FKSSv2-IIR-REQ-372053/A-FKSSInterfaceClient\_Rx

#### MD-REQ-027149/A-IgnitionStatus\_St (TcSE ROIN-225464-1)

Message Type: Status

Signal used to indicate ignition state.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Type | - | - | Indicates ignition state |
|  | Unknown | 0x0 |  |
|  | Off | 0x1 |  |
|  | Accessory | 0x2 |  |
|  | Run | 0x4 |  |
|  | Start | 0x8 |  |
|  | Invalid | 0xF |  |

#### MD-REQ-201601/A-Delay\_Accy

Message Type: Status

This signal is used indicate whether Delayed Accessory is active or not.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Type | - | - | Status of delayed accessory |
|  | Off | 0x00 |  |
|  | On | 0x01 |  |

#### MD-REQ-014025/A-VehicleSpeed\_St (TcSE ROIN-223023-1)

Message Type: Status

Status used to indicate vehicle speed.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Type | - | - | Indicates vehicle speed.  Unit: kph  Resolution:0.01  Offset:0 |
|  | kph | 0x0 to 0xFFFF |  |

#### MD-REQ-014023/A-GearLvrPos\_D\_Actl (TcSE ROIN-266648-1)

Message Type: Status

Vehicle status signal for the Gear Lever Position on an automatic transmission vehicle.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| Type | - | - | - |
|  | Park | 0x0 |  |
|  | Reverse | 0x1 |  |
|  | Neutral | 0x2 |  |
|  | Drive | 0x3 |  |
|  | Sport\_DriveSport | 0x4 |  |
|  | Low | 0x5 |  |
|  | First | 0x6 |  |
|  | Second | 0x7 |  |
|  | Third | 0x8 |  |
|  | Fourth | 0x9 |  |
|  | Fifth | 0xA |  |
|  | Sixth | 0xB |  |
|  | Undefined\_Treat\_as\_Fault | 0xC |  |
|  | Undefined\_Treat\_as\_Fault1 | 0xD |  |
|  | Unknown\_Position | 0xE |  |
|  | Fault | 0xF |  |

#### MD-REQ-297763/A-HoodStatus

Message Type: Status

This method is indicating the vehicle hood status.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| HoodStatus | - | - |  |
|  | Closed | 0x0 |  |
|  | Ajar | 0x1 |  |

# General Requirements

## FKSS-REQ-372054/A-Powermode Conditions

The FKSSInterfaceClient shall only allow the functionality of this feature when:

* IgnitionStatus\_St = Run, Start, or Acc and the touch screen display is On, OR
* IgnitionStatus\_St = Off and Delay\_Accy = On and the touch screen display is On

## FKSS-REQ-372055/A-Feature Configuration

The FKSSInterfaceClient shall have configurable parameters to determine whether the vehicle supports the Frunk Softswitch feature and which specific variant.

* All of the functionality and signals defined in this SPSS shall be supported if the parameters indicate that:
  + The Frunk Softswitch feature is Enabled, AND
  + The Frunk Restricted Determination is Internal
* None of the functionality defined in this SPSS shall be supported if the parameters indicate that:
  + The Frunk Softswitch feature is Enabled, AND
  + The Frunk Restricted Determination is External
    - (see original Frunk Softswitch SPSS in this case)

OR

* + The Frunk Softswitch feature is Disabled

## FKSS-REQ-372067/A-Speed Restriction Configuration

The FKSSInterfaceClient shall have a configurable parameter to set the vehicle speed threshold by which the Frunk Softswitch menu shall be made available/unavailable. The default shall be 3kph.

# Functional Definition

## FKSS-FUN-REQ-372056/A-Power Frunk Softswitch

### Use Cases

#### FKSS-UC-REQ-372069/A-User selects Open Power Frunk Softswitch on FKSSInterfaceClient (switch enabled)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Powermode Conditions are met  FKSSInterfaceClient is ON  Frunk Softswitch Button is Enabled  Power Frunk is Closed |
| **Scenario Description** | The user selects the Frunk softswitch on the FKSSInterfaceClient |
| **Post-conditions** | The FKSSServer2 begins to open the Power Frunk  FKSSInterfaceClient displays the Frunk as Opened |
| **List of Exception Use Cases** |  |
| **Interfaces** | FKSSInterfaceClient  CAN, G-HMI |

#### FKSS-UC-REQ-372070/A-User selects Close Power Frunk Softswitch on FKSSInterfaceClient (switch enabled)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Powermode Conditions are met  FKSSInterfaceClient is ON  Frunk Softswitch Button is Enabled  Power Frunk is Open |
| **Scenario Description** | The user selects the Frunk softswitch on the FKSSInterfaceClient |
| **Post-conditions** | The FKSSServer2 begins to close the Power Frunk  FKSSInterfaceClient displays the Frunk as Opened until it fully closes. When closed, the FKSSInterfaceClient displays the Frunk as Closed. |
| **List of Exception Use Cases** |  |
| **Interfaces** | FKSSInterfaceClient  CAN, G-HMI |

#### FKSS-UC-REQ-372071/A-User selects Power Frunk Softswitch on FKSSInterfaceClient while Frunk in motion (switch enabled)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Powermode Conditions are met  FKSSInterfaceClient is ON  Frunk Softswitch Button is Enabled  Power Frunk is in motion (opening/closing) |
| **Scenario Description** | The user selects the Frunk softswitch on the FKSSInterfaceClient |
| **Post-conditions** | The FKSSServer2 stops/pauses Power Frunk operation/motion  FKSSInterfaceClient displays the Frunk as Opened |
| **List of Exception Use Cases** |  |
| **Interfaces** | FKSSInterfaceClient  CAN, G-HMI |

#### FKSS-UC-REQ-372072/A-User selects Power Frunk Softswitch on FKSSInterfaceClient (switch disabled)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Powermode Conditions are met  FKSSInterfaceClient is ON  Frunk Softswitch Button is Disabled |
| **Scenario Description** | The user selects the Frunk softswitch on the FKSSInterfaceClient |
| **Post-conditions** | The FKSSInterfaceClient indicates that the operation cannot be performed at this time |
| **List of Exception Use Cases** |  |
| **Interfaces** | FKSSInterfaceClient  CAN, G-HMI |

### Requirements

#### FKSS-REQ-372057/A-Frunk Release - Interface Client Request

When the Frunk Release is selected by the user via HMI, the FKSSInterfaceClient shall increment the event counter FrunkReleaseCounter\_Rq by a value of 1.

When FrunkReleaseCounter\_Rq reaches a count value of 6, the next increment shall reset the counter to a value of 1. The count value of 0 is reserved, and shall not be used in the increment operation of this counter.

#### Event Counter Requirements

##### FKSS-REQ-372058/A-Initial Value

When the FKSSInterfaceClient resets, it shall initialize and publish FrunkReleaseCounter\_Rq = 0.

Immediately following a reset, the FKSSInterfaceClient shall monitor for events that will cause FrunkReleaseCounter\_Rq to increment.

The FKSSInterfaceClient shall continue to publish 0 until an event causes FrunkReleaseCounter\_Rq to increment.

##### FKSS-REQ-372059/A-Valid Events

For a count event to be deemed valid, the FKSSInterfaceClient must first detect a “non-button press” before an actual “press.” Only then shall the FKSSInterfaceClient increment FrunkReleaseCounter\_Rq.

When powering back On from a reset, the FKSSInterfaceClient shall not increment FrunkReleaseCounter\_Rq if the first value it reads for the corresponding button is a “pressed” value. This is to avoid any possible “stuck button” error conditions.

Ex. If the interface is a manual switch that is pressed/not pressed, the module shall ensure that the switch is first not pressed, and then when it sees a pressed event, it shall increment the counter.

##### FKSS-REQ-372060/A-Voltage Range

The FKSSInterfaceClient shall not increment FrunkReleaseCounter\_Rq when voltage is out of range, even if an incrementing event occurs (refer to Ford Next Generation Infotainment Engineering Spec\_VerX\_SYNC4 for voltage requirements).

##### FKSS-REQ-372061/A-Bus Wakeup

The FKSSInterfaceClient shall wake CAN whenever FrunkReleaseCounter\_Rq has changed.

##### FKSS-REQ-372062/A-Bus Sleep Voting

The FKSSInterfaceClient is allowed to vote for CAN Sleep 5 seconds after the last FrunkReleaseCounter\_Rq change, independent of the FNOS wakeup strategy.

##### FKSS-REQ-372063/A-Value Retention

The FKSSInterfaceClient shall retain the last transmitted value of FrunkReleaseCounter\_Rq through sleep/wake cycle.

#### FKSS-REQ-372064/A-Frunk Release - User Input

The FKSSInterfaceClient shall provide a user interface (button/graphic) to allow selection of the Frunk Softswitch release button.

#### FKSS-REQ-372065/A-Frunk Release - User Input Enable/Disable

The FKSSInterfaceClient shall enable/disable (show/hide, grey-out, etc.) the Frunk Softswitch user interface (button/graphic) based on the following:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IgnitionStatus\_St** | **Delay\_Accy** | **VehicleSpeed\_St** | **GearLvrPos\_D\_Actl** | **Frunk Softswitch User Interface** |
| OFF | ON | Less than threshold in REQ-372067 | D/C | Enabled |
| RUN, START or ACC | D/C | Less than threshold in REQ-372067 | D/C | Enabled |
| RUN, START or ACC | D/C | Greater than threshold in REQ-372067 | D/C | Disabled |
| RUN, START or ACC | D/C | D/C | Park | Enabled |
| RUN, START or ACC | D/C | D/C | != Park | Disabled |
| != OFF, RUN, START or ACC | D/C | D/C | D/C | Disabled |

\*D/C – Don’t Care

#### FKSS-REQ-372066/A-Frunk Ajar Status

The FKSSInterfaceClient shall display a graphic indicating the ajar (open/close) status of the Frunk. The graphic shall be shown as such:

* When HoodStatus = “(0x0) Closed” the Frunk shall be shown as Closed
* When HoodStatus = “(0x1) Ajar” the Frunk shall be shown as Opened
  + If HoodStatus is not available on the bus or cannot be read, the Frunk shall be shown as Closed

### White Box View

#### Activity Diagrams

##### FKSS-ACT-REQ-372074/A-User Selects Power Frunk Softswitch On FKSSInterfaceClient

Activity Diagram



#### Sequence Diagrams

##### FKSS-SD-REQ-372076/A-User Selects Power Frunk Softswitch On FKSSInterfaceClient

Constraints

Pre-Condition

Powermode Conditions are met

FKSSInterfaceClient is ON

Frunk Softswitch is Enabled

Power Frunk is Closed

Scenarios

Normal Usage

The user selects the Frunk softswitch on the FKSSInterfaceClient

Post-Condition

The FKSSServer2 begins to open the Power Frunk

Sequence Diagram



# Appendix: Reference Documents

|  |  |
| --- | --- |
| Reference # | Document Title |
| 1 | Infotainment Diagnostics Specification APIM Gen 4 |
| 2 | Ford Next Generation Infotainment Engineering Spec\_VerX\_SYNC4 |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| 11 |  |
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