

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – Steering Horizon Controller**

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

Version 1.1

**UNCONTROLLED COPY IF PRINTED**

**Version Date: November 18, 2022**

**FORD CONFIDENTIALF**

**Revision History**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Version** | **Notes** | | |
| **July 27, 2022** | **1.0** | **Initial Release** |  | |
|  |  |  | |  |
| **November 18, 2022** | **1.1** |  | | |
|  | STR-1016153/B-Architectural Design | | | rpaquet2 - Logical to Physical CAN mapping table for XY position |
| SHC-STR-1143370/A-Logical Signal Mapping | | | rpaquet2 - New |
| IIR-REQ-473070/B-Steering Horizon Controller Client \_Rx | | | rpaquet2 - Added signals for XY Position |
| MD-REQ-531977/A-SteeringWhlSwitchPrimary2\_St | | | rpaquet2 - New for XY position |
| MD-REQ-531999/A-SteeringWhlSwitchSecondary2\_St | | | rpaquet2 - New for XY position |
|  | MD-REQ-532000/A-SteeringWhlPriPositionY\_St | | | rpaquet2 - New for XY position |
|  | MD-REQ-532017/A-SteeringWhlPriPositionX\_St | | | rpaquet2 - New for XY position |
|  | MD-REQ-532018/A-SteeringWhlSecPositionY\_St | | | rpaquet2 - New for XY position |
|  | MD-REQ-532019/A-SteeringWhlSecPositionX\_St | | | rpaquet2 - New for XY position |
|  | STR-1016156/B-Functional Definition | | | rpaquet2 - Added new function for XY position |
|  | SHC-FUN-REQ-532037/A-X, Y Position | | | rpaquet2 - New for XY position |
|  | STR-1143352/A-Requirements | | | rpaquet2 - New for XY position |
|  | SHC-REQ-532038/A-Receiving X and Y Position | | | rpaquet2 - New for XY position |

**Table of Contents**

[Revision History 2](#_Toc119663627)

[1 Architectural Design 4](#_Toc119663628)

[1.1 Overview 4](#_Toc119663629)

[1.2 SHC-CLD-REQ-473068/A-Steering Horizon Controller Client 4](#_Toc119663630)

[1.3 SHC-CLD-REQ-473069/A-Steering Horizon Controller Server 4](#_Toc119663631)

[1.4 Physical Mapping of Classes 4](#_Toc119663632)

[1.5 Logical Signal Mapping 4](#_Toc119663633)

[1.6 IIR-REQ-473072/A-Steering Horizon Controller Client \_Tx 4](#_Toc119663634)

[1.6.1 MD-REQ-473073/A-SYNCDriverAdjustment\_Rq 4](#_Toc119663635)

[1.6.2 MD-REQ-483761/A-PlayPauseButton\_St 5](#_Toc119663636)

[1.7 IIR-REQ-473070/B-Steering Horizon Controller Client \_Rx 5](#_Toc119663637)

[1.7.1 MD-REQ-473071/A-SecondarySwitchDisplay\_St 5](#_Toc119663638)

[1.7.2 MD-REQ-492597/A-DriverAdjustmentPulse\_Rq 6](#_Toc119663639)

[1.7.3 MD-REQ-531977/A-SteeringWhlSwitchPrimary2\_St 6](#_Toc119663640)

[1.7.4 MD-REQ-531999/A-SteeringWhlSwitchSecondary2\_St 6](#_Toc119663641)

[1.7.5 MD-REQ-532000/A-SteeringWhlPriPositionY\_St 6](#_Toc119663642)

[1.7.6 MD-REQ-532017/A-SteeringWhlPriPositionX\_St 7](#_Toc119663643)

[1.7.7 MD-REQ-532018/A-SteeringWhlSecPositionY\_St 7](#_Toc119663644)

[1.7.8 MD-REQ-532019/A-SteeringWhlSecPositionX\_St 7](#_Toc119663645)

[2 Functional Definition 9](#_Toc119663646)

[2.1 SHC-FUN-REQ-473074/A-Driver Adjustment Redundant SHC Center Stack Control 9](#_Toc119663647)

[2.1.1 Use Cases 9](#_Toc119663648)

[2.1.2 Requirements 9](#_Toc119663649)

[2.1.3 White Box Views 10](#_Toc119663650)

[2.2 FUN-REQ-481977/A-Individual Button Activation 12](#_Toc119663651)

[2.2.1 Use Cases 12](#_Toc119663652)

[2.2.2 Requirements 12](#_Toc119663653)

[2.3 SHC-FUN-REQ-532037/A-X, Y Position 13](#_Toc119663654)

[2.3.1 Requirements 13](#_Toc119663655)

[3 Appendix: Reference Documents 14](#_Toc119663656)

# Architectural Design

## Overview

The Steering Horizon Controller feature uses one steering wheel control switch pack to control multiple features based on the focus of the switch pack. The Steering Wheel Horizon Controller Control Function STSS will define the main SHC interaction for the VIP. This SPSS will cover the CCPU interaction with the VIP to realize the Driver Adjustments Redundant center stack screens and special case button usage.

## SHC-CLD-REQ-473068/A-Steering Horizon Controller Client

Is responsible for displaying the Redundant Driver Adjustment Controls in the center stack. These controls will show the user how to use the steering wheel controls to change the different features defined in the center stack HMI. The Steering Horizon Controller Client will request the switch pack related to the user selected option. The Steering Horizon Controller Client shall also provide in special cases which buttons are available.

## SHC-CLD-REQ-473069/A-Steering Horizon Controller Server

Is responsible for displaying the SHC switch packs based on the Redundant Driver Adjustment requests from the Steering Horizon Controller Client. The Steering Horizon Controller Server shall monitor variables from the Steering Horizon Controller Client to determine if buttons are available in certain situations.

## Physical Mapping of Classes

The table below shows how the logical classes that make up the Steering Horizon Controller feature may be mapped into physical modules. This mapping example is specific to Steering Horizon Controller architecture and does not necessarily carryover to other carlines or vehicle architectures.

|  |  |
| --- | --- |
| **Logical Class** | **Physical Module (ECU)** |
| Steering Horizon Controller Client | CCPU |
| Steering Horizon Controller Server | VIP |

## Logical Signal Mapping

Each logical name used in this document is mapped to its corresponding CAN signal. Please refer to the following mapping:

|  |  |
| --- | --- |
| **Logical name** | **CAN signal name** |
| SteeringWhlSwitchPrimary2\_St | StewSwtchPrim\_D\_Stat2 |
| SteeringWhlSwitchSecondary2\_St | StewSwtchScnd\_D\_Stat2 |
| SteeringWhlPriPositionY\_St | StewSwtchPrimPosY\_D\_St |
| SteeringWhlPriPositionX\_St | StewSwtchPrimPosX\_D\_St |
| SteeringWhlSecPositionY\_St | StewSwtchScndPosY\_D\_St |
| SteeringWhlSecPositionX\_St | StewSwtchScndPosX\_D\_St |

## IIR-REQ-473072/A-Steering Horizon Controller Client \_Tx

### MD-REQ-473073/A-SYNCDriverAdjustment\_Rq

Message Type: Request

The signal is used to request the SHC display state.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - | The signal is used to request the SHC display state. |
|  | Inactive | 0x0 |  |
|  | Back/Exit | 0x1 |  |
|  | DriverAdjust | 0x2 |  |

### MD-REQ-483761/A-PlayPauseButton\_St

Message Type: Status

The signal is used to indicate to the VIP if Play or Pause is shown to the user.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - | The signal is used to indicate to the VIP if Play or Pause is shown to the user |
|  | Inactive | 0x0 | Default no request state |
|  | Neither Displayed | 0x1 | No Play or Pause button shown |
|  | Display Play | 0x2 | Play button should be shown |
|  | Display Pause | 0x3 | Pause button should be shown |

## IIR-REQ-473070/B-Steering Horizon Controller Client \_Rx

### MD-REQ-473071/A-SecondarySwitchDisplay\_St

Message Type: Status

The signal contains the active SHC switch display for VIP.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - | The signal contains the active switch display |
|  | Inactive | 0x0 |  |
|  | Global Alert | 0x1 |  |
|  | Warning | 0x2 |  |
|  | Driver Adjustment Menu | 0x3 |  |
|  | Steering Wheel Adjust | 0x4 |  |
|  | Left Mirror Adjust | 0x5 |  |
|  | Right Mirror Adjust | 0x6 |  |
|  | Pedal Adjust | 0x7 |  |
|  | Phone – Incoming Call | 0x8 |  |
|  | Phone – In Call | 0x9 |  |
|  | Text Message Control | 0xA |  |
|  | Media Control | 0xB |  |

### MD-REQ-492597/A-DriverAdjustmentPulse\_Rq

Message Type: Request

The signal is used to request the CCPU to pulse the Driver Adjustment Menu button in the centerstack.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - | The signal is used to request the CCPU to pulse the Driver Adjustment Menu button in the centerstack |
|  | Not Active | 0x0 | No pulse |
|  | Pulse | 0x1 | Pulse Button |

### MD-REQ-531977/A-SteeringWhlSwitchPrimary2\_St

Message Type: Status

Left hand steering wheel switch press status signal. This signal is for Steering Horizon controller system.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | Not Pressed | 0x0 |  |
|  | Pressed | 0x1 |  |

### MD-REQ-531999/A-SteeringWhlSwitchSecondary2\_St

Message Type: Status

Right hand steering wheel switch press status signal. This signal is for Steering Horizon controller system.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | Not Pressed | 0x0 |  |
|  | Pressed | 0x1 |  |

### MD-REQ-532000/A-SteeringWhlPriPositionY\_St

Message Type: Status

Left hand steering wheel primary switch position Y status signal.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | NoTouch | 0x0 |  |
|  | Loc\_1 | 0x1 |  |
|  | Loc\_2 | 0x2 |  |
|  | … | … |  |
|  | Loc\_252 | 0xFC |  |
|  | NotUsed\_1 | 0xFD |  |
|  | NotUsed\_2 | 0xFE |  |
|  | Faulty | 0xFF |  |

### MD-REQ-532017/A-SteeringWhlPriPositionX\_St

Message Type: Status

Left hand steering wheel primary switch position X status signal.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | NoTouch | 0x0 |  |
|  | Loc\_1 | 0x1 |  |
|  | Loc\_2 | 0x2 |  |
|  | … | … |  |
|  | Loc\_252 | 0xFC |  |
|  | NotUsed\_1 | 0xFD |  |
|  | NotUsed\_2 | 0xFE |  |
|  | Faulty | 0xFF |  |

### MD-REQ-532018/A-SteeringWhlSecPositionY\_St

Message Type: Status

Right hand steering wheel secondary switch position Y status signal.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | NoTouch | 0x0 |  |
|  | Loc\_1 | 0x1 |  |
|  | Loc\_2 | 0x2 |  |
|  | … | … |  |
|  | Loc\_252 | 0xFC |  |
|  | NotUsed\_1 | 0xFD |  |
|  | NotUsed\_2 | 0xFE |  |
|  | Faulty | 0xFF |  |

### MD-REQ-532019/A-SteeringWhlSecPositionX\_St

Message Type: Status

Right hand steering wheel secondary switch position X status signal.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Literals** | **Value** | **Description** |
| - | - | - |  |
|  | NoTouch | 0x0 |  |
|  | Loc\_1 | 0x1 |  |
|  | Loc\_2 | 0x2 |  |
|  | … | … |  |
|  | Loc\_252 | 0xFC |  |
|  | NotUsed\_1 | 0xFD |  |
|  | NotUsed\_2 | 0xFE |  |
|  | Faulty | 0xFF |  |

# Functional Definition

## SHC-FUN-REQ-473074/A-Driver Adjustment Redundant SHC Center Stack Control

### Use Cases

#### SHC-UC-REQ-473057/A-Enter Driver Adjustment Redundant Screens

|  |  |
| --- | --- |
| **Actors** | User |
| **Pre-conditions** | Infotainment System is On |
| **Scenario Description** | User selects HMI to enter Driver Adjustment Redundant Screen in the center stack. |
| **Post-conditions** | Center stack is showing redundant control screen for SHC controls. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | VIP, CCPU |

#### SHC-UC-REQ-473064/A-User Exits using Center Stack

|  |  |
| --- | --- |
| **Actors** | User |
| **Pre-conditions** | Infotainment System is On  Driver Adjustment Redundant Controls are displayed |
| **Scenario Description** | User exits Redundant screen using the center stack Back button or other command to leave Redundant screen. |
| **Post-conditions** | Center stack CCPU sends exit request to VIP. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | VIP, CCPU |

#### SHC-UC-REQ-492477/A-Pulse Button Location in Centerstack

|  |  |
| --- | --- |
| **Actors** | User |
| **Pre-conditions** | Infotainment System is On |
| **Scenario Description** | VIP sends command to pulse to the CCPU. |
| **Post-conditions** | CCPU pulses the driver adjustment button location |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | VIP, CCPU |

### Requirements

#### SHC-REQ-473077/A-Setting Request back to Inactive

The SHCClient shall set SYNC\_DriverAdjustment\_Rq back to Inactive 120ms after making a request. If another request is required to be sent before the 120ms has expired then the SHCClient shall send the new request and restart the 120ms timer.

#### SHC-REQ-477965/A-Selecting a Driver Adjustment in Centerstack when SHC has Warning Item Active

The SHCClient shall display a message if Secondary\_Switch\_Display signal equals Warning and the user tries to select Driver Adjustment HMI from the centerstack. The SYNC\_Driver\_Adjustment\_Rq shall not be sent in this case.

#### SHC-REQ-477966/A-Selecting a Driver Adjustment in Centerstack and SHC Higher Priority Item Becomes Active

The SHCClient shall not display a message to the user while SYNC\_Driver\_Adjustment\_Rq != Inactive and the Secondary\_Switch\_Display signal transitions to Warning.

#### SHC-REQ-492517/A-Pulsing the Button Icon in Centerstack

The SHCClient shall pulse their Driver Adjustment Menu button once they receive the DriverAdjustmentPulse\_Rq 0x1 Pulse from the SHCServer. The SHCClient shall continue to pulse the button until they receive DriverAdjustmentPulse\_Rq 0x0 Inactive.

### White Box Views

#### Activity Diagrams

##### SHC-ACT-REQ-477960/A-Enter Driver Adjustment Screen using Centerstack



##### SHC-ACT-REQ-473075/A-Select Exit or Back in Centerstack



#### Sequence Diagrams

##### SHC-SD-REQ-477959/A-Enter Driver Adjustment Screen using Centerstack



##### SHC-SD-REQ-473076/A-Exiting Driver Adjustment Screen in Centerstack



## FUN-REQ-481977/A-Individual Button Activation

### Use Cases

#### SHC-UC-REQ-483746/A-User selects Media Source that supports Play Pause Operation

|  |  |
| --- | --- |
| **Actors** | User |
| **Pre-conditions** | Infotainment System is On |
| **Scenario Description** | User selects a media source that supports play/pause operation |
| **Post-conditions** | CCPU sends an indication that either Play or Pause or neither button is active. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | VIP, CCPU |

### Requirements

#### SHC-REQ-483760/A-Setting Play/Pause Button State

The SHCClient shall set PlayPauseButton\_St based on the following.

1. Media Source does not support Play/Pause operation, set PlayPauseButton\_St to Neither Displayed.

Or

1. Media Source supports Play/Pause and media is paused or stopped, set PlayPauseButton\_St to Display Play.

Or

1. Media Source supports Play/Pause and media is playing, set PlayPauseButton\_St to Display Pause.

After 120ms the SHCClient shall set the PlayPauseButton\_St back to inactive.

Any time the source changes the SHCClient shall send the PlayPauseButton\_St.

To determine if the Play/Pause operation is supported the SHCClient shall look at the GetActions API. If GetActions API indicates that Play/Pause/Stop are available then Play/Pause operation is supported.

To determine whether to show Play or Pause the SCHClient shall look at the GetState API.

|  |  |
| --- | --- |
| GetState(State) | PlayPauseButton\_St |
| Playing | Display Pause |
| Buffering | Last PlayPauseButton\_St before buffering |
| Pause | Display Play |
| Stop | Display Play |
| Error | Neither Displayed |
| None | Neither Displayed |

## SHC-FUN-REQ-532037/A-X, Y Position

### Requirements

#### SHC-REQ-532038/A-Receiving X and Y Position

The SHCClient will receive the X and Y position for the Primary and Secondary switch packs. The SHCClient shall provide a cursor to mark the location as defined in the HMI spec.

If NoTouch/NotUsed\_1/NotUsed\_2/Faulty are received then the cursor shall not be shown in the HMI.

If signal is not received then the cursor shall not be shown in the HMI.

# Appendix: Reference Documents

|  |  |
| --- | --- |
| Reference # | Document Title |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| 11 |  |
| 12 |  |
| 13 |  |
| 14 |  |
| 15 |  |
| 16 |  |
| 17 |  |