Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Power Lumbar Seat Client

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.1
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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
December 1, 2016	**1.0**	**Initial Release**	
April 5, 2017	**1.1**	**Updated Release**	
		LBC-SR-REQ-239447/B-Inactivity of any user input to Power Lumbar Seats	MBORREL4: Updated to convey timer reset on user input and timer initialization on release of input
		MCS-UC-REQ-237633/B-Open Seat Adjust Screen from Shortcut Key	cwu3: Added Note to clarify when Ignition is not in Run. No content changed.
		MCS-UC-REQ-237634/B-Exit Seat Adjust Screen from Shortcut Key	cwu3: Added Note for time out timer reference
		LBC-ACT-REQ-239308/B-Activate/Deactivate Power Lumbar Seats Feature Screen HMI	MBORREL4: Updated diagram to correctly reflect user input request (no functional changes, clarification only)
		LBC-SD-REQ-239309/B-Activate/Deactivate Power Lumbar Seats Feature Screen HMI	MBORREL4: Updated diagram to correctly reflect user input request (no functional changes, clarification only)
		STR-407606/B-Appendix: Reference Documents	cwu3: Added HMI specification H74a

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1 Architectural Design

1.1 Physical Mapping of Classes

The table below shows an example of how the logical classes may be mapped into physical modules. This mapping example is specific to the MY20 U611 program under CGEA1.3 architecture and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
Power Lumbar Seat Remote Client	Switch Pack (i.e. Shortcut Key)
Power Lumbar Seat Server	DSM / PSM
Power Lumbar Seat Client	APIM

1.2 LBC-CLD-REQ-239462/A-Power Lumbar Seat Remote Client

The Power Lumbar Seat Remote Client has one function:

1. Receive input from user for activation/deactivation of HMI display for Power Lumbar Seats functionality.

1.3 LBC-CLD-REQ-237630/A-Power Lumbar Seat Server

The Power Lumbar Seat Server has two functions:

1. Transmit request for activation/deactivation of HMI display for Power Lumbar Seats functionality.
2. Execute Power Lumbar Seat Function as directed by the Power Lumbar Seat Client.

1.4 LBC-CLD-REQ-237631/A-Power Lumbar Seat Client

The Power Lumbar Seat Client has two functions:

1. Interface between user and power lumbar seat functions, both inputs and outputs from the display device
2. Control inputs to the Power Lumbar Seat Server directing the server's execution of Power Lumbar Seat Functionality.

1.4.1 Functional Requirements

1.4.1.1 *LBC-SR-REQ-239785/A-Powermode Conditions*

The Power Lumbar Seat Client shall only allow this feature functionality when the touch screen display is On (HMI_HMIMode_St=On).

1.4.1.2 *LBC-SR-REQ-239562/A-Configurable Parameter for 2/4Way Lumbar*

The Power Lumbar Seat Client shall have a configurable parameter to determine whether the vehicle supports 2 Way Lumbar, 4 Way Lumbar, or neither (Disabled).
- If the parameter indicates that the vehicle is to support 2 Way Lumbar, then only the Driver/Passenger Fore and Aft seat adjustments shall be made available to the user.
- If the parameter indicates that the vehicle is to support 4 Way Lumbar, then only the Driver/Passenger Fore, Aft, Up and Down seat adjustments shall be made available to the user.
- If the parameter indicates that the vehicle is to support neither (Disabled), then no seat adjustments shall be made available to the user.

If the configurable parameter for the Enhanced (or Legacy) Multi Contoured Seats feature is also configured On, that feature shall take priority and a DTC shall be set by the Power Lumbar Seat Client to signify this conflict.

1.4.1.3   *LBC-SR-REQ-239566/A-Request to display Power Lumbar Seats screen*

When the PowerLumbarSeatsUser requests to make seat adjustments via the specific Driver or Passenger Shortcut Keys, the Power Lumbar Seat Client shall receive the respective signals set to On:

DriverSeatScreenToggle_St = On
PassengerSeatScreenToggle_St = On

When these signals transition from from Off to On:
- If not already displayed, the Power Lumar Seat Client shall display the Seat Adjust Screen for the respective signal/user (Driver or Passenger) when allowed (see REQ-239447 & REQ-239448).
- If already displayed, the Power Lumar Seat Client shall close the Seat Adjust Screen for the respective signal/user (Driver or Passenger) and return to the last displayed screen.

Upon release of the Shortcut Keys, the respective signal above shall revert to Off. No screen change shall be made upon release.

1.4.1.4   *LBC-SR-REQ-239447/B-Inactivity of any user input to Power Lumbar Seats*

After the PowerLumbarSeatUser has made their last input, and the DriverSeatScreenToggle_St or PassengerSeatScreenToggle_St has reverted to Off, and the SeatLumbar_Rq has reverted to Null, the Power Lumbar Seat Client shall start the T_LBC_Input and T_LBC_Screen timers.

- While T_LBC_Input is active (not expired), the opposing seat shall not be able to request to become the primary seat on the touch screen display.
- After T_LBC_Input expires, the opposing seat shall be able to request to become the primary seat on the touch screen display.
- After T_LBC_Screen expires, the Seat Adjust Screen shown on the touch screen display shall close.

If the user makes another seat adjustment on the HMI (via SeatLumbar_Rq) within either timer, both the T_LBC_Input and T_LBC_Screen timers shall restart on input, and initialize upon the release of the users last input, when SeatLumbar_Rq has once again reverted to Null.

If the user closes the Seat Adjust Screen using the HMI or the originating Shortcut Key (via DriverSeatScreenToggle_St or PassengerSeatScreenToggle_St) within either timer, both the T_LBC_Input and T_LBC_Screen timers shall become inactive and return to their default state. These timers and their functionality shall not be used when the Seat Adjust Screen is not displayed.

1.4.1.5   **LBC-TMR-REQ-239448/A-T_LBC_Input**

Name	Description	Units	Range	Resolution	Default
T_LBC_Input	Time allowed from the Power Lumbar Seat Client after the users last input (either by the Shortcut Key, or touch screen display) before allowing the opposing seat to request screen control.	sec	0-20	1	6

1.4.1.6   **LBC-TMR-REQ-239564/A-T_LBC_Screen**

Name	Description	Units	Range	Resolution	Default
T_LBC_Screen	Time allowed from the Power Lumbar Seat Client after the users last input (either from the Shortcut Key or touch screen display) before closing the HMI screen.	sec	0-20	1	8

1.4.1.7   LBC-SR-REQ-237843/A-Power Lumbar Seats Adjustment via TouchScreen

If the user presses any seat adjustment button from the touch screen display, the Power Lumbar Seat Client shall set SeatLumbar_Rq with the associated parameter.

The SeatLumbar_Rq signal shall then transmit the associated parameter continuously as long as the button is pressed by the user. Upon release of the button, SeatLumbar_Rq shall return to "Null."

When any seat adjustment button is pressed from the touch screen display, the associated parameter shall be held for a minimum of 100ms.

The Power Lumbar Seat Client does not arbitrate if an input is a "press and hold" or a "tap". This shall be done by the Power Lumbar Seat Server.
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1.5 PowerLumbarSeatClient Interface

1.5.1 LBC-IIR-REQ-237844/A-PowerLumbarSeatClient_Tx

The PowerLumbarSeatClient_Tx represents all the Power Lumbar Seats feature related signals transmitted by the Power Lumbar Seat Client object. The below table represents the mapping of the logical signal names (as described in this specification) to the global GSDB signal names.

Logical Signal Name	Parameter Name	GSDB Signal Name
SeatLumbar_Rq	Mode	SeatLmbr_D_Rq

Note: GSDB signal names are reference only. The Global Signal Database (GSDB) is the master for all signals. If there is a conflict bring to the module D&R's attention.

1.5.1.1 *MD-REQ-237845/A-SeatLumbar_Rq*

Message Type : Request

This method is a signal from the Seat Control Client to the Seat Control Server. This request indicates to the server what seat control update is requested.

Name	Literals	Value	Description
Mode	-	-	Requested active function.
	Null	0x0	
	Driver Fore	0x1	
	Driver Aft	0x2	
	Driver Up	0x3	
	Driver Down	0x4	
	Passenger Fore	0x5	
	Passenger Aft	0x6	
	Passenger Up	0x7	
	Passenger Down	0x8	

1.5.2 LBC-IIR-REQ-237846/A-PowerLumbarSeatClient_Rx

The PowerLumbarSeatClient_Rx represents all the Power Lumbar Seats feature related signals received by the Power Lumbar Seat Client object. The below table represents the mapping of the logical signal names (as described in this specification) to the global GSDB signal names.

Logical Signal Name	Parameter Name	GSDB Signal Name
DriverSeatScreenToggle_St	Mode	SeatScrnDrvOn_B_Stat
PassengerSeatScreenToggle_St	Mode	SeatScrnPsngrOn_B_Stat

Note: GSDB signal names are reference only. The Global Signal Database (GSDB) is the master for all signals. If there is a conflict bring to the module D&R's attention.

1.5.2.1 *MD-REQ-237615/A-DriverSeatScreenToggle_St*

Message Type: Status

This method is a signal from a seat feature server (Driver's side) to a seat feature client informing the Client that a request has been made by the user, via seat controls (Shortcut Key), to toggle the current on/off state of the seat feature's control function. This signal allows the Client to update the HMI output and activate/deactivate HMI controls.

Name	Literals	Value	Description
Mode	-	-	Request to activate drivers side seat adjust screen in HMI
	Off	0x0	
	On	0x1	

1.5.2.2 MD-REQ-237617/A-PassengerSeatScreenToggle_St

Message Type: Status

This method is a signal from the seat feature server (Passenger's side) to a seat feature client informing the Client that a request has been made by the user, via seat controls (Shortcut Key), to toggle the current on/off state of the seat feature's control function. This signal allows the Client to update the HMI output and activate/deactivate HMI controls.

Name	Literals	Value	Description
Mode	-	-	Request to activate passengers side seat adjust screen in HMI
	Off	0x0	
	On	0x1	

2 Functional Definition

2.1 LBC-FUN-REQ-239307/A-Activate Power Lumbar Seat Display HMI via Shortcut Key

2.1.1 Use Cases

2.1.1.1 *MCS-UC-REQ-237633/B-Open Seat Adjust Screen from Shortcut Key*

Actors	Vehicle Occupant
Pre-conditions	Display is ON HMI is not displaying seat control feature screen
Scenario Description	User presses seat shortcut key to bring up seat controls
Post-conditions	HMI indicates {brings up seat control feature screen}
List of Exception Use Cases	MCS-UC-REQ-237634-Exit Seat Adjust Screen from Shortcut Key
Interfaces	G-HMI & vehicle system
Note	Pressing the Shortcut key will bring up the Multi Control Seat Menu when the HMI display is On. If Ignition is not in RUN, the real control menu (button input) will be greyed-out with only the Return button available. Please refer to [H74a.R030]

#### 2.1.1.2 *MCS-UC-REQ-237634/B-Exit Seat Adjust Screen from Shortcut Key*

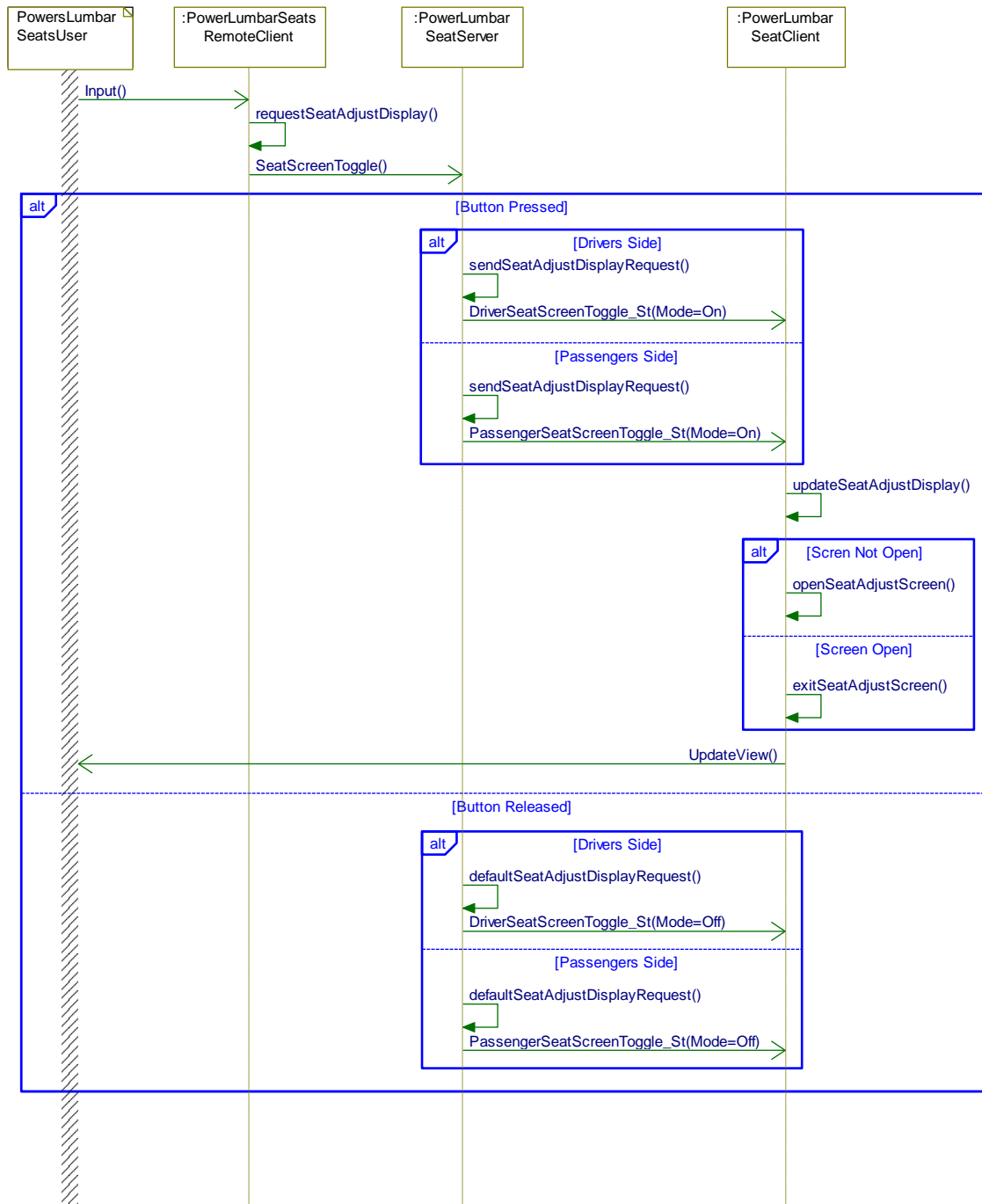| Actors	Vehicle Occupant
Pre-conditions	Display is ON HMI is displaying seat control feature screen
Scenario Description	User presses seat shortcut key prior to screen timeout
Post-conditions	HMI exits seat control screen and returns to prior screen
List of Exception Use Cases	Screen Timeout duration has expired
Interfaces	G-HMI & vehicle system
Note	For "screen timeout" refer to MCS-TMR-REQ-239813-T_MCS_Screen

2.1.2 White Bow View

2.1.2.1 *LBC-ACT-REQ-239308/B-Activate/Deactivate Power Lumbar Seats Feature Screen HMI*
Activity Diagram
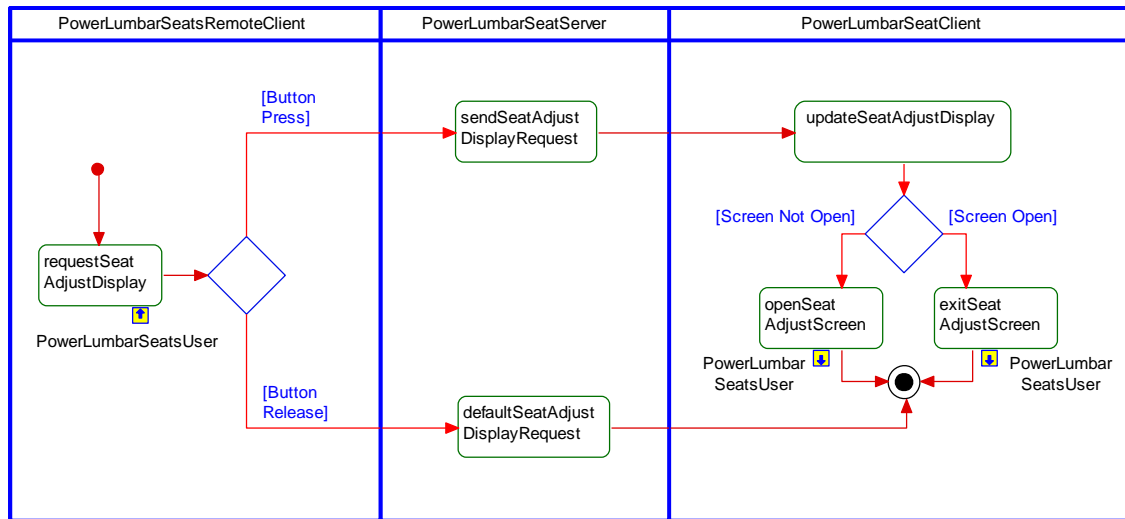
2.1.2.2 *LBC-SD-REQ-239309/B-Activate/Deactivate Power Lumbar Seats Feature Screen HMI*
Sequence Diagram

Page Break

2.2 LBC-FUN-REQ-237847/A-Adjust Power Lumbar Seat

2.2.1 Use Cases

2.2.1.1 *LBC-UC-REQ-237851/A-Increase/Decrease Lumbar Apex*

Actors	Vehicle Occupant
Pre-conditions	Display is ON
Scenario Description	User Selects Increase / decrease Lumbar Apex
Post-conditions	HMI indicates desired adjustments. Customer experiences seat feedback with adjustment
List of Exception Use Cases	
Interfaces	G-HMI & vehicle system
Links to Referenced Use Cases	Vehicle Occupant

2.2.1.2 *LBC-UC-REQ-237852/A-Lumbar Up / Down Adjustment*

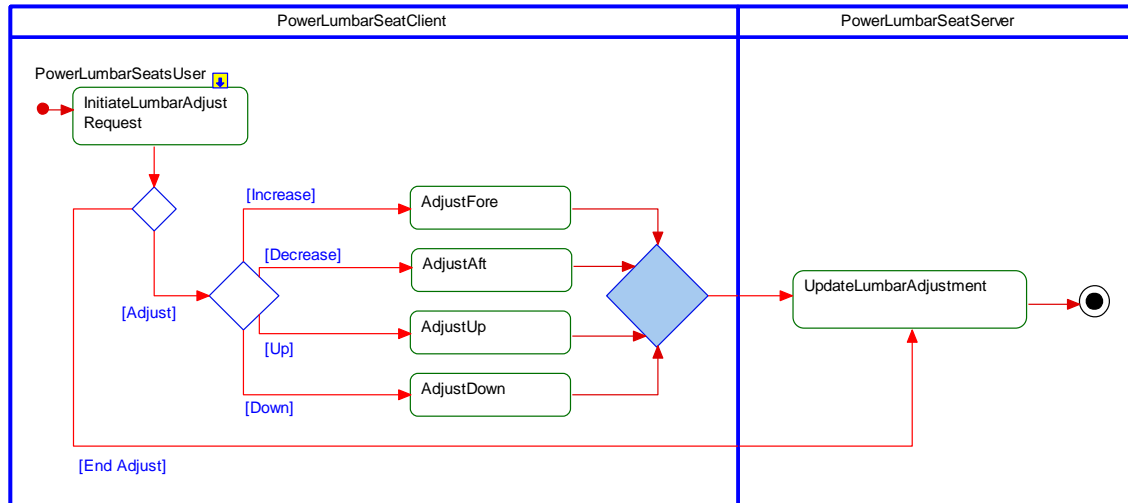| Actors	Vehicle Occupant
Pre-conditions	Display is ON
Scenario Description	User Selects Up / Down Lumbar Apex Option
Post-conditions	HMI indicates desired adjustments. Customer experiences seat feedback with adjustment
List of Exception Use Cases	
Interfaces	G-HMI & vehicle system
Links to Referenced Use Cases	Vehicle Occupant

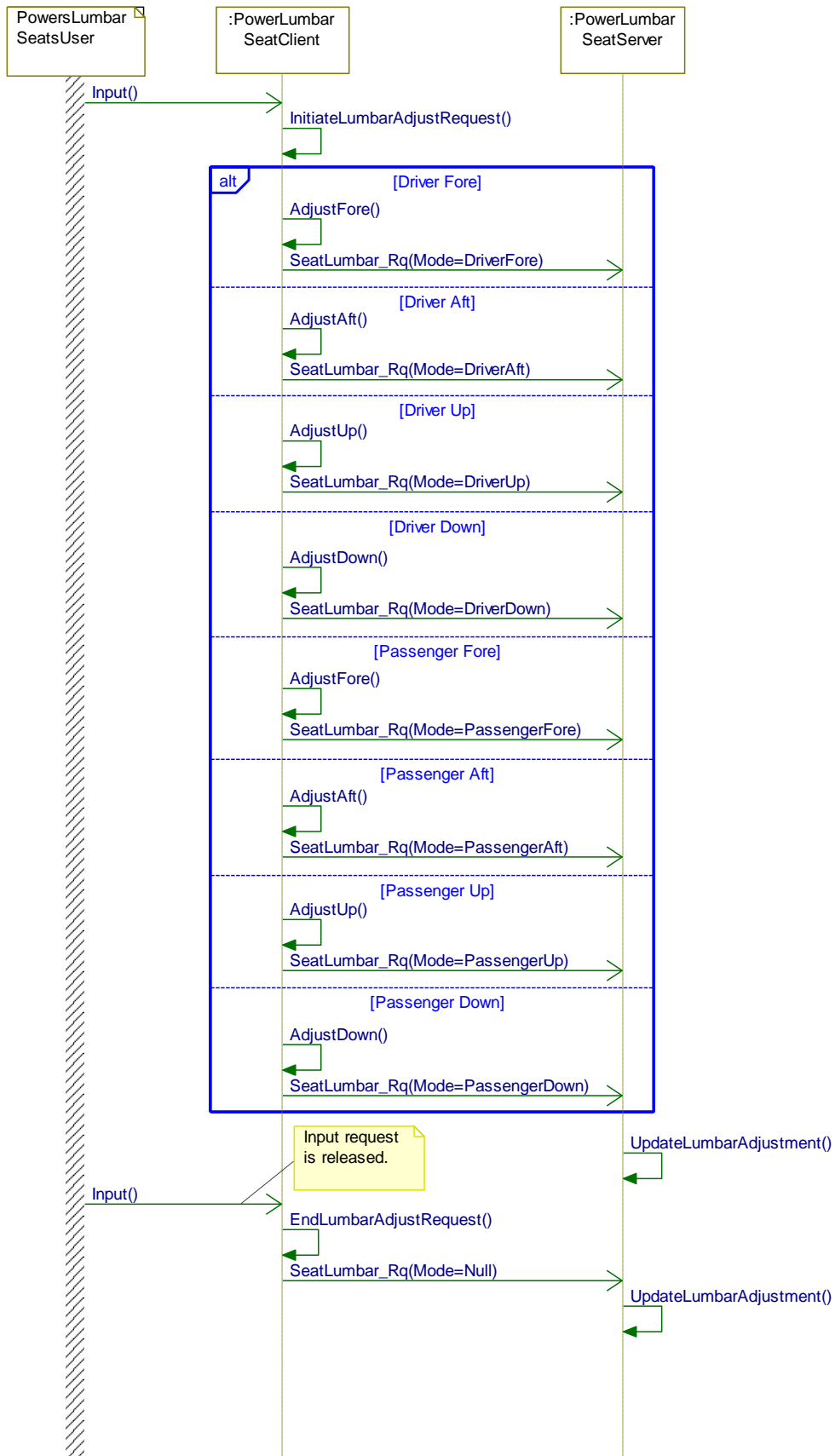### 2.2.2 White Box View

2.2.2.1 *LBC-ACT-REQ-237848/A-Adjust Power Lumbar via TouchScreen HMI*
Activity Diagram

2.2.2.2 LBC-SD-REQ-237849/A-Adjust Power Lumbar via TouchScreen HMI

Sequence Diagram

PowersLumbar
SeatsUser

:PowerLumbar
SeatClient

:PowerLumbar
SeatServer

Input()

InitiateLumbarAdjustRequest()

alt [Driver Fore]

AdjustFore()

SeatLumbar_Rq(Mode=DriverFore)

[Driver Aft]

AdjustAft()

SeatLumbar_Rq(Mode=DriverAft)

[Driver Up]

AdjustUp()

SeatLumbar_Rq(Mode=DriverUp)

[Driver Down]

AdjustDown()

SeatLumbar_Rq(Mode=DriverDown)

[Passenger Fore]

AdjustFore()

SeatLumbar_Rq(Mode=PassengerFore)

[Passenger Aft]

AdjustAft()

SeatLumbar_Rq(Mode=PassengerAft)

[Passenger Up]

AdjustUp()

SeatLumbar_Rq(Mode=PassengerUp)

[Passenger Down]

AdjustDown()

SeatLumbar_Rq(Mode=PassengerDown)

Input request
is released.

UpdateLumbarAdjustment()

Input()

EndLumbarAdjustRequest()

SeatLumbar_Rq(Mode=Null)

UpdateLumbarAdjustment()

3   Appendix: Reference Documents

Reference #	Document Title
1	Related HMI specification: H74a-Seat Controls Shortcut Key
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	