Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature: Fuel Economy (Global)

Subsystem Part Specific Specification (SPSS)

Version 1.1

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
November 2, 2018	**1.0**	**Initial Release**	
January 31, 2019	**1.1**		
	FE-582838/B-Architectural Design		MBORREL4: Added Physical Mapping of Classes
	FE-FUR-REQ-327835/B-Logical Table		tmertiri: added new signal AvgFeActv_B_Dsply. MBORRLE4: Added InstFe_No_Dsply, InstFeTripUnit_D_Stat
	FE-IIR-REQ-327830/B-Fuel Economy Client Rx - Server Tx		tmertiri: added REQ-339109. MBORREL4: Added REQ-341021, REQ-341023 and rearranged signal order
	FE-MD-REQ-327904/B-LAvgFuelEcoValue		MBORREL4: Changed logical name from LAvFuelEco to LAvgFuelEcoValue. Added signal definition.
	FE-MD-REQ-327908/B-LAvgFuelEcoUnits		MBORREL4: Changed logical name from Lunits to LAvgFuelEcoUnits. Added signal definition.
	FE-MD-REQ-339109/A-LAvgFuelEcoDataDisp		tmertiri: New signal for the Average Fuel Economy dashes
	FE-MD-REQ-341021/A-LInsFuelEcoValue		MBORREL4: New signal for the Inst. Fuel value
	FE-MD-REQ-341023/A-LInsFuelEcoUnits		MBORREL4: New signal for the Inst. Fuel units
	FE-MD-REQ-327906/B-LInstFuelEcoMax		MBORREL4: Changed logical name from LMaxVal to LInsFuelEcoMax. Added signal definition.
	FE-MD-REQ-327905/B-LConsValue		MBORREL4: Changed logical name from LInsFuelEco to LConsValue. Added signal definition.
	FE-MD-REQ-329150/B-LConsUnits		MBORREL4: Changed logical name from LConU to LConsUnits. Added signal definition.
	FE-MD-REQ-329151/B-LConsActive		MBORREL4: Changed logical name from LConUSt to LConsActive. Added signal definition.
	FE-MD-REQ-327907/B-LAvgFuelEcoReset		MBORREL4: Changed logical name from LFuelEcoReset to LAvgFuelEcoReset. Added signal definition.
	FE-598213/B-General Requirements		MBORREL4: Moved REQ-333165 to REQ-341030. Added REQ-339110, REQ-341892, REQ-341893, REQ-341894, REQ-342186
	FE-REQ-342186/A-Feature Configuration		MBORREL4: New req.
	FE-REQ-342657/A-Reset Button Configuration		MBORREL4: New req.
	FE-SR-REQ-341893/A-Request return to Null state		MBORREL4: New req.
	FE-TMR-REQ-341892/A-T_ReturnToNull		MBORREL4: New req.
	FE-REQ-341894/A-Missing Message Strategy		MBORREL4: New req.
	FE-582839/B-Functional Definition		MBORREL4: Added REQ-341029, REQ-341030
	FE-FUN-REQ-333218/B-Average Fuel Economy		MBORREL4: Changed function name, addd new sections, usecases, reqs.
	STR-612654/A-Requirements		MBORREL4: New section/header/paragraph item. Added REQ-341051, REQ-341052, REQ-341058
	FE-REQ-341051/A-Displaying Average Fuel Economy Data		MBORREL4: New req.
	FE-REQ-341052/A-Displaying Average Fuel Economy Units		MBORREL4: New req.
	FE-REQ-341058/A-Average Fuel Economy Reset Request		MBORREL4: New req.
	STR-612655/A-Use Cases		MBORREL4: New section/header/paragraph item
	FE-UC-REQ-342200/A-Displaying Average Fuel Economy to the User		MBORREL4: New usecase
	FE-UC-REQ-342306/A-Displaying Missing Data to the User		MBORREL4: New usecase
	FE-UC-REQ-342198/A-User Performs Average Fuel Economy Reset		MBORREL4: New usecase

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	STR-612701/A-White Box Views	MBORREL4: New section/header/paragraph item
	STR-612702/A-Activity Diagrams	MBORREL4: New section/header/paragraph item
	FE-ACT-REQ-342525/A-Average Fuel Economy & Reset	MBORREL4: New diagram
	FE-SD-REQ-329149/B-Average Fuel Economy & Reset	MBORREL4: Changed sequence name and diagram
	FE-REQ-341053/A-Displaying Instantaneous Fuel Economy Data	MBORREL4: New req.
	FE-REQ-341054/A-Displaying Instantaneous Fuel Economy Units	MBORREL4: New req.
	FE-REQ-341055/A-Displaying Instantaneous Fuel Economy Graph	MBORREL4: New req.
	FE-UC-REQ-342201/A-Displaying Instantaneous Fuel Economy to the User	MBORREL4: New usecase
	STR-617024/A-Activity Diagrams	MBORREL4: New section/header/paragraph item
	FE-ACT-REQ-342528/A-Instantaneous & Consumption Fuel Economy	MBORREL4: New diagram
	STR-617026/A-Sequence Diagrams	MBORREL4: New section/header/paragraph item
	FE-SD-REQ-342529/A-Instantaneous & Consumption Fuel Economy	MBORREL4: New diagram
	FE-REQ-333165/B-Consumption vs. Instantaneous Fuel Economy	MBORREL4: Change req. name and content.
	FE-REQ-341056/A-Displaying Consumption Data	MBORREL4: New req.
	FE-REQ-341057/A-Displaying Consumption Units	MBORREL4: New req.
	FE-UC-REQ-342199/A-Displaying Consumption Data to the User	MBORREL4: New usecase
	STR-617024/A-Activity Diagrams	MBORREL4: New section/header/paragraph item
	FE-ACT-REQ-342528/A-Instantaneous & Consumption Fuel Economy	MBORREL4: New diagram
	STR-617026/A-Sequence Diagrams	MBORREL4: New section/header/paragraph item
	FE-SD-REQ-342529/A-Instantaneous & Consumption Fuel Economy	MBORREL4: New diagram
	FE-582840/B-Appendix: Reference Documents	MBORREL4: Added reference table

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Table of Contents

1 Architectural Design

1.1 Overview

Fuel Economy IOD shows fuel economy related data in centerstack HMI. Consult with HMI Spec on how this data is displayed.

1.2 FE-CLD-REQ-327828/A-Fuel Economy Client

Fuel Economy Client among other duties it may have, is responsible for displaying the Fuel Economy data in HMI. Consult with HMI spec on how this data would look like.

1.3 FE-CLD-REQ-327829/A-Fuel Economy Server

Fuel Economy Server: Is responsible for sending the Fuel Economy data and relevant information to the client for displaying in HMI.

1.4 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the Fuel Economy IOD 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)
FuelEconomyServer	IPC
FuelEconomyClient	SYNC

1.5 FE-FUR-REQ-327835/B-Logical Table

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

Logical Name	Can Physical Name
LAvgFuelEcoValue	AvgFe_No_Dsply
LAvgFuelEcoUnits	AvgFeTripUnit_D_Stat
LAvgFuelEcoDataDisp	AvgFeActv_B_Dsply
LInsFuelEcoValue	InstFe_No_Dsply
LInsFuelEcoUnits	InstFeTripUnit_D_Stat
LInstFuelEcoMax	InstFeMax_No_Dsply
LConsValue	ConsInst_No_Dsply
LConsUnits	ConsInstUnit_D_Stat
LConsActive	ConsInstActv_B_Dsply
LAvgFuelEcoReset	ResetAvgFE_B_Rq

1.6 FE-IIR-REQ-327830/B-Fuel Economy Client Rx - Server Tx

1.6.1 FE-MD-REQ-327904/B-LAvgFuelEcoValue

Message Type: Status

This signal indicates the average fuel economy data value to display.

Name	Literals	Value	Description
Type	-	-	Indicates average fuel economy data value Unit: unitless Resolution: 0.1 Offset: 0
	units	0x0000 to 0x3FFF	

1.6.2 FE-MD-REQ-327908/B-LAvgFuelEcoUnits

Message Type: Status

This signal indicates the average fuel economy units to display.

Name	Literals	Value	Description
Type	-	-	Indicates average fuel economy units
	Inactive	0x0	
	MPG	0x1	
	Km/L	0x2	
	L/100Km	0x3	
	Reserved	0x4-0xF	

1.6.3 FE-MD-REQ-339109/A-LAvgFuelEcoDataDisp

Message Type: Status

This signal indicates whether the actual average fuel economy data shall be displayed, or dashes.

Name	Literals	Value	Description
Type	-	-	Indicates what average fuel economy data to display
	Inactive	0x0	
	Active	0x1	

1.6.4 FE-MD-REQ-341021/A-LInsFuelEcoValue

Message Type: Status

This signal indicates the instantaneous fuel economy data value to display.

Name	Literals	Value	Description
Type	-	-	Indicates instantaneous fuel economy data value Unit: unitless Resolution: 0.1 Offset: 0
	units	0x0000 to 0x3FFF	

1.6.5 FE-MD-REQ-341023/A-LInsFuelEcoUnits

Message Type: Status

This signal indicates the instantaneous fuel economy units to display.

Name	Literals	Value	Description
Type	-	-	Indicates instantaneous fuel economy units
	Inactive	0x0	
	MPG	0x1	
	Km/L	0x2	
	L/100Km	0x3	
	Reserved	0x4-0xF	

1.6.6 FE-MD-REQ-327906/B-LInstFuelEcoMax

Message Type: Status

This signal indicates the maximum labeled scale for instantaneous fuel economy.

Name	Literals	Value	Description
Type	-	-	Indicates the max instantaneous fuel economy scale Unit: unitless Resolution: 1 Offset: 0
	units	0x00 to 0xFF	

1.6.7 FE-MD-REQ-327905/B-LConsValue

Message Type: Status

This signal indicates the consumption data value to display.

Name	Literals	Value	Description
Type	-	-	Indicates consumption data value Unit: unitless Resolution: 0.1 Offset: 0
	units	0x000 to 0x3FF	

1.6.8 FE-MD-REQ-329150/B-LConsUnits

Message Type: Status

This signal indicates the consumption units to display.

Name	Literals	Value	Description
Type	-	-	Indicates consumption units
	Inactive	0x0	
	GallonPer Hour	0x1	
	LiterPerHour	0x2	
	Reserved	0x3	

1.6.9 FE-MD-REQ-329151/B-LConsActive

Message Type: Status

This signal indicates whether to display consumption data or instantaneous fuel economy data.

Name	Literals	Value	Description
Type	-	-	Indicates whether to display consumption data or instantaneous fuel economy data
	Inactive	0x0	
	Active	0x1	

1.7 FE-IIR-REQ-327831/A-Fuel Economy Client Tx - Server Rx

1.7.1 FE-MD-REQ-327907/B-LAvgFuelEcoReset

Message Type: Request

This signal is used to request a reset of the average fuel economy data.

Name	Literals	Value	Description
Type	-	-	Average fuel economy data reset request
	Null	0x0	
	Reset	0x1	

2 General Requirements

2.1 FE-REQ-342188/A-Powermode Conditions

The FuelEconomyClient shall only allow the functionality defined by this feature/SPSS when the IgnitionStatus_St = Run/Start, and the touch screen display is On.

If IgnitionStatus_St != Run/Start, the FuelEconomyClient shall display dashes (ex. “--.-”) in place of any Average Fuel Economy Data, Instantaneous Fuel Economy Data, or Fuel Consumption Data.

2.2 FE-REQ-342186/A-Feature Configuration

The FuelEconomyClient shall have a configurable parameter to determine whether the vehicle supports the Fuel Economy IOD.

- If the parameter indicates that the vehicle supports the Fuel Economy IOD, all of the requirements and functions in this SPSS shall be followed, and the FuelEconomyClient shall make the Fuel Economy IOD available/visible to the user.
- If the parameter indicates that the vehicle does not support the Fuel Economy IOD, none of the requirements and functions in this SPSS shall be followed, and the FuelEconomyClient shall not make the Fuel Economy IOD available/visible to the user.

2.3 FE-REQ-342657/A-Reset Button Configuration

The FuelEconomyClient shall have a configurable parameter to determine whether it supports the Average Fuel Economy Reset Button.

- If the parameter indicates that the FuelEconomyClient supports the Reset Button, the Fuel Economy IoD shall make the Reset button available/visible to the user.
- If the parameter indicates that the FuelEconomyClient does not support the Reset Button, the Fuel Economy IoD shall not make the Reset button available/visible to the user.

Note: This configuration is used so that only one module/Client has the ability to request the Reset from the Server (ex. for CX727, the Reset button will remain on the Server, and so this button shall not be offered on the Client).

2.4 FE-SR-REQ-341893/A-Request return to Null state

When updating on event, the following event-periodic signals listed below shall hold there signal encoding values for a period of time defined by T_ReturnToNull and then shall transition back to Null as shown in the sequence diagrams:

- LAvgFuelEcoReset

The receiving modules of these signals shall act upon the event signal and shall not wait for the “Null” to act upon the signal request.

2.5 FE-TMR-REQ-341892/A-T_ReturnToNull

Name	Description	Units	Range	Resolution	Default
T_ReturnToNull	The nominal hold time before returning to a Null state. Use the default value +/- 10%.	sec	0.5-2	0.5	1

2.6 FE-REQ-341894/A-Missing Message Strategy

If any of the signals defined in this SPSS (used for displaying any fuel economy data) become unavailable or missing from the bus for more than 5 seconds, the FuelEconomyClient shall display dashes (ex. “--.-”) in place of actual fuel economy data.

3 Functional Definition

3.1 FE-FUN-REQ-333218/B-Average Fuel Economy

3.1.1 Requirements

3.1.1.1 FE-REQ-341051/A-Displaying Average Fuel Economy Data

The FuelEconomyClient shall display the average fuel economy as such:

- When LAvgFuelEcoDataDisp = "(0x0) Inactive" the FuelEconomyClient shall display dashes (ex. "--.-").
- When LAvgFuelEcoDataDisp = "(0x1) Active" the FuelEconomyClient shall display the data indicated by LAvgFuelEcoValue.

3.1.1.2 FE-REQ-341052/A-Displaying Average Fuel Economy Units

The FuelEconomyClient shall display the average fuel economy units as indicated by LAvgFuelEcoUnits.

3.1.1.3 FE-REQ-341058/A-Average Fuel Economy Reset Request

When the Reset button is selected by the user, the FuelEconomyClient shall send LAvgFuelEcoReset = "(0x1) Reset" to the FuelEconomyServer.

If the Powermode Conditions are not satisfied (as per REQ-342188), the FuelEconomyClient shall disable (grey-out, hide, etc.) the Reset button.

3.1.2 Use Cases

3.1.2.1 FE-UC-REQ-342200/A-Displaying Average Fuel Economy to the User

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are met FuelEconomyClient is ON
Scenario Description	The user selects the Fuel Economy IOD on the FuelEconomyClient
Post-conditions	The FuelEconomyClient displays the Average Fuel Economy Data
List of Exception Use Cases	REQ-342306-Displaying Missing Data to the User
Interfaces	FuelEconomyClient CAN, G-HMI

3.1.2.2 FE-UC-REQ-342306/A-Displaying Missing Data to the User

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are not met, OR Signals from FuelEconomyServer are missing from bus FuelEconomyClient is ON
Scenario Description	The user selects the Fuel Economy IOD on the FuelEconomyClient
Post-conditions	The FuelEconomyClient displays dashes (ex. "--.-") in place of the Average, Instantaneous, and Consumption Fuel Economy Data
List of Exception Use Cases	

Interfaces	FuelEconomyClient CAN, G-HMI

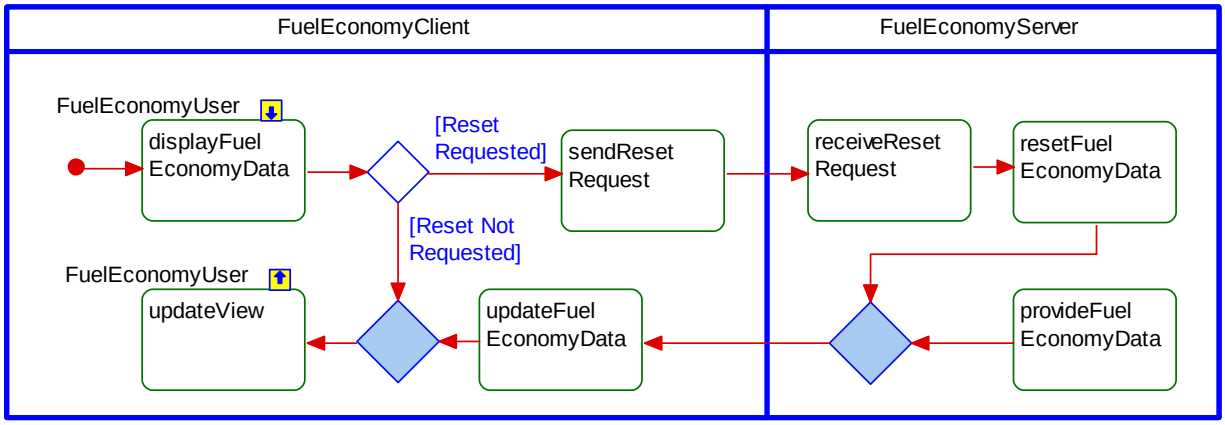
3.1.2.3 FE-UC-REQ-342198/A-User Performs Average Fuel Economy Reset

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are met FuelEconomyClient is ON Fuel Economy IOD is visible
Scenario Description	The user selects the Reset button on the FuelEconomyClient
Post-conditions	The FuelEconomyServer resets the Average Fuel Economy Data The FuelEconomyClient displays dashes (ex. "--.-") in place of the Average Fuel Economy Data
List of Exception Use Cases	
Interfaces	FuelEconomyClient CAN, G-HMI

3.1.3 White Box Views

3.1.3.1 Activity Diagrams

3.1.3.1.1 FE-ACT-REQ-342525/A-Average Fuel Economy & Reset Activity Diagram



3.1.3.2 Sequence Diagrams

3.1.3.2.1 FE-SD-REQ-329149/B-Average Fuel Economy & Reset Constraints

Pre-Condition

Powermode Conditions are met
FuelEconomyClient is ON

Scenarios

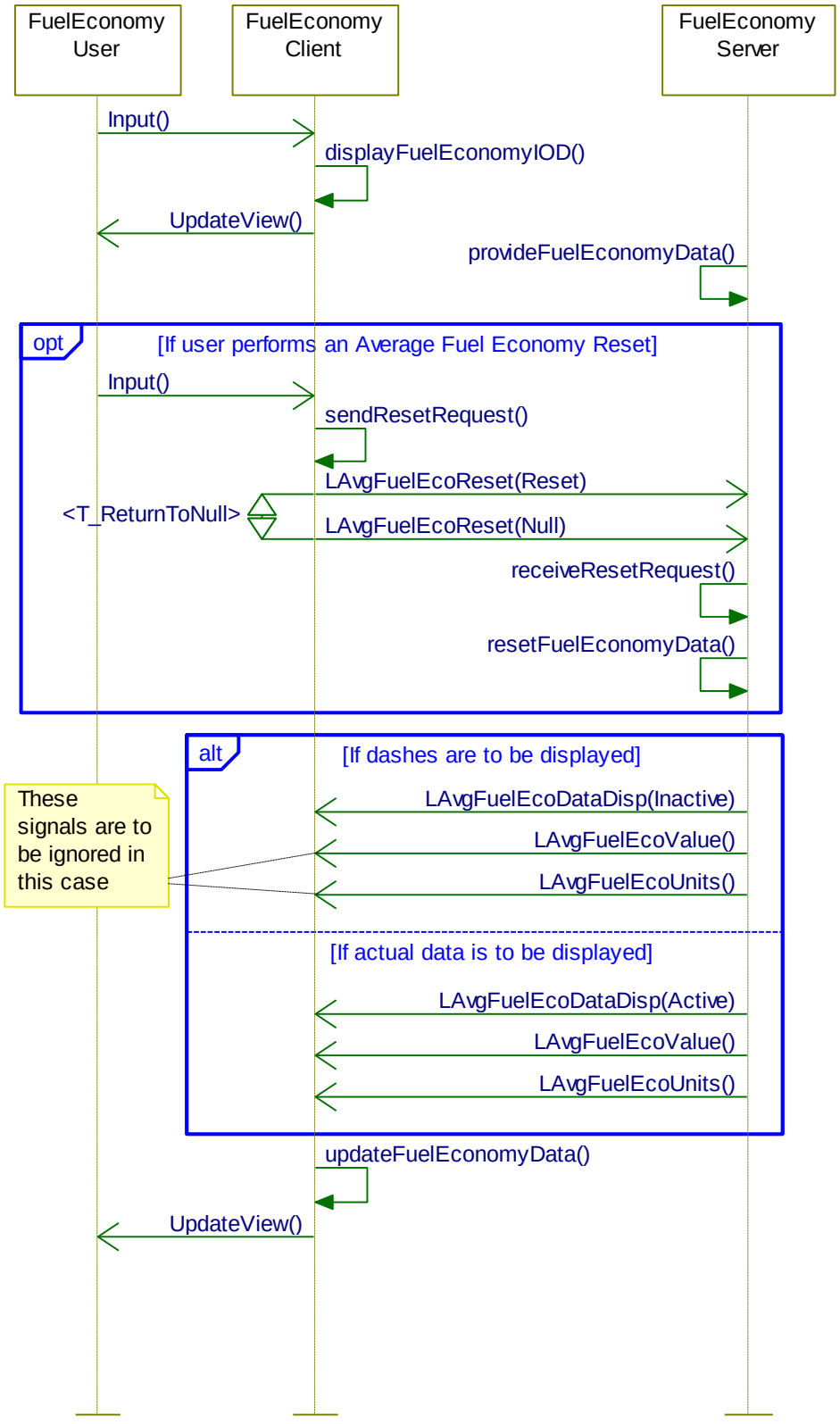
Normal Usage

The user selects the Fuel Economy IOD on the FuelEconomyClient (and optionally selects the Reset Avergae Fuel Economy button)

Post-Condition

The FuelEconomyClient displays the Average Fuel Economy Data (or dashes if Reset was performed)

Sequence Diagram



3.2 FE-FUN-REQ-341029/A-Instantaneous Fuel Economy

3.2.1 Requirements

3.2.1.1 *FE-REQ-341053/A-Displaying Instantaneous Fuel Economy Data*

The FuelEconomyClient shall display the instantaneous fuel economy data indicated by LInsFuelEcoValue.

3.2.1.2 *FE-REQ-341054/A-Displaying Instantaneous Fuel Economy Units*

The FuelEconomyClient shall display the instantaneous fuel economy units as indicated by LInsFuelEcoUnits.

3.2.1.3 *FE-REQ-341055/A-Displaying Instantaneous Fuel Economy Graph*

The FuelEconomyClient shall display the instantaneous fuel economy bar/graph with a maximum scale size indicated by LInstFuelEcoMax.

3.2.2 Use Cases

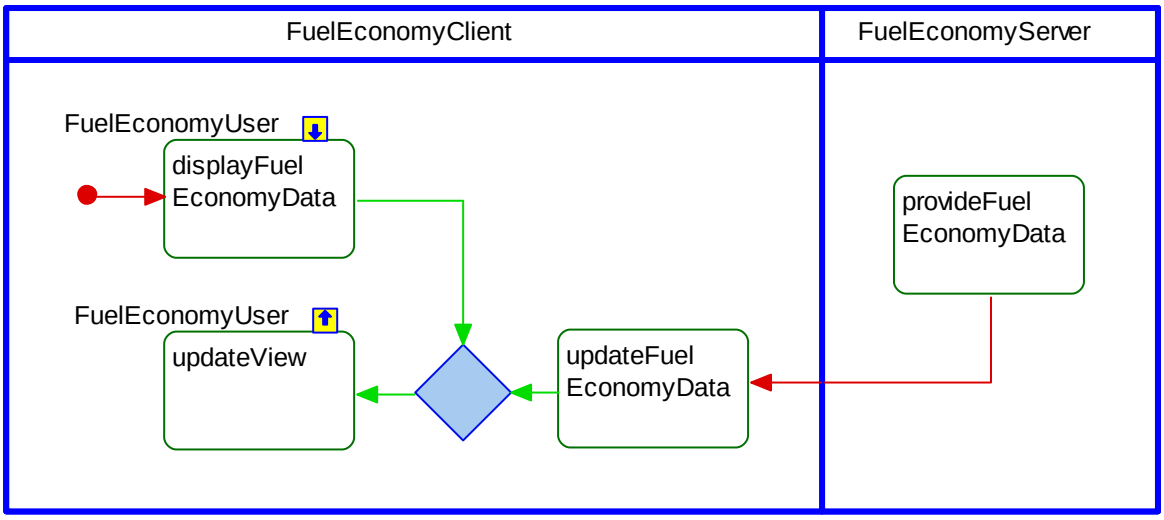
3.2.2.1 FE-UC-REQ-342201/A-Displaying Instantaneous Fuel Economy to the User

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are met FuelEconomyClient is ON
Scenario Description	The user selects the Fuel Economy IOD on the FuelEconomyClient
Post-conditions	The FuelEconomyClient displays the Instantaneous Fuel Economy Data
List of Exception Use Cases	REQ-342306-Displaying Missing Data to the User
Interfaces	FuelEconomyClient CAN, G-HMI

3.2.3 White Box View

3.2.3.1 Activity Diagrams

3.2.3.1.1 FE-ACT-REQ-342528/A-Instantaneous & Consumption Fuel Economy Activity Diagram



3.2.3.2 Sequence Diagrams

3.2.3.2.1 FE-SD-REQ-342529/A-Instantaneous & Consumption Fuel Economy

Constraints

Pre-Condition

Powermode Conditions are met
FuelEconomyClient is ON

Scenarios

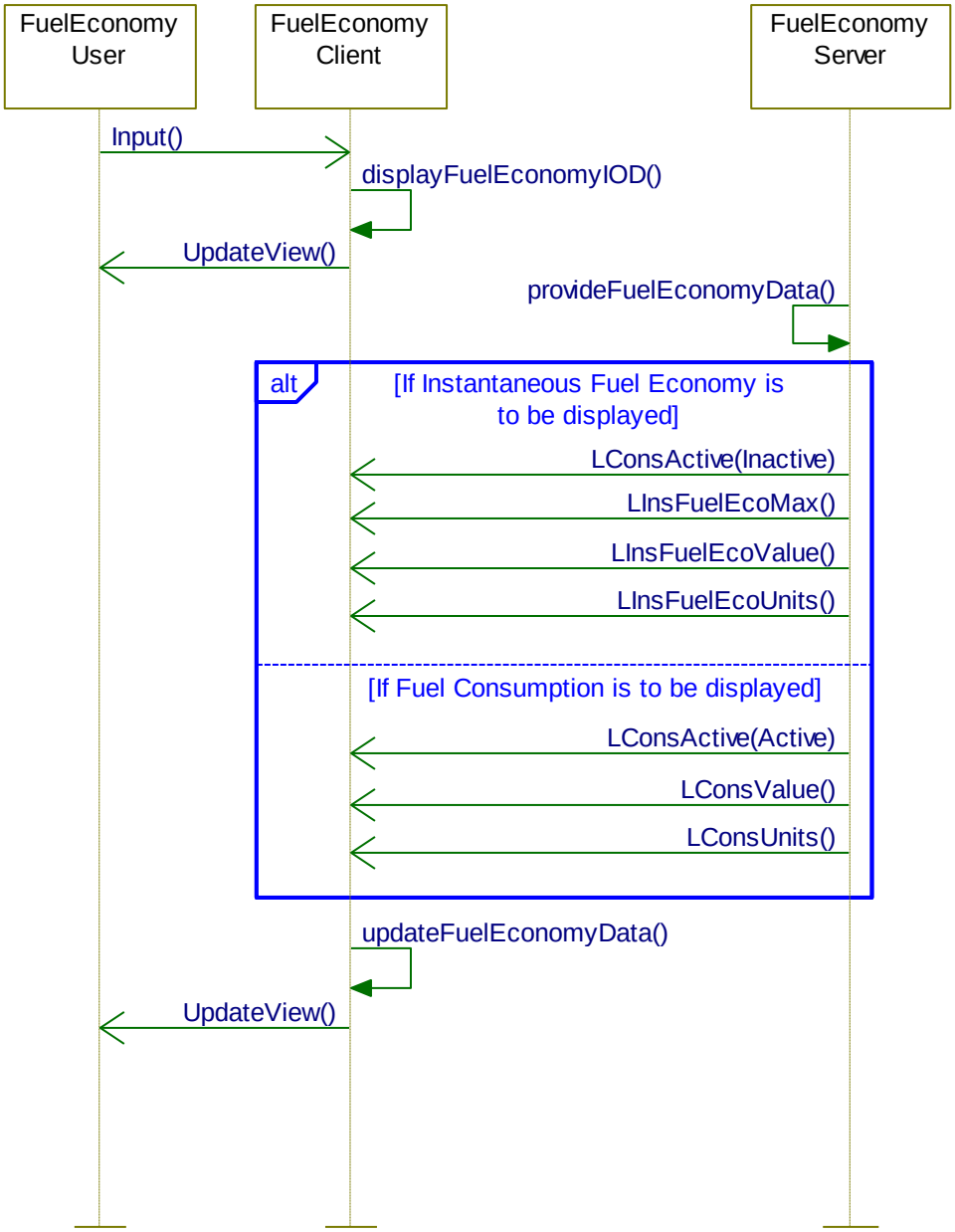
Normal Usage

The user selects the Fuel Economy IOD on the FuelEconomyClient

Post-Condition

The FuelEconomyClient displays the Instantaneous Fuel Economy Data (or Fuel Consumption Data)

Sequence Diagram



3.3 FE-FUN-REQ-341030/A-Fuel Consumption

3.3.1 Requirements

3.3.1.1 FE-REQ-333165/B-Consumption vs. Instantaneous Fuel Economy

The FuelEconomyClient shall display Consumption in place of Instantaneous Fuel Economy as defined below:

- When LConsActive = "(0x1) Active" the Consumption requirements in FUN-REQ-341030-Fuel Consumption shall be followed.
- When LConsActive = "(0x0) Inactive" the Instantaneous Fuel Economy requirements in FUN-REQ-341029-Instantaneous Fuel Economy shall be followed.

3.3.1.2 FE-REQ-341056/A-Displaying Consumption Data

The FuelEconomyClient shall display the consumption data indicated by LConsValue.

3.3.1.3 FE-REQ-341057/A-Displaying Consumption Units

The FuelEconomyClient shall display the consumption units as indicated by LConsUnits.

3.3.2 Use Cases

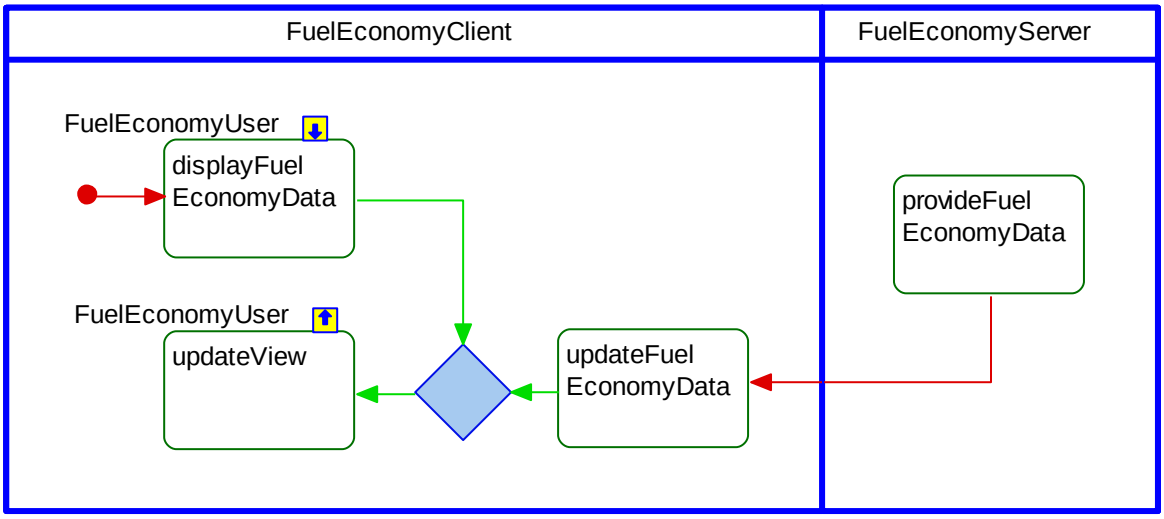
3.3.2.1 FE-UC-REQ-342199/A-Displaying Consumption Data to the User

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are met FuelEconomyClient is ON Vehicle is at stationary/idle
Scenario Description	The user selects the Fuel Economy IOD on the FuelEconomyClient
Post-conditions	The FuelEconomyClient displays the Consumption Data
List of Exception Use Cases	REQ-342306-Displaying Missing Data to the User
Interfaces	FuelEconomyClient CAN, G-HMI

3.3.3 White Box View

3.3.3.1 Activity Diagrams

3.3.3.1.1 FE-ACT-REQ-342528/A-Instantaneous & Consumption Fuel Economy Activity Diagram



3.3.3.2 Sequence Diagrams

3.3.3.2.1 FE-SD-REQ-342529/A-Instantaneous & Consumption Fuel Economy

Constraints

Pre-Condition

Powermode Conditions are met
FuelEconomyClient is ON

Scenarios

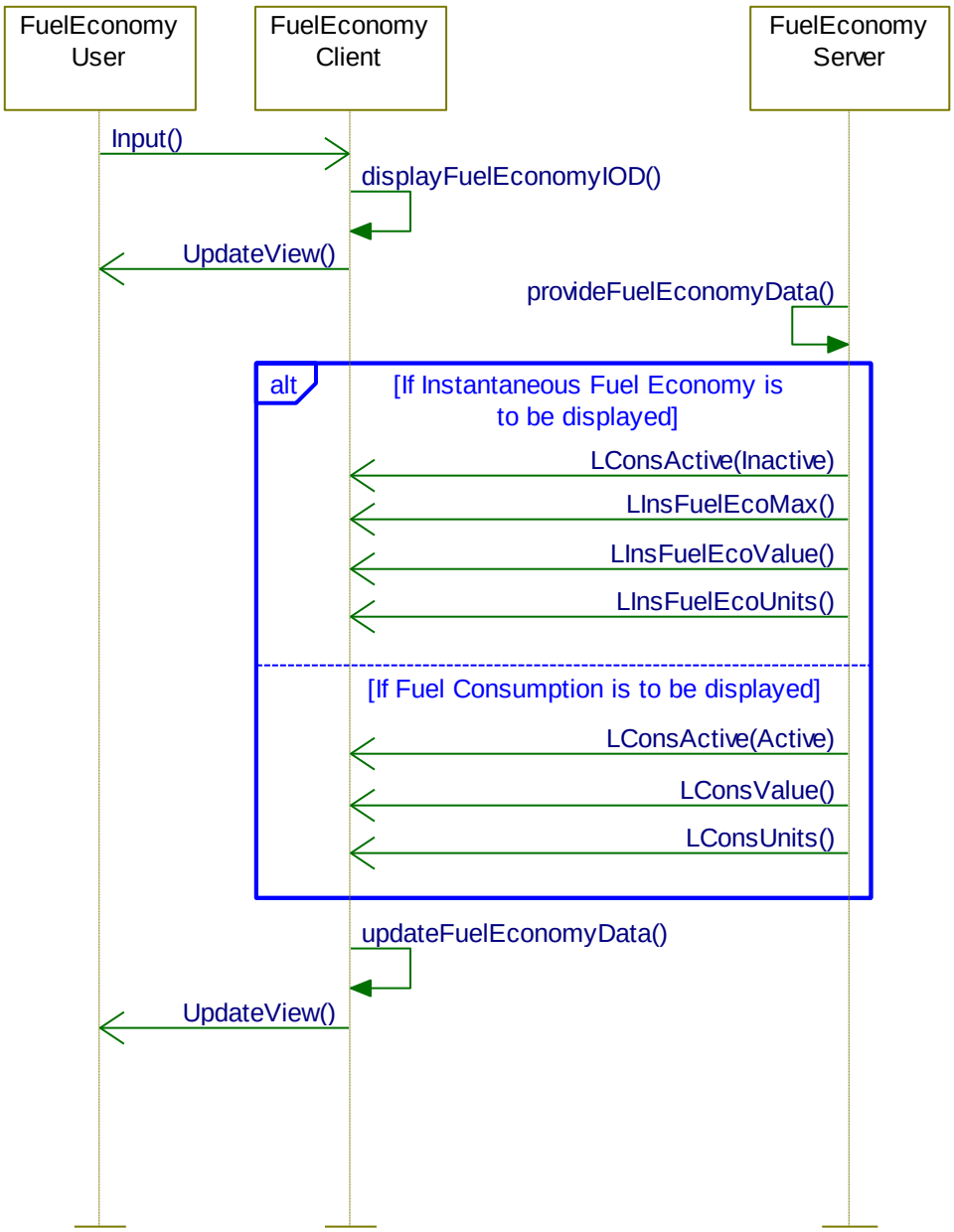
Normal Usage

The user selects the Fuel Economy IOD on the FuelEconomyClient

Post-Condition

The FuelEconomyClient displays the Instantaneous Fuel Economy Data (or Fuel Consumption Data)

Sequence Diagram



4 Appendix: Reference Documents

Reference #	Document Title
1	Fuel Economy IOD HMI specifications
2	H87a_SYNC4_IoD_In _SYNC_Requirements
3	
4	
5	
6	
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