Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Off-road Front View Camera

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.0

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Version Date: May 31st, 2013

FORD CONFIDENTIAL

Revision History

Date	Version	Notes
May 31st, 2013	1.0	Initial Release

Table of Contents

1.1 Architectural Design

1.1.1 FAS-FVCv1-GCLD-266635-1-FrontViewCameraClient

Responsibility: The FrontViewCameraClient is the interface of the Front View Camera (FVC) feature. It displays the FVC image to the user and acts with other system parts that control the FVC or need data from it.

1.1.2 FrontViewCameraClient Interface

1.1.2.1 FAS-FVCv1-GIF-266657-1-FrontViewCameraClient_Rx

1.1.2.1.1 FrontCamera_St

(CAN Name: CamraFrntStat_D_Stat)

Message Type: Status

Vehicle status signal for enabling/disabling front camera feature.

Name	Literals	Value	Description
Type	-	-	-
	OFF	0x0	
	ON	0x1	
	NotUsed	0x2	
	NoData	0x3	

1.1.2.1.2 Elocker_St

(CAN Name: RearDiffLckLamp_D_Rq)

Message Type: Status

Vehicle status signal for displaying the Electric Differential Locker (Elocker) engagement message to the user.

Name	Literals	Value	Description
Type	-	-	-
	OFF	0x0	
	ON	0x1	
	Flash	0x2	
	Notused	0x3	

1.1.2.1.3 AwdRange_St

(CAN Name: AwdRnge_D_Actl)

Message Type: Status

Vehicle status signal for the state of the transfer box in terms of range and coupling locking.

"locked" means the AWD coupling / differential is locked.

"auto" means the AWD coupling / differential is under active control (could be locked, open or anywhere in between depending on system).

"2wd" means the AWD coupling is open.

Name	Literals	Value	Description
Type	-	-	-
	LowRangeLocked	0x0	
	LowRangeAuto	0x1	
	LowRange2wd	0x2	
	Neutral	0x3	
	HighRangeLocked	0x4	
	HighRangeAuto	0x5	
	HighRange2wd	0x6	
	Unknown	0x7	

1.1.2.1.4 OffRoadMode_St

(CAN Name: AwdOffRoadMode_D_Stats)

Message Type: Status

Vehicle status signal for the state of Off Road Mode.

Name	Literals	Value	Description
Type	-	-	-
	NormalMode	0x0	
	OffRoad	0x1	
	ExtemeOffRoad	0x2	
	Invalid	0x3	

1.1.2.1.5 GearLvrPos_D_Actl

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	

1.1.2.1.6 GearRvrseActv_D_Actl

Message Type: Status

Vehicle status signal for notifying that Reverse Gear is engaged on a manual transmission vehicle.

Name	Literals	Value	Description
Type	-	-	-
	Inactive	0x0	
	Active	0x1	
	Unknown	0x2	
	Fault	0x3	

1.1.2.1.7 VehicleSpeed_St

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	

1.2 General Requirements

FAS-FVCv1-GREQ-266605-1-Handling Rear Camera Delay Mode (Functional) -
When front view camera is enabled (FrontCamera_St = ON), the rear view camera delay mode setting is ignored by the FrontViewCameraClient (Front camera image takes precedence over Rear camera image when vehicle is in forward gear).

1.3 Functional Definition

1.3.1 FAS-FVCv1-GFUN-293109-Feature Activation

1.3.1.1 Requirements

FAS-FVCv1-GREQ-266606-1-Front View Camera Activation Hysteresis (Functional) -
The FrontViewCameraClient shall use a hysteresis window around the activation speed threshold for front view camera of 2 mph and 100 ms.

Example:

1) The vehicle is driving forward, at less than 15 mph (All conditions for showing front video are true). Front camera image is shown by the FrontViewCameraClient.
2) The vehicle exceeds 15 mph for greater than 100 ms. The front camera image is no longer shown by the FrontViewCameraClient.
3) The vehicle slows down to 13 mph for greater than 100ms. The front camera image is shown again by the FrontViewCameraClient.

FAS-FVCv1-GREQ-267522-1-Deactivate FVC (Functional) -
The FrontViewCameraClient shall stop displaying Front View Camera (FVC) image when one of the following conditions is met:

- Vehicle is shifted into 'Reverse' (Rear View Camera image will be shown)
- Vehicle is shifted into 'Park' (No Image shown in 'Park')
- Power Mode does not equal IgnitionOn_2 or Running_2 or Crank_3
- FVC is disabled (FrontCamera_St = 0x0:OFF)
- Vehicle speed exceeds 15 mph

- Vehicle no longer meets the following conditions:
  1) 4x4 transfer case is locked in 4L (AwdRange_St = 0x0:LowRangeLocked)

  or

  2) Off-Road Mode is on (OffRoadMode_St = 0x1:OffRoad or 0x2:ExtremeOffRoad)
     and
     E-Locker is locked (Elocker_St = 0x1:ON)

FAS-FVCv1-GREQ-266607-1-E-Locker Deactivation Delay (Functional) -
If the FrontViewCameraClient is displaying the Front View Camera (FVC) image (all conditions for front camera image display are true) and the E-Locker transistions from 'Locked' (Elocker_St = 0x1:ON) to 'Unlocked' (Elocker_St = 0x0:OFF), the FrontViewCameraClient shall start a timer (T_eLockerDelay) and shall continue to display the FVC image until the expiration of this timer.

If the FrontViewCameraClient detects that the E-Locker transistions back to 'Locked' prior to the expiration of T_eLockerDelay, and all other conditions for front camera image remain true, the FrontViewCameraClient shall cancel the timer and continue to display the FVC image.

Requirement#	Name	Description	Units	Range	Resolution	Default
FAS-FVCv1-GREQ-266609-1-T_eLockerDelay	T_eLockerDelay	Maximum time FrontViewCameraClient should wait before stopping the display of the FVC video image to the user according to FAS-FVC-GREQ-266607-E-Locker Deactivation Delay.	msec	4975-5025	5.0	5,000.0

1.3.1.2 Use Cases

1.3.1.2.1 FAS-FVCv1-GUC-290140-Activate Front View Camera

Linked Elements
[266606-1] FAS-FVCv1-GREQ-266606-1-Front View Camera Activation Hysteresis
[290141] FAS-FVCv1-GUC-290141-Front View Camera Malfunction
[293097] FAS-FVCv1-GSD-293097-Activate_Deactivate Front View Camera
[293109] FAS-FVCv1-GFUN-293109-Feature Activation

Actors	Vehicle Occupant
Pre-conditions	• The ignition status is Run/Start. • The front view camera feature is enabled. • The Vehicle Speed is less than 15 mph. • The gear position status is not Park and not Reverse. • The 4x4 transfer case is locked in 4L. or The Off-Road Mode is on and the E-Locker is locked.
Scenario Description	The user activates the front view camera by placing the vehicle in forward Gear.
Post-conditions	The vehicle system display shows Front View Camera (FVC) image.
List of Exception Use Cases	E1 – Front View Camera Malfunction
Interfaces	G-HMI Vehicle System Interface

1.3.1.2.2 FAS-FVCv1-GUC-290141-Front View Camera Malfunction

Linked Elements
[290140] FAS-FVCv1-GUC-290140-Activate Front View Camera
[293109] FAS-FVCv1-GFUN-293109-Feature Activation

Actors	Vehicle Occupant

Pre-conditions	• The ignition status is Run/Start. • The front view camera feature is enabled. • The Vehicle Speed is less than 15 mph. • The gear position status is not Park and not Reverse. • The 4x4 transfer case is locked in 4L. or The Off-Road Mode is on and the E-Locker is locked.
Scenario Description	The Front View Camera (FVC) video cannot be shown because of a malfunction.
Post-conditions	The FVC user interface (vehicle system display) indicates that the FVC video cannot be shown because of a malfunction.
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

1.3.1.2.3 FAS-FVCv1-GUC-290142-Deactivate Front View Camera

Linked Elements
[266607-1] FAS-FVCv1-GREQ-266607-1-E-Locker Deactivation Delay
[267522-1] FAS-FVCv1-GREQ-267522-1-Deactivate FVC
[293097] FAS-FVCv1-GSD-293097-Activate_Deactivate Front View Camera
[293109] FAS-FVCv1-GFUN-293109-Feature Activation

Actors	Vehicle Occupant
Pre-conditions	The ignition status is Run/Start. The vehicle system display is showing front view camera image.
Scenario Description	The user deactivates the front view camera by any of the following: • Shifting the vehicle into Reverse gear (RVC image will be shown) • Shifting the vehicle into Park (No image shown in 'Park') • Disabling front view camera • Exceeding the speed threshold (15 mph) • No longer meeting the following conditions: 1) 4x4 transfer case is locked in or 2) Off-Road Mode is on and E-Locker is locked
Post-conditions	The vehicle system display is NOT showing front view camera image.
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

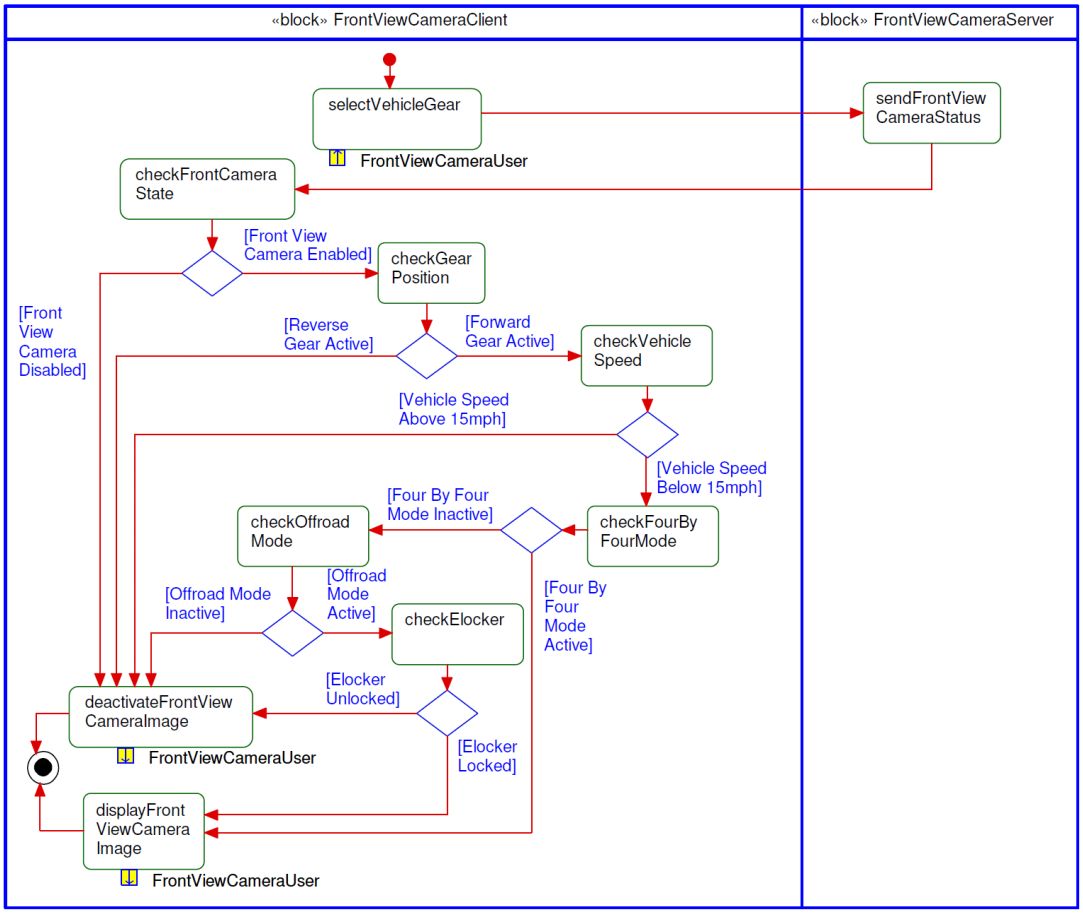
1.3.1.3 White Box View

1.3.1.3.1 Activity Diagrams

FAS-FVCv1-GAD-293107-Front View Camera Activation

Linked Elements

Activity Diagram



1.3.1.3.2 Sequence Diagrams

FAS-FVCv1-GSD-293097-Activate_Deactivate Front View Camera

Linked Elements
[290140] FAS-FVCv1-GUC-290140-Activate Front View Camera
[290142] FAS-FVCv1-GUC-290142-Deactivate Front View Camera
[293107] FAS-FVCv1-GAD-293107-Front View Camera Activation

Scenarios

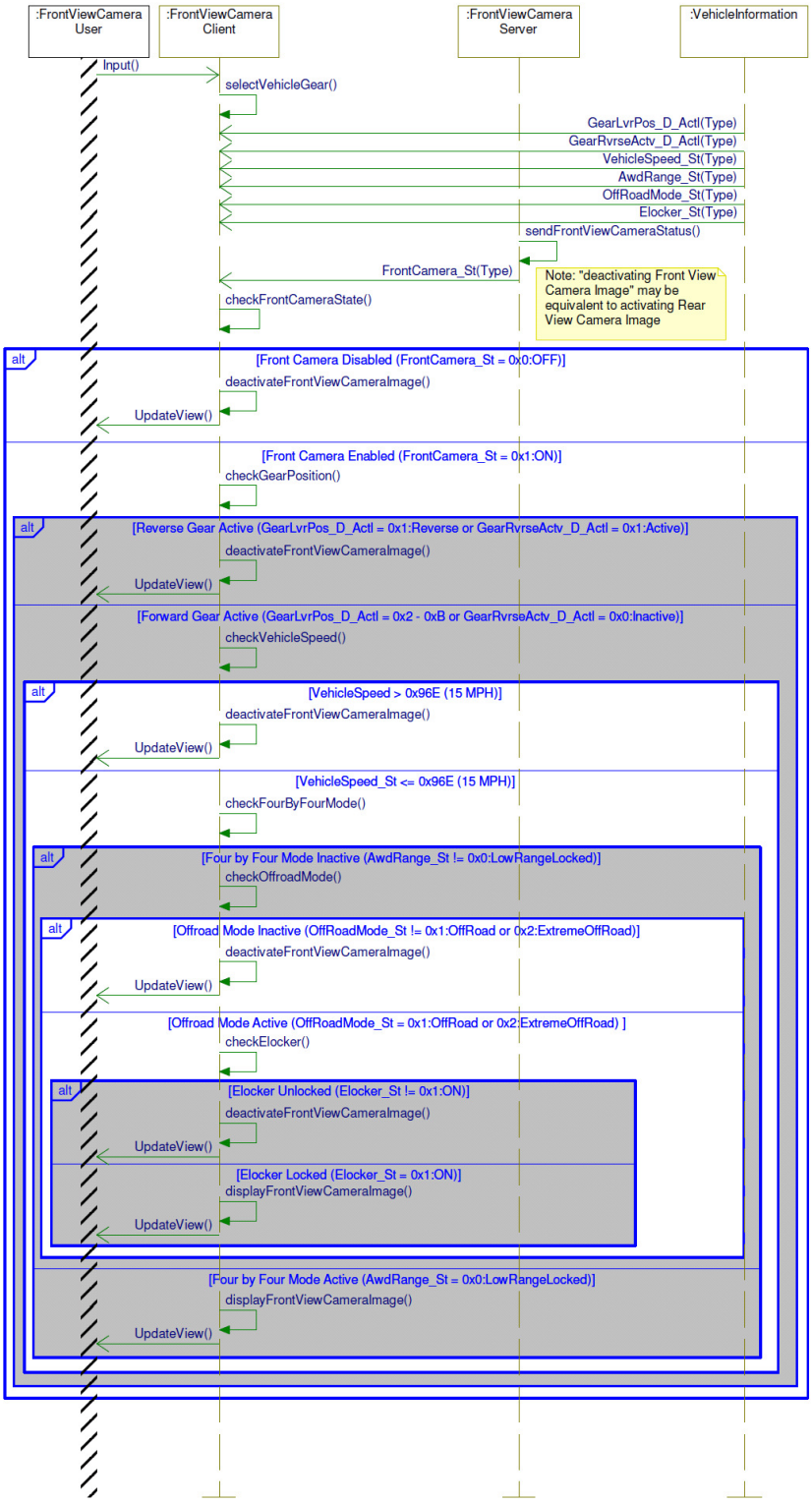
Normal Usage
The front camera is activated or deactivate by driver actions (vehicle gear selection, four by four mode selected, etc.).

Constraints

Pre-condition
Power Mode = IgnitionOn_2 or Running_2 or Crank_3

Post-condition
The appropriate camera image is displayed to the driver.

Sequence Diagram



1.4 Appendix: Reference Documents

Reference #	Document Title
1	
2	
3	
4	
5	