Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – First Notification of Loss

ECG Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.2.1

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
June 16, 2020	1.0	Initial Release	
October 30, 2020	1.1		
	FNOL-FRD-REQ-361084/B-First Notification Of Loss	bganesa7: Added Sample JSON format file for Calibration	
	STR-680809/B-Logical Signal Mapping	bganesa7: Added new requirements	
	FNOL-IIR-REQ-361513/B-FNOL Client _Rx	bganesa7: Added new requirements	
	STR-766663/B-Rx Messages on CAN	bganesa7: Added new requirements	
	MD-REQ-400984/A-Vehicle_Actual_Latitude_St	bganesa7: Added new requirements	
	MD-REQ-400985/A-Vehicle_Actual_Longtitude_St	bganesa7: Added new requirements	
	MD-REQ-400986/A-Vehicle_Actual_Vertical_St	bganesa7: Added new requirements	
	MD-REQ-400983/A-Vehicle_Actual_Yaw_St	bganesa7: Added new requirements	
	MD-REQ-400796/A-YawStabilityIndex_St	bganesa7: Added new requirements	
	MD-REQ-400797/A-ImpactSeverityThreshold_St	bganesa7: Added new requirements	
	MD-REQ-400798/A-Impact_Event_Type_St	bganesa7: Added new requirements	
	MD-REQ-400799/A-Impact_RollOver_St	bganesa7: Added new requirements	
	MD-REQ-400800/A-EDR_EventTriger_St	bganesa7: Added new requirements	
	STR-814426/A-Rx Messages on FTCP	bganesa7: Added new requirement for FTCP calibration command	
	MD-REQ-400801/A-FRCC_Calibration_Config	bganesa7: Added new requirement for FTCP calibration command	
	MD-REQ-385133/B-FRCC_Algorithm_Output_St	bganesa7: Modified the signal definition	
	STR-766666/B-Tx Messages on FTCP	bganesa7: Added new requirement for FTCP calibration command response	
	MD-REQ-400802/A-FRCC_Calibration_Rsp	bganesa7: Added new requirement for FTCP calibration command response	
	STR-679573/B-Functional Definition	bganesa7: Added new requirement	
	FNOL-FUN-REQ-361282/B-FNOL Notification	bganesa7: Added new use case requirements	
	STR-679746/B-Requirements	bganesa7: Added new requirements	
	FNOL-REQ-390482/B-FRCC Algorithm CAN Inputs	bganesa7: Added new requirements	
	FNOL-REQ-390484/B-CAN Data Input	bganesa7:Added new requirements	
	FNOL-REQ-390492/B-FRCC Alert Operation	bganesa7: Modified the requirement as per FO direction	
	STR-766715/B-FNOL Feature configuration	bganesa7: Added new requirements	
	FNOL-REQ-390495/B-Alerts Threshold Configuration	bganesa7: Added new requirements	
	FNOL-REQ-400905/A-FRCC Alert Configuration	bganesa7: Added new requirements	
	FNOL-REQ-390496/B-EOL Configuration List	bganesa7: Added new requirements	
	FNOL-REQ-361284/A-CCS entities that affects FNOL feature	bganesa7: Added new requirements	
	FNOL-REQ-391546/B-FRCC Algorithm output when CCS Settings Enabled	bganesa7: Added reference for CCS settings 'Vehicle Data' and 'Driving Characterstics'	
	FNOL-REQ-391545/B-FRCC Algorithm output when CCS Settings Disabled	bganesa7: Added reference for CCS settings 'Vehicle Data' and 'Driving Characterstics'	
	FNOL-REQ-361285/A-Location Information setting	bganesa7: Added new requirements	
	STR-814592/A-Use Cases	bganesa7: Added new Calibration requirements	
	FNOL-UC-REQ-361536/A-Vehicle Impact detected by FNOL Client	bganesa7: Added new requirements	
	FNOL-UC-REQ-361537/A-Same level impact severity detected by FNOL Client	bganesa7: Added new requirements	
	FNOL-UC-REQ-361538/A-Multiple impacts detected by FNOL Client	bganesa7: Added new requirements	
	FNOL-UC-REQ-400931/A-Vehicle Impact detected when CCS Settings Disabled	bganesa7: Added new requirements	
	FNOL-UC-REQ-400932/A-Vehicle Impact detected when 'Location Sharing' is disabled	bganesa7: Added new requirements	
	FNOL-UC-REQ-400933/A-Alert notification is disabled through EOL Configuration	bganesa7: Added new requirements	

	FNOL-UC-REQ-400944/A-FNOL Client losses connection with Offboard Client	bganesa7: Added new requirements
	FNOL-UC-REQ-400956/A-FRCC Code shared with OnBoard Client	bganesa7: Added new requirements
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	FNOL-REQ-400889/A-Load New/Default Calibration on Ignition ON	bganesa7: Added new Calibration requirements
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	FNOL-REQ-400891/A-Validate new Calibration settings Time stamp	bganesa7: Added new Calibration requirements
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	FNOL-REQ-400895/A-Response for calibration request	bganesa7: Added new Calibration requirements
	FNOL-REQ-400896/A-Model Calibration update via debug command	bganesa7: Added new Calibration requirements
	STR-679752/A-Use Cases	bganesa7: Added new Calibration requirements
	FNOL-UC-REQ-400942/A-FNOL Client receives a valid Cloud Calibration	bganesa7: Added new Calibration requirements
	FNOL-UC-REQ-400943/A-FNOL Client receives an invalid Cloud Calibration	bganesa7: Added new Calibration requirements
	STR-679753/A-White Box View	bganesa7: Added new Calibration requirements
	679754/A-Activity Diagram	bganesa7: Added new Calibration requirements
	FNOL-ACT-REQ-400948/A-FNOL Model Calibration update via Cloud	bganesa7: Added new Calibration requirements
	679755/A-Sequence Diagram	bganesa7: Added new Calibration requirements
	FNOL-SD-REQ-400949/A-FNOL Model Calibration update via Cloud	bganesa7: Added new Calibration requirements
	STR-679570/B-Appendix: Reference Documents	bganesa7: Added reference for FTCP Proto
	STR-814736/A-Sample JSON file format	bganesa7: Added new requirement
May 18, 2021	**1.2**	
	STR-691180/B-Logical Block Diagram	<BG> Updated new logical block diagram
	STR-680809/C-Logical Signal Mapping	<BG> Added new QF signals
	STR-766663/C-Rx Messages on CAN	<BG> Added new CAN signals
	MD-REQ-411814/A-BrakePedal_QualityFactor_St+	<BG> Added new requirement
	MD-REQ-411814/B-Vehicle_Lateral_Acc_QF_St	<BG> Added new requirement
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	MD-REQ-412786/A-Accelerator_Pedal_Position_QF_St	<BG> Added new requirement
	MD-REQ-400797/B-RCM_ImpactSeverityThreshold_St	<BG> Added new CAN signals
	MD-REQ-400798/B-RCM_Impact_Event_Type_St	<BG> Added new CAN signals
	MD-REQ-416467/A-Ecall_Notification_St	<BG> Added new requirements

MD-REQ-400801/B-FRCC_Calibration_Config	<BG> Updated the requirement to align with the ECG
MD-REQ-385133/C-FRCC_Algorithm_Output_St	<BG>Modified the signal definiton
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FNOL-UC-REQ-400956/B-FRCC Code shared with OnBoard Client	<BG> Updated the requirement to align with the ECG
FNOL-ACT-REQ-361557/B-FNOL Data Monitoring	<BG> Updated the requirement to align with the ECG
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FNOL-REQ-400895/B-Response for calibration request	<BG> Modified the requirement
FNOL-FUN-REQ-413864/A-FNOL Near Alerts	<BG> Added new requirements
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	FNOL-UC-REQ-413869/A-EACall Alert notification - When Enabled	<BG> Added new requirements
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	FNOL-UC-REQ-400945/A-High impact Alert notification - When Enabled	<BG> Added new requirements
	STR-886512/A-White Box View	<BG> Added new requirements
	STR-886514/A-Sequence Diagrams	<BG> Added new requirements
	FNOL-SD-REQ-413870/A-FNOL Near Alert notification	<BG> Added new requirements
	STR-679570/C-Appendix: Reference Documents	<BG> Updated the reference document in the Appendix
	STR-814736/B-Appendix: Sample File format	<BG> updated new configuration file
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	STR-814736/C-Appendix: Sample File format	<BG> Added new sample files

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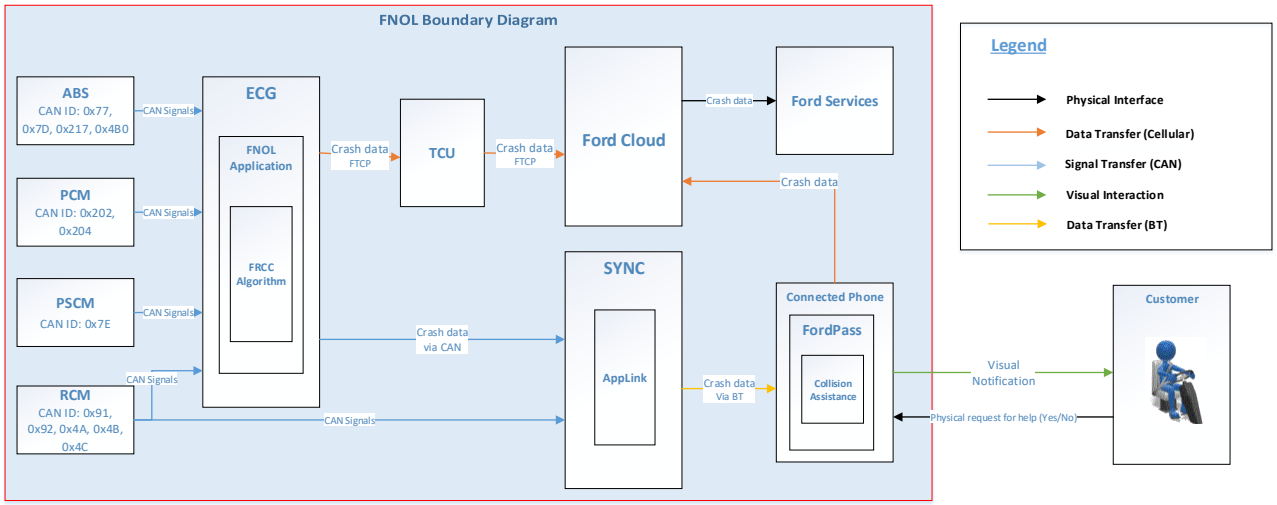
1 Overview

First Notification of Loss ("FNOL") is a feature that detects a qualified vehicle impact and its severity level. Upon impact detection, FNOL notifies the vehicle occupant(s) through the FordPass application about the incident and aid the occupant for post-crash services. In addition, relevant vehicle impact data will be sent to the Cloud. This document specifies the requirements for the FNOL in-vehicle system, specifically, those that apply to the FNOL Client for the Far Phase development.

1.1 Logical Block Diagram



1.2 Terminology and Abbreviations

Acronym	Definition
ABS	Antilock Brake System
ECG	Enhanced Central Gateway
EDR	Event Data Recorder
FNOL	First Notification of Loss
FRCC	Ford Real-time Collision Classification
FTCP	Ford Telematics Communication Protocol
PCM	Powertrain Control Module
RCM	Restrain Control Module
SDN	Service Delivery Network
UTC	Coordinated Universal Time

2 Architectural Design

2.1 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the First Notification of Loss (FNOL) feature can mapped into physical modules. This mapping is an FNV2 example only and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
FNOL Client	ECG
FNOL Server	RCM/ABS/PCM
FNOL OffBoard Gateway	TCU
FNOL OffBoard Client	Ford Cloud
FNOL OnBoard Client	APIM

2.2 FNOL-CLD-REQ-361509/A-FNOL Server

The First Notification of Loss Server (FNOL Server) is responsible for the task listed below:

- Send sensor/vehicle data to the FNOL Client.

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

2.3 FNOL-CLD-REQ-361510/A-FNOL Client

The First Notification of Loss Client (FNOL Client) is responsible for the task listed below:

- Receive sensor/vehicle data from the FNOL Server.
- Process the received data from the FNOL Server and compute Ford Real-time Collision Classification (FRCC) code by employing the FRCC algorithm.
- Determine a qualified vehicle impact.
- Send the computed FRCC code and its corresponding CAN data recording to FNOL OffBoard Client through FTCP Alert.
- Send FRCC codes to the FNOL OnBoard Client.

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

2.4 FNOL-CLD-REQ-361511/A-FNOL OffBoard Gateway

The First Notification of Loss OffBoard Gateway (FNOL OffBoard Gateway) is responsible for the task listed below:

- Receive the data from FNOL Client via SoA interface.
- Process received FTCP Alert message.
- Forward the message to FNOL OffBoard Client, to upload the data in Ford Cloud.

Please review the implementation guide/ block diagram to locate the FNOL OffBoard Gateway class.

2.5 FNOL-CLD-REQ-361512/A-FNOL OffBoard Client

The First Notification of Loss OffBoard Client (FNOL OffBoard Client) is responsible for the tasks listed below:

- Receives the data from FNOL OffBoard Gateway and store the received data in Ford Cloud.

Please review the implementation guide/ block diagram to locate the FNOL OffBoard Client class.

2.6 FNOL-CLD-REQ-390477/A-FNOL OnBoard Client

The FNOL OnBoard Client is responsible for the tasks listed below:

- Receives the FRCC code from the FNOL Client.

Please review the implementation guide/ block diagram to locate the FNOL OnBoard Client.

2.7 Logical Signal Mapping

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

Logical name	CAN signal name
Wheel_FL_Roational_St	WhlFl_W_Meas
Wheel_FR_Roational_St	WhlFr_W_Meas
Wheel_RL_Roational_St	WhlRl_W_Meas
Wheel_RR_Roational_St	WhlRr_W_Meas
Vehicle_Lateral_Acc_Secondary_St	VehLat2_A_Actl
Vehicle_Lateral_Acc_QF_St	VehLatAActl_D_Qf
Vehicle_Actual_Latitude_St	VehLatComp_A_Actl
Vehicle_Longitudinal_Acc_St	VehLong2_A_Actl
Vehicle_Longitudinal_Acc_QF_St	VehLongAActl_D_Qf
Vehicle_Longitudinal_Acc_Comp_St	VehLongComp_A_Actl
Vehicle_Vertical_Acc_St	VehVert2_A_Actl
Vehicle_Vertical_Acc_QF_St	VehVertAActl_D_Qf
Vehicle_Vertical_Acc_Comp_St	VehVertComp_A_Actl
Vehicle_Yaw _Rate_St	VehYaw _W_Actl
Vehicle_Yaw _Rate_QF_St	VehYaw WActl_D_Qf
Vehicle_Actual_Yaw _St	VehYaw Comp_W_Actl
Vehicle_Roll_Rate_St	VehRol_W_Actl
Vehicle_Roll_Rate_QF_St	VehRolWActl_D_Qf
Vehicle_Roll_Rate_Comp_St	VehRolComp_W_Actl
VehicleSpeed_St	Veh_V_ActlEng
VehicleSpeed_QF_St	VehVActlEng_D_Qf
Steering_Pinion_Angle_St	StePinRelInit_An_Sns
Accelerator_Pedal_Position_St	ApedPos_Pc_ActlArb
Accelerator_Pedal_Position_QF_St	ApedPosPcActl_D_Qf
Brake_Torque_Total_St	BrkTot_Tq_Actl
Yaw StabilityIndex_St	Yaw StabilityIndex
RCM_ImpactSeverityThreshold_St	RstrnImpactEvntStatus
RCM_Impact_Event_Type_St	VedsEvntType_D_Ltchd
EDR_EventTriger_St	EDRTriggerEvntSync

FRCC_Algorithm_Output_St	VehImpactCode_No2_Actl
Ecall_Notification_St	eCallConfirmation

Logical name	FTCP Message name
FRCC_Calibration_Config	UpdateFNOLConfigurationCommand
FRCC_Calibration_Rsp	UpdateFNOLConfigurationCommandResponse
FRCC_Alert	RealTimeCollisionStatusAlert
VehicleHighImpactEvent_Alert	VehicleHighImpactEvent_Alert
VehicleMediumImpactEvent_Alert	VehicleMediumImpactEvent_Alert
EACallStatus_Alert	EACallStatus_Alert

2.8 FNOL Client Interface

2.8.1 FNOL-IIR-REQ-361513/B-FNOL Client _Rx

2.8.1.1 Rx Messages on CAN

2.8.1.1.1 MD-REQ-361418/B-Wheel_FL_Rotational_St

Message Type: Status

Rotational speed of front left wheel.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0x7FFD	0 to 327.65 radians / second Resolution: 0.01 Offset:0
	Unknown	0x7FFE	
	Fault	0x7FFF	

2.8.1.1.2 MD-REQ-361419/B-Wheel_FR_Rotational_St

Message Type: Status

Rotational speed of front right wheel.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0x7FFD	0 to 327.65 radians / second Resolution: 0.01 Offset:0
	Unknown	0x7FFE	
	Fault	0x7FFF	

2.8.1.1.3 MD-REQ-361420/B-Wheel_RL_Rotational_St

Message Type: Status

Rotational speed of Rear Left wheel.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0x7FFD	0 to 327.65 radians / second Resolution: 0.01 Offset:0
	Unknown	0x7FFE	
	Fault	0x7FFF	

2.8.1.1.4 MD-REQ-361421/B-Wheel_RR_Rotational_St

Message Type: Status

Rotational speed of Rear Right wheel.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0x7FFD	0 to 327.65 radians / second Resolution: 0.01 Offset:0
	Unknown	0x7FFE	
	Fault	0x7FFF	

2.8.1.1.5 MD-REQ-361407/B-Vehicle_Lateral_Acc_Secondary_St

Message Type: Status

The purpose of this signal is to distribute the actual lateral-acceleration of the vehicle. Left from driver's perspective is positive

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0x1FFD	-40 to 41.89 meters / (second*second) Resolution: 0.01 Offset: -40
	No Data	0x1FFE	No data exists
	Faulty	0x1FFF	Faulty

2.8.1.1.6 MD-REQ-411814/B-Vehicle_Lateral_Acc_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Vehicle_Lateral_Acc_Secondary_St.

Name	Literals	Value	Description
Vehicle_Lateral_Acc_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.7 MD-REQ-400984/A-Vehicle_Actual_Latitude_St

Message Type: Status

The purpose of this signal is to distribute the actual lateral-acceleration of the vehicle.

Name	Literals	Value	Description
Vehicle_Actual_Latitude_St	-	-	
	<Range>	0x0- 0x3FD	-17.9 to 17.835 Unit: meters / (second*second) Resolution: 0.035 Offset: -17.9
	No Data	0x3FE	No data exists
	Faulty	0x3FF	Faulty

2.8.1.1.8 MD-REQ-361408/B-Vehicle_Longitudinal_Acc_St

Message Type: Status

The purpose of this signal is to distribute the actual longitudinal-acceleration of the vehicle. Forward is positive.

Name	Literals	Value	Description
Vehicle_Longitudinal_Acc_St	-	-	
	<Range>	0x0- 0x3FD	-17.9 to 17.835 meters / (second*second)
	No Data	0x3FE	No data exists
	Faulty	0x3FF	Faulty

2.8.1.1.9 MD-REQ-412779/A-Vehicle_Longitudinal_Acc_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Vehicle_Longitudinal_Acc_St.

Name	Literals	Value	Description
Vehicle_Longitudinal_Acc_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.10 MD-REQ-400985/B-Vehicle_Longitudinal_Acc_Comp_St

Message Type: Status

The purpose of this signal is to distribute the actual longitudinal-acceleration of the vehicle.

Name	Literals	Value	Description
Vehicle_Longitudinal_Acc_Comp_St	-	-	
	<Range>	0x0- 0x3FD	-17.9 to 17.835 Unit: meters / (second*second) Resolution: 0.035 Offset: -17.9
	No Data	0x3FE	No data exists
	Faulty	0x3FF	Faulty

2.8.1.1.11 MD-REQ-361409/A-Vehicle_Vertical_Acc_St

Message Type: Status

The purpose of this signal is to distribute the actual vertical-acceleration of the vehicle. Up is positive.

Name	Literals	Value	Description
Vehicle_Vertical_Acc_St	-	-	
	<Range>	0x0- 0x3FD	-17.9 to 17.835 meters / (second*second)
	No Data	0x3FE	No data exists
	Faulty	0x3FF	Faulty

2.8.1.1.12 MD-REQ-412781/A-Vehicle_Vertical_Acc_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Vehicle_Vertical_Acc_St.

Name	Literals	Value	Description
Vehicle_Vertical_Acc_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.13 MD-REQ-400986/B-Vehicle_Vertical_Acc_Comp_St

Message Type: Status

The purpose of this signal is to distribute the actual vertical-acceleration of the vehicle.

Name	Literals	Value	Description
Vehicle_Vertical_Acc_Comp_St	-	-	
	<Range>	0x0- 0x3FD	-17.9 to 17.835 Unit: meters / (second*second)

			Resolution: 0.035 Offset: -17.9
	No Data	0x3FE	No data exists
	Faulty	0x3FF	Faulty

2.8.1.1.14 MD-REQ-361532/B-Vehicle_Yaw_Rate_St

Message Type: Status

The purpose of this signal is to distribute the actual yaw-velocity of the vehicle. When the vehicle is making a left turn this signal is supposed to show positive numbers.

Name	Literals	Value	Description
Vehicle_Yaw_Rate_St	-	-	
	<Range>	0x0- 0xFFFD	-6.5 to 6.6066 radians / second Resolution: 0.002 Offset: -6.5
	No Data	0xFFFE	
	Fault	0xFFFF	

2.8.1.1.15 MD-REQ-412782/A-Vehicle_Yaw_Rate_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Vehicle_Yaw_Rate_St.

Name	Literals	Value	Description
Vehicle_Yaw_Rate_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.16 MD-REQ-400983/A-Vehicle_Actual_Yaw_St

Message Type: Status

This signal is used to indicate actual yaw-velocity of the vehicle.

Name	Literals	Value	Description
Vehicle_Actual_Yaw_St	-	-	
	<Range>	0x0 – 0xFFD	-75 to 74.92659 Unit: degrees / second **Resolution**: 0.03663 **Offset**: -75
	No_Data	0xFFE	No Data Exist
	Fault	0xFFF	Faulty

2.8.1.1.17 MD-REQ-361543/A-Vehicle_Roll_Rate_St

Message Type: Status

This signal is used indicate the actual roll-velocity of the vehicle.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0-0xFFFD	-6.5 to 6.6066 radians / second Resolution: 0.002 Offset: -6.5
	No Data	0xFFFE	
	Fault	0xFFFF	

2.8.1.1.18 MD-REQ-412783/A-Vehicle_Roll_Rate_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Vehicle_Roll_Rate_St.

Name	Literals	Value	Description
Vehicle_Roll_Rate_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.19 MD-REQ-412784/A-Vehicle_Roll_Rate_Comp_St

Message Type: Status

This signal is used to distribute the actual roll rate of the vehicle. Clockwise from rear is positive.

Name	Literals	Value	Description
Vehicle_Roll_Rate_Comp_St	-	-	
	<Range>	0x0-0xFFD	-75 to 74.92659 degrees / second Resolution: 0.03663 Offset: -75
	No Data	0xFFE	
	Fault	0xFFF	

2.8.1.1.20 MD-REQ-367940/A-VehicleSpeed_St

Message Type: Status

This signal is used to represent the vehicle speed.

Name	Literals	Value	Description
Type	-	-	Indicates vehicle speed.
	<Range>	0x0 – 0xFFFF	0 to 655.35 kilometers / hour. Unit: kph Resolution:0.01 Offset:0

2.8.1.1.21 MD-REQ-412785/A-VehicleSpeed_QF_St

Message Type: Status

The signal is used to notify the Quality factor for VehicleSpeed_St.

Name	Literals	Value	Description
VehicleSpeed_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.22 MD-REQ-361403/B-Steering_Pinion_Angle_St

Message Type: Status

The signal informs about steering pinion angle. Datum (zero) of the steering wheel position is for each voltage cycle.

Name	Literals	Value	Description
Steering_Pinion_Angle_St	-	-	
	<Range>	0x0- 0xFFFD	-3200 to 3353.3 degrees Resolution: 0.1 Offset: -3200
	No Data	0xFFFE	No data exists
	Faulty	0xFFFF	Faulty

2.8.1.1.23 MD-REQ-361547/B-Accelerator_Pedal_Position_St

Message Type: Status

This signal is used to indicate the status of the Accelerator pedal position.

Name	Literals	Value	Description
Accelerator_Pedal_Position_St	-	-	
	<Range>	0x0- 0x7FF	0 to 102.3 percent Resolution: 0.1 Offset: 0

2.8.1.1.24 MD-REQ-412786/A-Accelerator_Pedal_Position_QF_St

Message Type: Status

The signal is used to notify the Quality factor for Accelerator_Pedal_Position_St.

Name	Literals	Value	Description
Accelerator_Pedal_Position_QF_St	-	-	
	Faulty	0x0	
	NoDataExists	0x1	
	Degraded	0x2	NotWithinSpecifications
	Ok	0x3	

2.8.1.1.25 MD-REQ-361548/A-Brake_Torque_Total_St

Message Type: Status

This signal is used to indicate the status of the Total torque applied by foundation brakes (not parking brake).

Name	Literals	Value	Description
Brake_Torque_Total_St	-	-	
	<Range>	0x0- 0x1FFD	0 to 32756 newton*meter Resolution: 4 Offset: 0
	Unknown	0x1FFE	
	Fault	0x1FFF	

2.8.1.1.26 MD-REQ-400796/A-YawStabilityIndex_St

Message Type: Status

This signal is used to indicate the status of yaw steering index.

Name	Literals	Value	Description
YawStabilityIndex_St	-	-	
	<Range>	-256 to 255	-256 to 255 percent Unit (%) of under / over steer tendency **Resolution**: 1 **Offset**: -256

2.8.1.1.27 MD-REQ-400797/B-RCM_ImpactSeverityThreshold_St

Message Type: Status

This signal is used to indicate whether crash event severity thresholds, as defined in the RCM specification.

Name	Literals	Value	Description
RCM_ImpactSeverityThreshold_St	-	-	
	Normal	0x0	Normal
	Not_Used1	0x1	Not used
	Not_Used2	0x2	Not used
	Threshold1	0x3	Threshold 1 exceeded
	Not_Used3	0x4	Not used
	Threshold2	0x5	Threshold 2 exceeded
	Not_Used4	0x6	Not used
	Invalid	0x7	Invalid

2.8.1.1.28 MD-REQ-400798/B-RCM_Impact_Event_Type_St

Message Type: Status

This signal is used to indicate the impact event type for the first event to occur between front, side, rear or rollover.

Name	Literals	Value	Description
RCM_Impact_Event_Type_St	-	-	
	No_Event	0x0	No Event
	Front	0x1	Frontal
	Side	0x2	Side
	Rear	0x3	Rear
	Rollover	0x4	Rollover
	Not_Used1	0x5	Not used
	Not_Supported	0x6	Not Supported
	Faulty	0x7	Faulty

2.8.1.1.29 MD-REQ-400799/A-Impact_RollOver_St

Message Type: Status

This signal is used to indicate the rollover status.

Name	Literals	Value	Description
Impact_RollOver_St	-	-	
	No_Event	0x0	No Event
	No	0x1	No
	Yes	0x2	Yes
	Not_Used1	0x3	Not used
	Not_Used2	0x4	Not used
	Not_Used3	0x5	Not used
	Not_Supported	0x6	Not Supported
	Faulty	0x7	Faulty

2.8.1.1.30 MD-REQ-400800/A-EDR_EventTriger_St

Message Type: Status

This signal is used to indicate the Restraints Trigger Event, as defined by the NHTSA EDR Final Rule, has been exceeded.

Name	Literals	Value	Description
EDR_EventTriger_St	-	-	
	Normal	0x0	Normal
	Exceeded	0x1	Threshold Exceeded

2.8.1.1.31 MD-REQ-416467/A-Ecall_Notification_St

Message Type: Status

The purpose of this signal is to allow the RCM to record the status of the emergency call and return the eCallNotification signal to Normal state.

Name	Literals	Value	Description
Ecall_Notification_St	-	-	
	Normal	0x0	
	Call_In_Progress	0x1	
	Call_Completed	0x2	
	Call_Cancelled	0x3	
	Call_Unsuccessful	0x4	
	eCall_Configured_Off	0x5	
	CallComplete_DTMF_Timeout	0x6	
	Not_used	0x7	

2.8.1.2 Rx Messages on FTCP

2.8.1.2.1 MD-REQ-400801/B-FRCC_Calibration_Config

Message Type: FTCP

This FTCP message is used to send a command to FNOL Client to calibrate FRCC Algorithm.

Parameter Name	Description
P_USE_VEH_PARAM	0: NO Vehicle Parameters Required; 1: ALL Vehicle Parameters Required
P_USE_COMP_SIGNAL	Let FRCC know whether to use RAW or COMPENSATED CAN signals
P_BUFFER_FLAG	0: Use Real-time Algo (Not Yet Optimized); 1: Use BUFFER Algo (Optimized for 100Hz CAN feed) to extract features from signals spanning several timesteps.
P_SAMPLE_TIME	Feature sampling time step
P_BUFFER_SIZE	Number of samples to buffer
P_FRCC_HOLD	Hold FRCC CODE for 10 timesteps (i.e. 1 sec when P_BUFFER_FLAG=1 and 0.1sec when P_BUFFER_FLAG=0) if no higher severity impact is reported.
P_M	Total vehicle weight
P_IZ	Vehicle yaw moment of inertia
P_TW	Average track width
P_TWF	Front track width
P_TWR	Rear track width
P_WB	Wheelbase
P_WBF	Front wheelbase
P_WBR	Rear wheelbase
P_LFCG	Distance of CG from front end of vehicle
P_LRCG	Distance of CG from rear end of vehicle
P_TIRE_WIDTH_SPEC	Tire width specification
P_TIRE_H2W_RATIO_SPEC	Tire height to width ratio specification
P_WHEEL_DIAMETER_SPEC	Wheel diameter specification

P_EPSILON	Used for threshold check for accelerations, yaw rate, roll rate, impact angle etc.
P_SPEED_THRSH	Vehicle speed threshold
P_VERT_ACC_OFFSET	Offset for vertical acceleration from RCM CAN signal
P_IMPACT_T1_THRSH_20MS	Duration of impact
P_IMPACT_T2_THRSH_20MS	Duration of impact
P_LONG_CHANGE_V_THRSH_20MS	Change in longitudinal velocity
P_LAT_CHANGE_V_THRSH_20MS	Change in lateral velocity
P_SIDESLIP_RATE_FRONT_THRSH_20MS	Front axle sideslip rate
P_SIDESLIP_RATE_REAR_THRSH_20MS	Rear axle sideslip rate
P_LANE_DEPT_V_THRSH_20MS	Lane departure speed
P_LAT_ACC_CHANGE_THRSH_10MS	Change in lateral acceleration over 10ms
P_YSI_CHANGE_THRSH_10MS	Change in yaw stability index over 10ms
P_YAW_RATE_THRSH_10MS	Yaw rate threshold over 10ms
P_ROLL_RATE_THRSH_10MS	Roll rate threshold over 10ms
P_YAW_RATE_CHANGE_THRSH_10MS	Yaw rate change over 10ms
P_ROLL_RATE_CHANGE_THRSH_10MS	Roll rate change over 10ms
P_SW_ANG_CHANGE_THRSH_10MS	Steering wheel angle change over 10ms
P_ACC_PED_THRSH_10MS	Accelerator pedal position over 10ms
P_BRK_TRQ_THRSH_10MS	Brake torque over 10ms
P_WHLSPEED_CHANGE_THRSH_10MS	Change in wheel speed over 10ms
P_WHLSPEED_VEHSPEED_DIFF_THRSH_10MS	Difference between wheel speed and vehicle speed over 10ms
P_TOT_A_LEVEL0	Total Acceleration Threshold Level 0
P_TOT_A_LEVEL1	Total Acceleration Threshold Level 1
P_TOT_A_LEVEL2	Total Acceleration Threshold Level 2
P_TOT_A_LEVEL3	Total Acceleration Threshold Level 3
P_TOT_A_LEVEL4	Total Acceleration Threshold Level 4
P_TOT_A_LEVEL5	Total Acceleration Threshold Level 5
P_TOT_A_LEVEL6	Total Acceleration Threshold Level 6
P_TOT_A_LEVEL7	Total Acceleration Threshold Level 7
P_TOT_A_FACTOR	Multiplying factor for z-acceleration
P_TOT_J_LEVEL0	Total Jerk Threshold Level 0
P_TOT_J_LEVEL1	Total Jerk Threshold Level 1
P_TOT_J_LEVEL2	Total Jerk Threshold Level 2
P_TOT_ J _LEVEL3	Total Jerk Threshold Level 3
P_TOT_ J _LEVEL4	Total Jerk Threshold Level 4
P_TOT_ J _LEVEL5	Total Jerk Threshold Level 5
P_TOT_ J _LEVEL6	Total Jerk Threshold Level 6
P_TOT_ J _LEVEL7	Total Jerk Threshold Level 7
P_TOT_ J _FACTOR	Multiplying factor for z-jerk

2.8.2 FNOL-IIR-REQ-390471/A-FNOL Client _Tx

2.8.2.1 Tx Messages on CAN

2.8.2.1.1 MD-REQ-385133/C-FRCC_Algorithm_Output_St

Message Type: Status

The signal indicates the output value of the FRCC algorithm.

Name	Literals	Value	Description
Type	-	-	
	<Range>	0x0- 0xFFFF	0 to 65535

2.8.2.2 Tx Messages on FTCP

2.8.2.2.1 MD-REQ-366039/C-FRCC_Alert

Message Type: FTCP

This message is used to transmit the FRCC code and the recorded CAN data to the FNOL Offboard Client when an impact is detected.

Parameters	Value	Description
UTC_time	YYYY-MM-DDTHH:MM:SSZ	ISO8601 format UTC time of the impact
FRCC_code	0 to 65535	Output of FRCC Algorithm
Impact_location		GPS (location when the impact is detected) if allowed by CCS
Buffer_data		CAN data recorded in Event Data Recorder

Note: Refer to the latest "Ford Telematics Communication Protocol Specification" and Proto file for the most up to date FTCP messages/definitions.

2.8.2.2.2 MD-REQ-400802/B-FRCC_Calibration_Rsp

Message Type: FTCP

In response to the FRCC Algorithm calibration request, the FNOL Client shall support to respond back with the status of the calibration operation. The FNOL Client shall update the status of the calibration operation in below format.

Calibration Response	Response Status	Description
FRCC_Calibration_Response	Success	Calibration update is Successful.
	Parsing_Failed	Calibration update Failed due to parsing error.
	Config_Mismatch	Calibration update Failed due to calibration mismatch.
FRCC_Calibration_Parameters	<list of Calibration values>	Respond with the list of persisted Model Calibration values. Details of the list of calibration parameter is mentioned in 'REQ-392396'

Note: Refer to the latest "Ford Telematics Communication Protocol Specification" and Proto file for the most up to date FTCP messages/definitions.

2.8.2.2.3 MD-REQ-416627/A-VehicleHighImpactEvent Alert

Message Type: FTCP

This message transmits the vehicle data as an alert message to FNOL Offboard Client when an impact is detected.

Parameters
vehiclePositionData
vehicleEmergencyData
driverSafetyData

Note: Refer to the latest "Ford Telematics Communication Protocol Specification" and Proto file for the most up to date FTCP messages/definitions.

2.8.2.2.4 MD-REQ-416629/A-VehicleMediumImpactEvent Alert

Message Type: FTCP

This message transmits the vehicle data as an alert message to FNOL Offboard Client when an impact is detected.

Parameters
vehiclePositionData
VehicleStatus
driverSafetyData

Note: Refer to the latest "Ford Telematics Communication Protocol Specification" and Proto file for the most up to date FTCP messages/definitions.

2.8.2.2.5 MD-REQ-416630/A-EACallStatus Alert

Message Type: FTCP

This message transmits the vehicle data as an alert message to FNOL Offboard Client when an impact is detected.

Parameters
vehiclePositionData
vehicleEmergencyData

Note: Refer to the latest "Ford Telematics Communication Protocol Specification" and Proto file for the most up to date FTCP messages/definitions.

3 General Requirements

3.1 FNOL-REQ-362540/A-FTCP Specification References

The following FTCP specification defines the FTCP alerts/commands mentioned in this SPSS, as well as the protocol used to transmit them via the FNOL Client

- Ford Telematics Communication Protocol Specification.
- FNV2-FCI Protocol SPSS.

3.2 FNOL-REQ-362541/A-FNOL OffBoard Client Transmission/Reception on Ethernet

The FNOL OffBoard Client shall follow the FNV2-FCI Protocol SPSS on how to transmit and receive FTCP data to/from the FNOL OffBoard Gateway using Ethernet.

3.3 FNOL-REQ-362542/A-FNOL CAN

All CAN communication is defined in the Ford databases that is provided by Ford. The components shall use the defined CAN messages to request, respond and gather information via CAN.

3.4 FNOL-REQ-390478/A-FNOL CCS Requirement

The FNOL feature is impacted by Customer Connectivity Settings. Please refer to the Customer Connectivity Settings Manager SPSS for details on the impact.

3.5 FNOL-REQ-390479/A-FRCC Algorithm Reference

The FRCC algorithm is developed by Ford Research and Advanced Engineering department. Please refer to "FRCC_Feature_Guide" for additional details of the algorithm. The source code for the algorithm can be obtained from the research engineer. The FNOL Client shall incorporate the FRCC algorithm to support the FNOL feature development.

3.6 FNOL-REQ-391469/B-Data Persistence

The FNOL Client shall persist the unsent data when there is a connection loss and shall attempt to offboard the data once the connection is re-established. The FNOL Client shall discard the unsent data after 48 hours (i.e. Real Time) or after a master reset.

4 Functional Definition

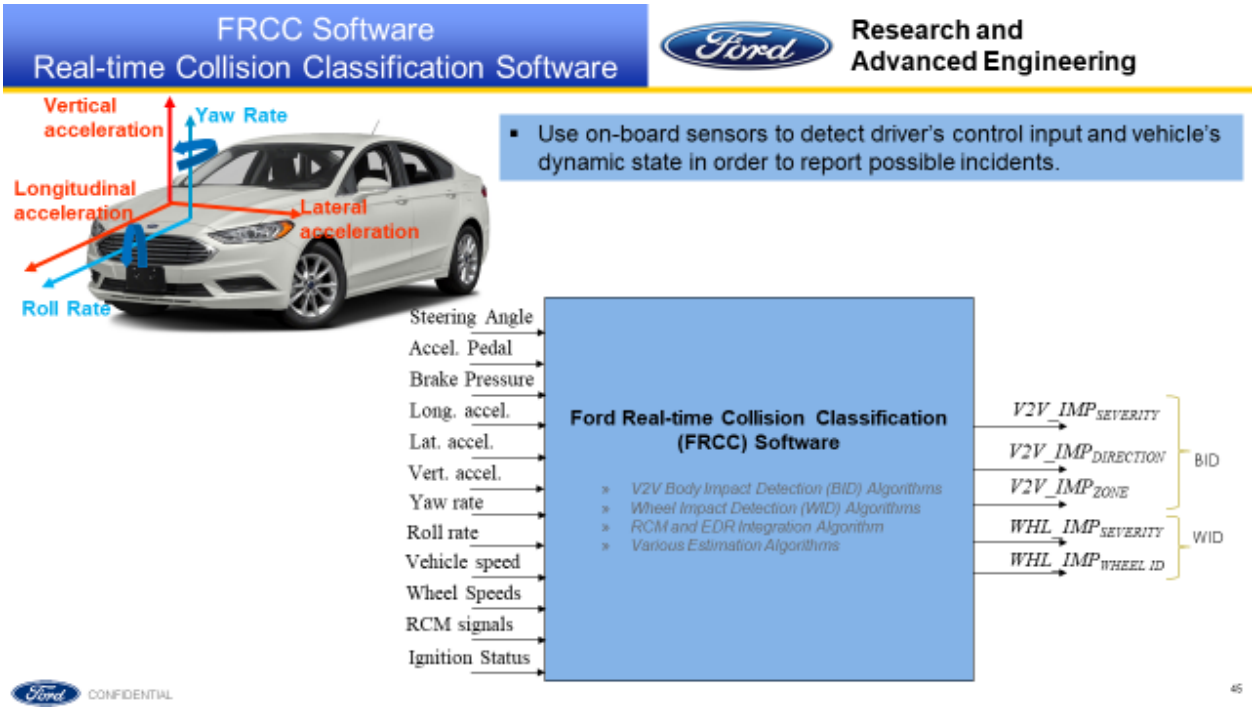
4.1 FNOL-FUN-REQ-361282/B-FNOL Notification

4.1.1 Requirements

4.1.1.1 FNOL-REQ-390480/A-FRCC Algorithm

The Ford Real-time Collision Classification (FRCC) algorithm shall reside on the FNOL Client. The purpose of the algorithm is to detect and determine a qualified impact on the vehicle and the impact severity level, zone/location and direction. The algorithm processes and computes CAN signals received from the FNOL Server and outputs the computed result in the form of FRCC_CODE (integer) every 100 milliseconds.

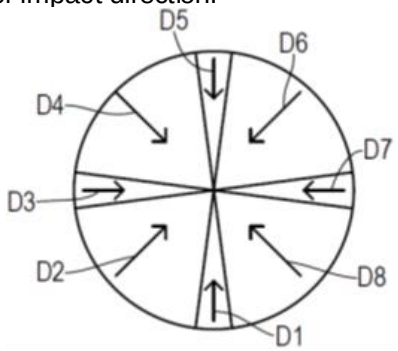
The picture below illustrates the FRCC algorithm.



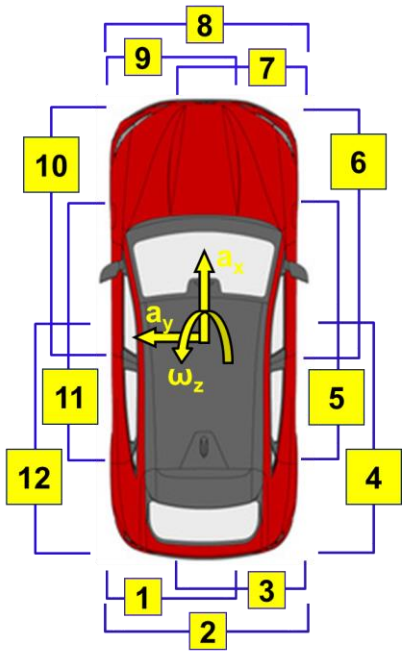
4.1.1.2 FNOL-REQ-390481/B-FRCC Algorithm Components

The FRCC algorithm consists of 3 components:

1. impact severity (FRCCS): Ranges from [0,6]. 0 means there is no detected qualified vehicle impact. 1 means it is a level 1 impact, so on and so forth. The higher the number, the more severe the impact.
2. impact direction (FRCCD): Refer to the diagram for impact direction.



3. impact zone/location (FRCCZ): Refer to the diagram for impact zone.



The mapping of the Ford Real-time Collision Classification (FRCC) to standard SAE-J224 CDC has been created. See below.

FRCC Components	FRCC-SAEJ224 Mapping
Impact Severity ($FRCC_S$)	SAE-J224 CDC severity is based on physical inspection of vehicle and measuring the depth of the deformation (1-9). In FRCC however, the severity (RCCS=[0,6]) has been defined based on the integrated IR algorithms (BID+WID+RCM+EDR).
Impact Direction ($FRCC_D$)	SAE-J224 CDC impact direction/angle is divided into 12 zones. However, in FRCC, it is divided into 8 zones. The SAE directions 3, 6, 9, and 12 are mapped to FRCC D7, D1, D3, and D5 respectively; and directions 1-2, 4-5, 7-8, and 10-11 are merged and mapped into D6, D8, D2, and D4 respectively. The angles are combined to create more clarity and distinction between angled impacts and head-on or side impacts. In reality distinguishing between an angle of impact from, say, 20 degrees to 40 degrees will not provide additional useful information. FRCC also provides impact angle in degrees.
Impact Zone ($FRCC_Z$)	The impact zone for Body Impact Detection (BID) has been mapped from SAE-J224 to FRCC. However, the exact dimension of each zone will be defined in FRCC based on the vehicle size, location of the CG of the vehicle and the dimensions of the wheelbase. The Underbody impact in SAE-J224 is mainly characterized by damages to the wheels/tires but do not identify the impacted wheel(s). However, in FRCC, the WID algorithm is used to detect impact severity and identify the impacted wheel/tire.

>> **$FRCC_{CODE} = 100*FRCC_Z + 10*FRCC_D + FRCC_S$**
>> $FRCC_Z$: FRCC Zone; $FRCC_D$: FRCC Direction; $FRCC_S$: FRCC Severity
>> $FRCC_Z$ = [0, 33]; $FRCC_D$ = [0, 8]; $FRCC_S$ = [0, 6]; Example $FRCC_{CODE}$ = 1802 [passenger side wheel impact w/ severity 2]

4.1.1.3 FNOL-REQ-390482/C-FNOL Client Inputs

The FNOL Client shall ensure the below CAN signals are available for FRCC algorithm by passing the received signals to the FRCC algorithm.

Logical Signal Reference	CAN Signal name	Unit	Frequency	Description
Wheel_FL_Roational_St	WhlFl_W_Meas	[rad/s]	10ms	Wheel Speed – Front Left
Wheel_FR_Roational_St	WhlFr_W_Meas	[rad/s]	10ms	Wheel Speed – Front Right
Wheel_RL_Roational_St	WhlRl_W_Meas	[rad/s]	10ms	Wheel Speed – Rear Left
Wheel_RR_Roational_St	WhlRr_W_Meas	[rad/s]	10ms	Wheel Speed – Rear Right
Vehicle_Lateral_Acc_Secondary_St	VehLat2_A_Actl	[m/s^2]	10ms	Lateral Acceleration
Vehicle_Lateral_Acc_QF_St	VehLatAActl_D_Qf		10ms	Quality factor for Lateral Acceleration

Vehicle_Actual_Latitude_St	VehLatComp_A_Actl	[m/s^2]	10ms	Compensated Lateral Acceleration
Vehicle_Longitudinal_Acc_St	VehLong2_A_Actl	[m/s^2]	10ms	Longitudinal Acceleration
Vehicle_Longitudinal_Acc_QF_St	VehLongAActl_D_Qf		10ms	Quality factor for Longitudinal Acceleration
Vehicle_Longitudinal_Acc_Comp_St	VehLongComp_A_Actl	[m/s^2]	10ms	Compensated Longitudinal Acceleration
Vehicle_Vertical_Acc_St	VehVert2_A_Actl	[m/s^2]	10ms	Vertical Acceleration
Vehicle_Vertical_Acc_QF_St	VehVertAActl_D_Qf		10ms	Quality factor for Vertical Acceleration.
Vehicle_Vertical_Acc_Comp_St	VehVertComp_A_Actl	[m/s^2]	10ms	Actual Vertical Acceleration
Vehicle_Yaw_Rate_St	VehYaw_W_Actl	[deg/s]	10ms	Yaw Rate
Vehicle_Yaw_Rate_QF_St	VehYawWActl_D_Qf		10ms	Quality factor for Yaw rate
Vehicle_Actual_Yaw_St	VehYawComp_W_Actl	[deg/s]	10ms	Actual Yaw Rate
Vehicle_Roll_Rate_St	VehRol_W_Actl		100ms	Actual roll-rate
Vehicle_Roll_Rate_QF_St	VehRolWActl_D_Qf		10ms	Quality factor for Actual roll-rate
Vehicle_Roll_Rate_Comp_St	VehRolComp_W_Actl	[deg/s]	10ms	Roll Rate
VehicleSpeed_St	Veh_V_ActlEng	[km/h]	20ms	Vehicle Speed
VehicleSpeed_QF_St	VehVActlEng_D_Qf		20ms	Quality factor for Vehicle Speed
Steering_Pinion_Angle_St	StePinRelInit_An_Sns	[deg]	10ms	Steering Wheel Angle
Accelerator_Pedal_Position_St	ApedPos_Pc_ActlArb	[%]	10ms	Accelerator Pedal
Accelerator_Pedal_Position_QF_St	ApedPosPcActl_D_Qf		10ms	Quality factor for Accelerator Pedal
Brake_Torque_Total_St	BrkTot_Tq_Actl	[Nm]	20ms	Brake Torque
Yaw StabilityIndex_St	Yaw StabilityIndex	%	20 ms	Yaw Stability Index
RCM_ImpactSeverityThreshold_St	RstrnImpactEvntStatus	-	100 ms	RCM Event Status
RCM_Impact_Event_Type_St	VedsEvntType_D_Ltchd	-	100 ms	RCM Event Type
EDR_EventTriger_St	EDRTriggerEvntSync	-	100 ms	EDR Event Triger

4.1.1.4 FNOL-REQ-390485/B-CAN Signal Quality Factor

The Quality Factor indicates the quality of the CAN signal. The possible values of the Quality Factor enumeration are as shown below:

Value	Labels	Description
0x0	UNKNOWN	Signal is expected to have a QF signal and it is missing
0x1	NOT_PRESENT	Signal has no quality factor
0x2	FAULTY	Faulty quality factor
0x3	NO_DATA_EXISTS	No quality factor data available
0x4	DEGRADED	Degraded Quality Factor
0x5	OK	Quality factor OK

4.1.1.5 FNOL-REQ-390483/A-FRCC Algorithm Initial Start

The FRCC Algorithm shall always be running and shall begin to process and compute upon receiving all the required CAN signals mentioned in 'REQ-390482' with a valid value (i.e. not 'Unknown', 'Fault' or 'No Data') within a 100ms period.

4.1.1.6 FNOL-REQ-361286/A-FRCC Algorithm Inputs

Table below lists all the inputs for FRCC Algorithm. Refer to "FRCC_Feature_Guide" for detailed information.

INDEX	Logical Signal Name	Physical CAN Signal Reference	Unit	INDEX	Corresponding Quality Factor	Units
1	Vehicle_Longitudinal_Acc_St	VehLong2_A_Actl	[m/s2]	23	VehLong2_A_Actl_QF (Corresponds to VehLongAActl_D_Qf)	[0-5]
2	Vehicle_Lateral_Acc_Secondary_St	VehLat2_A_Actl	[m/s2]	24	VehLat2_A_Actl_QF	[0-5]

					(Corresponds to VehLatAActl_D_Qf)	
3	Vehicle_Vertical_Acc_St	VehVert2_A_Actl	[m/s2]	25	VehVert2_A_Actl_QF (Corresponds to VehVertAActl_D_Qf)	[0-5]
4	Vehicle_Yaw_Rate_St	VehYaw_W_Actl	[rad/s]	26	VehYaw_W_Actl_QF (Corresponds to VehYaw WActl_D_Qf)	[0-5]
5	Vehicle_Roll_Rate_St	VehRol_W_Actl	[[rad/s]	27	VehRol_W_Actl_QF (Corresponds to VehRolWActl_D_Qf)	[0-5]
6	VehicleSpeed_St	Veh_V_ActlEng	[km/h]	28	Veh_V_ActlEng_QF (Corresponds to VehVActlEng_D_Qf)	[0-5]
7	Wheel_FL_Roational_St	WhlFl_W_Meas	[rad/s]	29	WhlFl_W_Meas_QF	[0-5]
8	Wheel_FR_Roational_St	WhlFr_W_Meas	[rad/s]	30	WhlFr_W_Meas_QF	[0-5]
9	Wheel_RL_Roational_St	WhlRl_W_Meas	[rad/s]	31	WhlRl_W_Meas_QF	[0-5]
10	Wheel_RR_Roational_St	WhlRr_W_Meas	[rad/s]	32	WhlRr_W_Meas_QF	[0-5]
11	Yaw StabilityIndex_St	Yaw StabilityIndex	[-256 to 255]	33	Yaw StabilityIndex_QF	[0-5]
12	Steering_Pinion_Angle_St	StePinRelInit_An_Sns	[deg]	34	StePinRelInit_An_Sns_QF	[0-5]
13	Accelerator_Pedal_Position_St	ApedPos_Pc_ActlArb	[%]	35	ApedPos_Pc_ActlArb_QF (Corresponds to ApedPosPcActl_D_Qf)	[0-5]
14	Brake_Torque_Total_St	BrkTot_Tq_Actl	[Nm]	36	BrkTot_Tq_Actl_QF	[0-5]
15	EDR_EventTriger_St	EDRTrigger EvntSync	[0 / 1]	37	EDRTrigger EvntSync_QF	[0-5]
16	RCM_ImpactSeverityThreshold_St	RstrnImpactEvnt Status	[0-7]	38	RstrnImpactEvnt Status_QF	[0-5]
17	RCM_Impact_Event_Type_St	VedsEvntType_D_Ltchd	[0-7]	39	VedsEvntType_D_Ltchd_QF	[0-5]
18	Vehicle_Longitudinal_Acc_Comp_St	VehLongComp_A_Actl	[m/s2]	40	VehLongComp_A_Actl_QF	[0-5]
19	Vehicle_Actual_Latitude_St	VehLatComp_A_Actl	[m/s2]	41	VehLatComp_A_Actl_QF	[0-5]
20	Vehicle_Vertical_Acc_Comp_St	VehVertComp_A_Actl	[m/s2]	42	VehVertComp_A_Actl_QF	[0-5]
21	Vehicle_Actual_Yaw_St	VehYaw Comp_W_Actl	[deg/s]	43	VehYaw Comp_W_Actl_QF	[0-5]
22	Vehicle_Roll_Rate_Comp_St	VehRolComp_W_Actl	[deg/s]	44	VehRollComp_W_Actl_QF	[0-5]

Note: Please note that some quality factor names differ slightly from their corresponding CAN signal names. These are noted in the table. For e.g., for index 23, CAN signal VehLongAActl_D_Qf corresponds to quality factor VehLong2_A_Actl_QF.

4.1.1.7 FNOL-REQ-390484/C-CAN Data Input

The FNOL Client shall continuously pass through all the required CAN signals to the FRCC algorithm at a fixed rate every 10ms.

4.1.1.8 FNOL-REQ-413664/A-FNOL Client Power Moding

The FNOL Application shall be on and running as long as the FNOL Client is fully powered and awake. It includes transport/factory mode.

4.1.1.9 FNOL-REQ-390486/B-Event Data Recorder

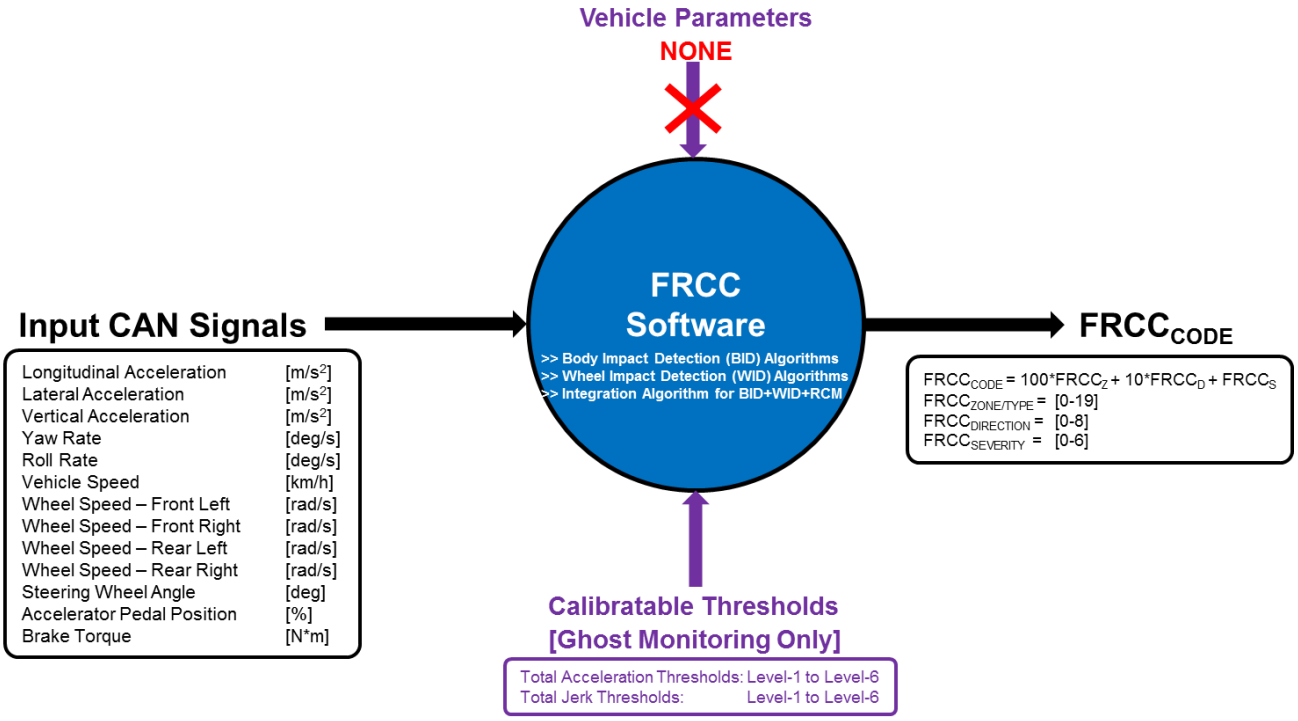
The FNOL Client shall have an Event Data Recorder (i.e., rolling buffer) that continuously records and stores all required CAN signals/messages mentioned in the 'REQ-390482' for the latest 10 seconds while the FNOL application is running. This buffer data will be sent to the FNOL Offboard Client as part of the 'FRCC_Alert' at the direction of the Timer(s) per 'REQ-390492'. The event data recording shall not be affected by the suspension of the algorithm.

4.1.1.10 FNOL-REQ-390487/A-FRCC Code Calculation

The algorithm outputs the computed FRCC code every 100ms. The FRCC code consists of severity, direction and zone/location information and is formulated using the following equations:

FRCC_CODE = 100*Z + 10*D + S

Where,
Z is the impact location/zone on the perimeter of the vehicle
D is the impact direction (non-zero for body impacts and 0 for wheel impacts)
S is the impact severity



4.1.1.11 FNOL-REQ-390488/A-FRCC Code Interpretation

A FRCC code with a value of zero means there is not a qualified vehicle impact, thus the impact severity level is 0. If the code is non-zero, the last digit of the FRCC code indicates the impact severity level. The severity level ranges from 1 to 6, where 1 denotes the lowest severity and 6 denotes the highest severity.

4.1.1.12 FNOL-REQ-390489/B-FNOL FRCC CAN Signal

The FNOL Client shall transmit the FRCC code from the algorithm in the CAN signal 'FRCC_Algorithm_Output_St' every 100ms.

4.1.1.13 FNOL-REQ-390490/A-FNOL Normal Operation

The FNOL Client shall monitor the FRCC code on change, which is outputted every 100ms. The FNOL Client is in normal operation if the code is zero.

4.1.1.14 FNOL-REQ-390491/A-Timers for Different Severity Levels

The FNOL Client shall have up to 6 timers, each with a duration of 5 seconds. Each severity level is assigned to a corresponding timer. See the table below for the mapping.

Severity Level	Timer
Severity 1	Timer 1
Severity 2	Timer 2
Severity 3	Timer 3
Severity 4	Timer 4
Severity 5	Timer 5
Severity 6	Timer 6

The FNOL Client shall treat severity levels 1 – 6 and their corresponding timers independently. Different severity levels shall not interfere with each other and may trigger separate corresponding timers that run concurrently.

4.1.1.15 FNOL-REQ-390492/C-FRCC Alert Operation

If 'FRCC_ALERT_CONFIG' is enabled, upon detecting a severity level higher than 'FRCC_Threshold', the FNOL Client shall store the code in FNOL Client internal memory and take the following actions based on different severity levels (last digit of the code)

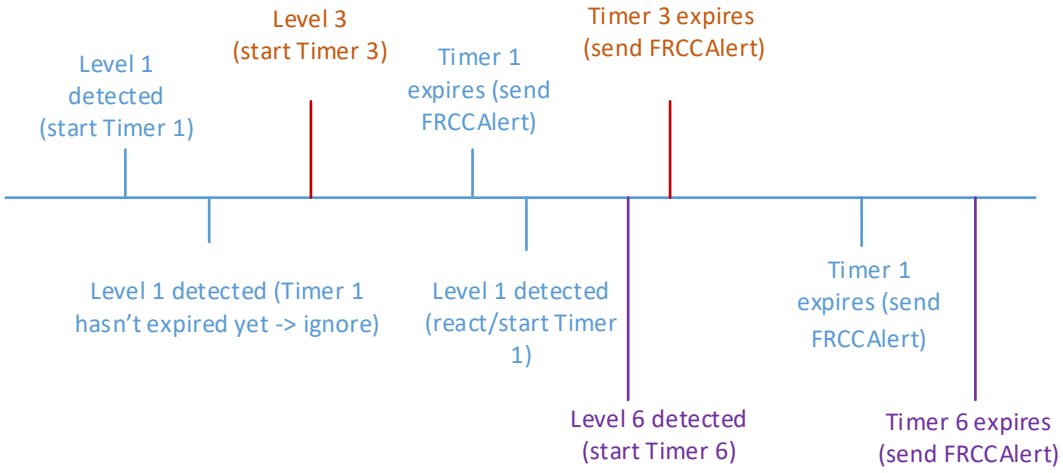
- If the severity level (last digit) is 1, the FNOL Client shall start Timer 1
- If the severity level (last digit) is 2, the FNOL Client shall start Timer 2
- If the severity level (last digit) is 3, the FNOL Client shall start Timer 3
- If the severity level (last digit) is 4, the FNOL Client shall start Timer 4
- If the severity level (last digit) is 5, the FNOL Client shall start Timer 5
- If the severity level (last digit) is 6, the FNOL Client shall start Timer 6

After the detection of a severity level and starting of the timer for that severity level:

1) if the same severity level is detected again before the timer for this level has expired, the FNOL Client shall not restart the timer for this level
2) if the same severity level is detected again after the timer for this level has expired, the FNOL Client shall restart the timer for this level
3) if a different severity level is detected at any time, the FNOL Client shall start its own corresponding timer and shall not impact the other timers that are running

At the expiration of each timer, the FNOL Client shall send the UTC time of the impact, the corresponding FRCC code, GPS location of when the impact is detected and all the data in the Event Data Recorder (-5 seconds to 5seconds) to the FNOL Offboard Client via the 'FRCC_Alert' message.

Below is an example/explanation of the logic:



4.1.1.16 FNOL-REQ-390493/A-FTCP Alerts Transmission Limitation per Severity Level

The FNOL Client shall not send more than 5 FTCP alerts for a severity level per ignition cycle. If the FNOL Client has already transmitted 5 FTCP alerts for a severity level, it shall ignore subsequent FRCC codes for this level for the rest of the time during the same ignition period.

4.1.1.17 FNOL Feature configuration

4.1.1.17.1 FNOL-REQ-390495/C-Alerts Threshold Configuration

The FNOL Client shall support for Diagnostics DID to configure the FRCC_Threshold. Based on the configuration, the FNOL Client shall send the FTCP alerts to Cloud only if the detected severity level is greater than the FRCC_Threshold.

The new configuration shall come in effect on next ignition cycle or after reset. Please refer to Part 2 specification for the configuration details.

4.1.1.17.2 FNOL-REQ-400905/B-FRCC Alert Configuration

The FNOL Client shall support diagnostics DID configuration for 'FRCC_Alert' notification.

- When Enabled, FNOL Client **shall** support to off-board the alert notification to Cloud.
- When Disabled, FNOL Client **shall not** support to off-board the 'FRCC_Alert' notification to cloud.

The new configuration shall come in effect on next ignition cycle or after reset.
Please refer to Part 2 specification under DID "Additional Alert Configuration Byte 2" for the configuration details.

4.1.1.17.3 FNOL-REQ-413669/A-FNOL Event Data Recorder Configuration

The FNOL Client shall support diagnostic DID configuration to determine whether "Buffer_data" shall be sent to the Cloud or not.

- When Enabled, the FNOL Client shall include "Buffer_data" in "FRCC_Alert" when offboarding the alert to the Cloud.
- When Disabled, the FNOL Client shall not include "Buffer_data" in "FRCC_Alert" when offboarding the alert to the Cloud.

The new configuration shall come in effect on next ignition cycle or after reset.
Please refer to Part 2 specification for the configuration details.

4.1.1.17.4 FNOL-REQ-390496/C-EOL Configuration List

Data Identifier	Description	Default Value	Range/ Values	Resolution
FRCC_Threshold	Threshold to send an FTCP alert	0	0 - 6	1
FRCC_ALERT_CONFIG (Refer to Part 2 Diagnostic Specification as part of DID "Additional Alert Configuration Byte 2")	Used to Enable/Disable 'FRCC_Alert' alert notification	0	0: Disable 1: Enable	1
FNOLData	Used to decide whether to send "Buffer_data" in "FRCC_Alert"	0	0: Disable 1: Enable	1

Note: Refer Part 2 Diagnostics Specification for more information.

4.1.1.18 FNOL-REQ-361284/B-CCS entities that affects FNOL feature

The FNOL Client shall consider the feature is enabled by CCS when FNOL CCS entity is overall enabled. FNOL CCS entity includes below sub-entities:

1. UAllow (FNOL is covered by CCS menu "Share Vehicle Data" and "Share Driving Data". Both need to be enabled for UAllow to be enabled)
2. SAllow (Refer to CCS entity Feature 95).
3. PAllow (Refer to CCS entity Feature 95).

4.1.1.19 FNOL-REQ-391546/B-FRCC Algorithm output when CCS Settings Enabled

When the CCS settings is enabled, the FNOL Client shall ensure below actions

1. The FNOL Client shall continue to run the FRCC algorithm.
2. The FNOL Client shall collect and store algorithm output to its internal memory.
3. The FNOL Client shall send the 'FRCC_Alert' upon detecting an impact.
4. The FNOL Client shall continue to send the FRCC code to the FNOL Onboard Client using 'FRCC_Algorithm_Output_St' interface.

4.1.1.20 FNOL-REQ-391545/C-FRCC Algorithm output when CCS Settings Disabled

When the CCS settings is disabled, the FNOL Client shall ensure below actions

1. The FNOL Client **shall not** run the FRCC algorithm and **shall stop** the data Off boarding to FNOL Offboard Client.
2. The FNOL Client shall send CAN signal 'FRCC_Algorithm_Output_St' once with a value of '0' before shutting down.

4.1.1.21 FNOL-REQ-361285/A-Location Information setting

The FNOL Client shall support to monitor the "Share Vehicle Location" settings status.

- When the "Share Vehicle Location" is disabled and when the CCS settings for FNOL is enabled, the FNOL Client shall support to send "FRCC_Alert" without the location information.

- When the "Share Vehicle Location" is enabled and when the CCS settings for FNOL is enabled, the FNOL Client shall support to send "FRCC_Alert" with the location information (i.e. 'Impact_location').

4.1.2 Use Cases

4.1.2.1 FNOL-UC-REQ-361536/B-Vehicle Impact detected by FNOL Client

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC Algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is enabled.
Scenario Description	1. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) greater than 3.
Post-conditions	1. FNOL Client shall start an internal unique timer (i.e. 5 Sec) and at the expiry of the Timer, the FNOL Client shall bundle the payload of 'FRCC_Alert' alert and shall offboard the Alert notification to 'FNOL OffBoard Client'. 2. FNOL Client is limited to send maximum of 5 'FRCC_Alert' notification for a given severity level. (i.e. FNOL client shall limit 5 Alert for each severity level ranging from 0-6). 3. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client. E2 – Impact of same level or higher-level Severity is not detected by FNOL Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL Onboard Client

4.1.2.2 FNOL-UC-REQ-361537/B-Same level impact severity detected by FNOL Client

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is enabled.
Scenario Description	1. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) 4.
Post-conditions	1. FNOL Client shall start an internal unique timer (ex. Timer4 for 5 Sec), while the timer is running FNOL detects the same severity level impact. 2. FNOL Client shall not restart the unique timer (ex. Timer4) and at the expiry of the Timer, the FNOL Client shall bundle the payload of 'FRCC_Alert' alert and shall offboard the Alert notification to 'FNOL OffBoard Client'. 3. FNOL Client is limited to send maximum of 5 'FRCC_Alert' notification for a given severity level. (i.e. FNOL client shall limit 5 Alert for each severity level ranging from 0-6). 4. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL Onboard Client

4.1.2.3 FNOL-UC-REQ-361538/B-Multiple impacts detected by FNOL Client

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold= 3' and 'FRCC_Alert' notification is enabled.
Scenario Description	1. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) 4. 2. While the first impact is processed by FNOL Client, second Vehicle Impact is detected by FNOL Client with impact severity level (FRCC code) 5.
Post-conditions	1. FNOL Client shall start an internal unique timer (ex. Timer4 for 5sec). 2. After second impact, FNOL Client shall start an internal unique timer (ex. Timer5 for 5sec). 3. At the expiry of the Timer (i.e. Timer4) the FNOL Client shall bundle the payload alert and shall offboard the Alert notification 'FRCC_Alert' to 'FNOL OffBoard Client'. 4. On the expiry of the Timer (i.e. Timer5), the FNOL Client shall bundle the payload and shall offboard the Alert notification 'FRCC_Alert' to 'FNOL OffBoard Client'. 5. FNOL Client is limited to send maximum of 5 'FRCC_Alert' notification for a given severity level. (i.e. FNOL client shall limit 5 Alert for each severity level ranging from 0-6). 6. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL Onboard Client

4.1.2.4 FNOL-UC-REQ-400931/B-Vehicle Impact detected when CCS Settings Disabled

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold= 3' and 'FRCC_Alert' notification is enabled. 5. FNOL feature setting is disabled as part of CCS setting.
Scenario Description	1. Vehicle Impact is detected.

Post-conditions	1. Since the CCS settings are disabled FNOL Client shall not run the FRCC algorithm and the FNOL Client **shall not** offboard the data to 'FNOL OffBoard Client'.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client. E2 – Impact of same level or higher-level Severity is not detected by FNOL Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

4.1.2.5 FNOL-UC-REQ-400932/B-Vehicle Impact detected when 'Location Sharing' is disabled

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is enabled. 5. "Location Sharing" is disabled as part of CCS Setting. 6. FNOL feature setting is enabled as part of CCS setting.
Scenario Description	1. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) 4.
Post-conditions	1. FNOL Client shall start an internal unique timer (ex. Timer4 for 5 Sec), 2. Upon expiry of the Timer, FNOL Client shall bundle the payload of 'FRCC_Alert' alert, however 'Impact_location' shall not be loaded to the alert bundle as the 'Location Sharing' settings are disabled. 3. Once the alert notification is bundled the Alert notification shall be offboarded to 'FNOL OffBoard Client'. 4. FNOL Client is limited to send maximum of 5 'FRCC_Alert' notification for a given severity level. (i.e. FNOL client shall limit 5 Alert for each severity level ranging from 0-6). 5. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL Onboard Client

4.1.2.6 FNOL-UC-REQ-400933/B-Alert notification is disabled through EOL Configuration

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is Disabled. 5. FNOL feature settings are enabled as part of CCS settings.
Scenario Description	1. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) greater than 3.
Post-conditions	1. FNOL Client **shall not** start send the 'FRCC_Alert' alert notification to 'FNOL OffBoard Client'. 2. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL OnBoard Client

4.1.2.7 FNOL-UC-REQ-400944/B-FNOL Client losses connection with Offboard Client

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FRCC algorithm output is captured in its internal memory. 4. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is enabled.
Scenario Description	1. FNOL Client losses Connection with FNOL OffBoard Client. 2. Vehicle Impact is detected and FNOL Client detects the impact severity level (FRCC code) greater than 3.
Post-conditions	1. FNOL Client shall start an internal unique timer (i.e. 5 Sec) and at the expiry of the Timer, the FNOL Client shall store the alert bundled data to its internal memory at FIFO order. 2. After 48 hours, the FNOL Client shall purge the unsent alert bundle that is stored in internal memory. 3. FNOL Client is limited to send maximum of 5 'FRCC_Alert' notification for a given severity level. (i.e. FNOL client shall limit 5 Alert for each severity level ranging from 0-6). 6. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency.
List of Exception Use Cases	E1- When the connection is re-established between FNOL Client and FNOL Offboard Client, then the FNOL Client shall offboard the alert bundle from its internal memory.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client, FNOL Onboard Client

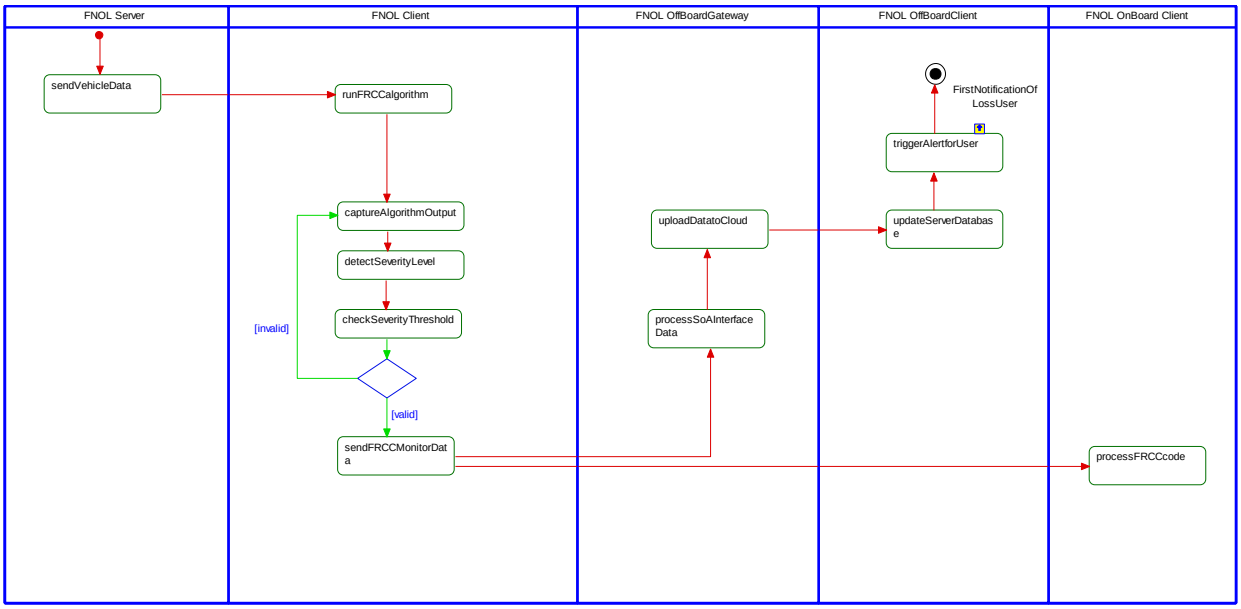
4.1.2.8 FNOL-UC-REQ-400956/B-FRCC Code shared with OnBoard Client

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON. 2. FNOL Client receives all the CAN signal that is necessary for the FRCC algorithm as mentioned in the REQ-390482. 3. FNOL Client is DID configured with 'FRCC_Threshold=3' and 'FRCC_Alert' notification is enabled.
Scenario Description	1. FRCC algorithm output is captured in its internal memory.
Post-conditions	1. Irrespective of the impact threshold the FNOL Client shall send the 'FRCC_Algorithm_Output_St' CAN signal to FNOL Onboard Client at a periodic frequency. 2. FNOL client shall load the 'FRCC_Code' received from the FRCC algorithm.
List of Exception Use Cases	
Interfaces	FNOL Client, FNOL Server, FNOL OnBoard Client

4.1.3 White Box View

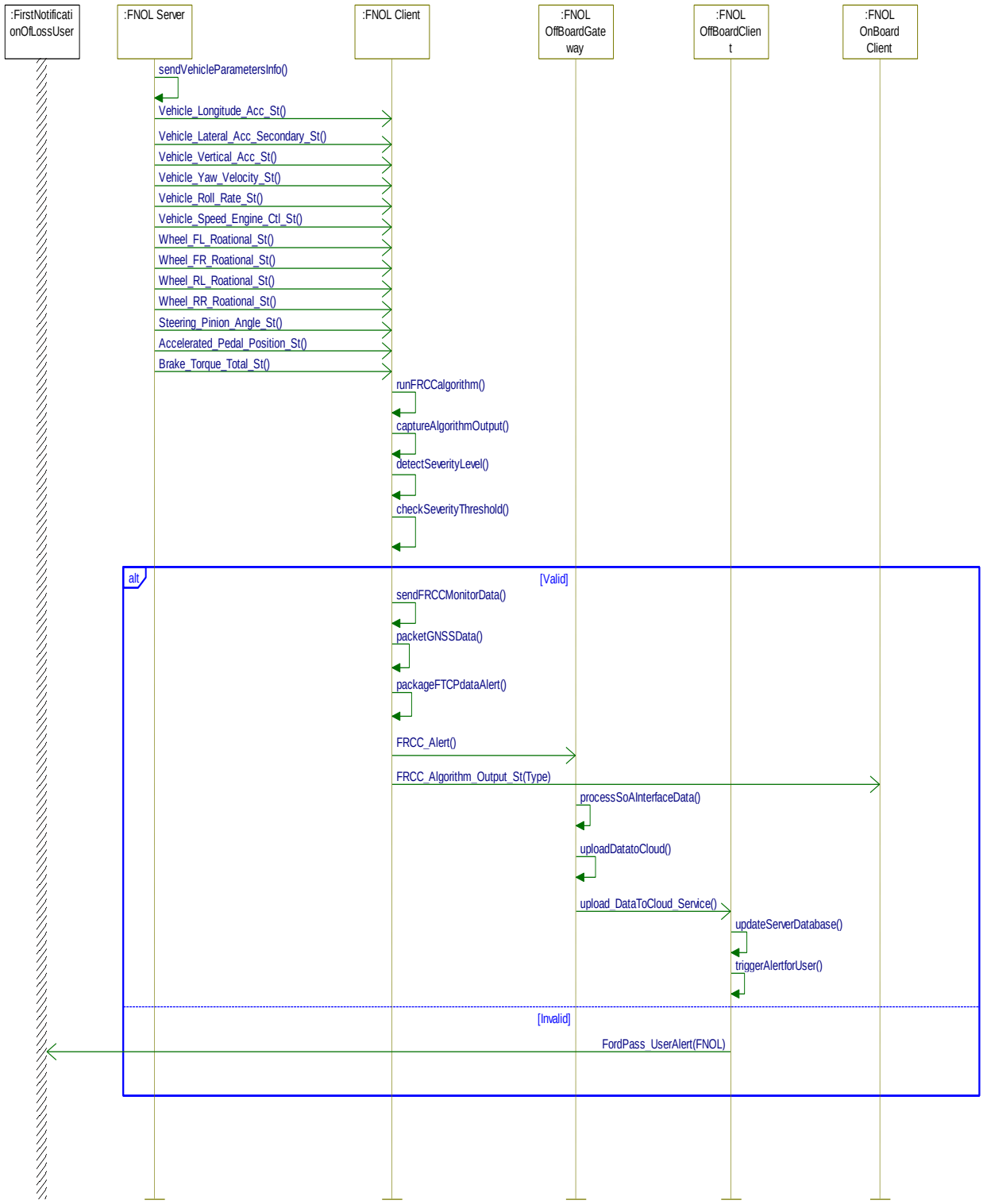
4.1.3.1 Activity Diagram

4.1.3.1.1 FNOL-ACT-REQ-361557/B-FNOL Data Monitoring



4.1.3.2 Sequence Diagram

4.1.3.2.1 FNOL-SD-REQ-361559/B-FNOL Data Monitoring



4.2 FNOL-FUN-REQ-361283/B-FRCC Algorithm Calibration

4.2.1 Requirements

4.2.1.1 FNOL-REQ-400888/B-FRCC Algorithm Calibration parameters as JSON format

The FNOL Client shall support to maintain a set of calibration parameters for FRCC algorithm (FNOL-REQ-392396) and shall receive these calibration parameters in JSON file format.

The FNOL Client shall support to update calibration files through FTCP update mechanism. Table below lists the model name and its assigned JSON file.

Model Name	JSON File name
FRCC algorithm	extFRCCCalibration

4.2.1.2 FNOL-REQ-400889/A-Load New/Default Calibration on Ignition ON

On every ignition cycle, before loading the last known calibration from the persistence memory the FNOL application shall validate the SHA value of the calibration settings read from persistence memory against the last stored SHA value in persistence memory.

1. If the SHA values are same, then the FNOL Application shall validate the calibration settings against the schema
    a. If the validation of last known calibration setting **succeeds**, then the FNOL application shall load and use the calibration settings.
    b. If the validation of last known calibration setting **fails,** then the new calibration settings shall be discarded. And the FNOL application shall load and use the default calibration settings.

2. If the SHA values are different, then default calibration setting shall be loaded and used by FNOL application. The last known calibration shall be purged from persistent memory.

4.2.1.3 FNOL-REQ-400890/A-Validate new Calibration settings SHA value

The FNOL application shall support to validate the SHA value of the new calibration setting against the SHA value that is received through FTCP message.

1. If both SHA value **do not match**, then the FNOL application shall not make changes to the current calibration and shall discard the new calibration settings.
2. If both SHA value **do match**, then the FNOL application shall compare the SHA value of the new calibration against the current calibration setting loaded and used by the FNOL application.
    a. If the SHA value of both the calibration do match, then FNOL application shall discard the new calibration update request.
    b. If the SHA value of both the calibration do not match, then FNOL application shall do the update process.

4.2.1.4 FNOL-REQ-400891/A-Validate new Calibration settings Time stamp

The FNOL application shall support to validate and compare the time stamp of the new calibration setting with the time stamp of the current calibration settings that is used by the FNOL application.

1. If the both timestamps do matches, then no update shall trigger.
2. If the time stamp of the new calibration is older than the current calibration, then the FNOL Application shall not trigger an update and the new calibration shall be discarded.
3. If the time stamp of the new calibration is newer/latest than the current calibration, then the FNOL Application shall do the update process.

4.2.1.5 FNOL-REQ-400892/A-Validate new Calibration settings against the Schema

The FNOL application shall support to validate the new calibration parameters against admissible ranges/resolutions. The FNOL application shall also support to check if all the calibration items are available and valid for new calibration update. The schema for validating the calibration setting shall be within the FNOL application

1. If the validation of new calibration setting **fails**, then the new calibration settings shall be discarded.
2. If the validation of new calibration setting **succeeds**, then the FNOL application shall do the update process.

4.2.1.6 FNOL-REQ-400893/A-Persistence of new Calibration settings

When the FNOL application has validates the new calibration setting as mentioned in the 'REQ-400890/ REQ-400891/ REQ-400892' and if the new calibration settings are found to be valid then the FNOL application shall support to load the details of the calibration data to its internal memory (persistent memory) and the stored data shall not be purged on Master Reset. The values stored in the internal memory shall be retained across ignition cycle and the new calibration changes shall come in effect on subsequent ignition cycle.

The details of calibration data that are persisted are:

1. New calibration parameters.
2. SHA Value of the new calibration.
3. Timestamp of the new calibration.

4.2.1.7 FNOL-REQ-400894/A-Fallback to default Model Calibration

In scenarios where the new model calibration and the last valid calibration are not valid (or) not accessible, the default calibration values shall be used as mentioned in 'FNOL-REQ-392396'

4.2.1.8 FNOL-REQ-392396/C-FRCC Algorithm Calibration Parameters

The FRCC Algorithm has a list of tuning parameters that are calibratable. These calibration parameters shall be updatable remotely through FTCP commands.

Parameter Name	Description	Default Value	Min	Max	Res.	Units
P_USE_VEH_PARAM	0: NO Vehicle Parameters Required; 1: ALL Vehicle Parameters Required	0	0	10	1	integer
P_USE_COMP_SIGNAL	Let FRCC know whether to use RAW or COMPENSATED CAN signals	0	0	1	1	integer
P_BUFFER_FLAG	0: Use Real-time Algo (Not Yet Optimized); 1: Use BUFFER Algo (Optimized for 100Hz CAN feed) to extract features from signals spanning several timesteps.	1	0	1	1	integer
P_SAMPLE_TIME	Feature sampling time step	0.01	0.01	1	0.01	sec
P_BUFFER_SIZE	Number of samples to buffer	10	0	100	1	integer
P_FRCC_HOLD	Hold FRCC CODE for 10 timesteps (i.e. 1 sec when P_BUFFER_FLAG=1 and 0.1sec when P_BUFFER_FLAG=0) if no higher severity impact is reported.	10	0	1000	1	integer
P_M	Total vehicle weight	2470	100	10000	1	kg
P_IZ	Vehicle yaw moment of inertia	6755	100	10000	1	Kg*m^2
P_TW	Average track width	1.73	0.01	10.0	0.01	m
P_TWF	Front track width	0.87	0.01	10.0	0.01	m
P_TWR	Rear track width	0.86	0.01	10.0	0.01	m
P_WB	Wheelbase	3.69	0.01	10.0	0.01	m
P_WBF	Front wheelbase	1.54	0.01	10.0	0.01	m
P_WBR	Rear wheelbase	2.15	0.01	10.0	0.01	m
P_LFCG	Distance of CG from front end of vehicle	2.34	0.01	10.0	0.01	m
P_LRCG	Distance of CG from rear end of vehicle	2.95	0.01	10.0	0.01	m
P_TIRE_WIDTH_SPEC	Tire width specification	255	100	1000	1	mm
P_TIRE_H2W_RATIO_SPEC	Tire height to width ratio specification	65	10	100	1	%

P_WHEEL_DIAMETER_SPEC	Wheel diameter specification	17	10	50	0.1	inch
P_EPSILON	Used for threshold check for accelerations, yaw rate, roll rate, impact angle etc.	0.35	0.01	1.0	0.01	n.a.
P_SPEED_THRSH	Vehicle speed threshold	0	0	100	0.1	Kph
P_VERT_ACC_OFFSET	Offset for vertical acceleration from RCM CAN signal	9.81	0	10	0.01	m/s^2
P_IMPACT_T1_THRSH_20MS	Duration of impact	0.1	0.01	100	0.01	sec
P_IMPACT_T2_THRSH_20MS	Duration of impact	1.0	0.01	100	0.01	sec
P_LONG_CHANGE_V_THRSH_20MS	Change in longitudinal velocity	2	0.1	10	0.01	m/s/20ms
P_LAT_CHANGE_V_THRSH_20MS	Change in lateral velocity	2	0.1	10	0.01	m/s/20ms
P_SIDESLIP_RATE_FRONT_THRSH_20MS	Front axle sideslip rate	0.2	0.01	1	0.01	n.a.
P_SIDESLIP_RATE_REAR_THRSH_20MS	Rear axle sideslip rate	0.2	0.01	1	0.01	n.a.
P_LANE_DEPT_V_THRSH_20MS	Lane departure speed	5.0	0.1	10	0.1	m/s/20ms
P_LAT_ACC_CHANGE_THRSH_10MS	Change in lateral acceleration over 10ms	0.5	0.1	100	0.01	m/s^2/10ms
P_YSI_CHANGE_THRSH_10MS	Change in yaw stability index over 10ms	5	1	100	1	[ ]/10ms
P_YAW_RATE_THRSH_10MS	Yaw rate threshold over 10ms	0.4	0.01	10	0.01	rad/s/10ms
P_ROLL_RATE_THRSH_10MS	Roll rate threshold over 10ms	0.4	0.01	10	0.01	rad/s/10ms
P_YAW_RATE_CHANGE_THRSH_10MS	Yaw rate change over 10ms	0.1	0.01	10	0.01	rad/s^2/10ms
P_ROLL_RATE_CHANGE_THRSH_10MS	Roll rate change over 10ms	0.1	0.01	10	0.01	rad/s^2/10ms
P_SW_ANG_CHANGE_THRSH_10MS	Steering wheel angle change over 10ms	0.2	0.01	100	0.01	rad/s/10ms
P_ACC_PED_THRSH_10MS	Aceelerator pedal position over 10ms	50	0	102	1	[%]
P_BRK_TRQ_THRSH_10MS	Brake torque over 10ms	500	1	3000	1	Nm/10ms
P_WHLSPEED_CHANGE_THRSH_10MS	Change in wheel speed over 10ms	1.5	0.1	100	0.1	Kph/10ms
P_WHLSPEED_VEHSPEED_DIFF_THRSH_10MS	Difference between wheel speed and vehicle speed over 10ms	6.0	0.1	100	0.1	kph/10ms
P_TOT_A_LEVEL0	Total Acceleration Threshold Level 0	0.2g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL1	Total Acceleration Threshold Level 1	0.5g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL2	Total Acceleration Threshold Level 2	0.8g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL3	Total Acceleration Threshold Level 3	1.2g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL4	Total Acceleration Threshold Level 4	1.5g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL5	Total Acceleration Threshold Level 5	2.0g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL6	Total Acceleration Threshold Level 6	3.0g	0.01	1000	0.01	m/s^2
P_TOT_A_LEVEL7	Total Acceleration Threshold Level 7	5.0g	0.01	1000	0.01	m/s^2
P_TOT_A_FACTOR	Multiplying factor for z-acceleration	0.70	0.01	1.0	0.01	n.a.
P_TOT_J_LEVEL0	Total Jerk Threshold Level 0	100	1	10000	1	m/s^3
P_TOT_J_LEVEL1	Total Jerk Threshold Level 1	250	1	10000	1	m/s^3
P_TOT_J_LEVEL2	Total Jerk Threshold Level 2	500	1	10000	1	m/s^3
P_TOT_J_LEVEL3	Total Jerk Threshold Level 3	750	1	10000	1	m/s^3
P_TOT_J_LEVEL4	Total Jerk Threshold Level 4	1000	1	10000	1	m/s^3
P_TOT_J_LEVEL5	Total Jerk Threshold Level 5	1500	1	10000	1	m/s^3
P_TOT_J_LEVEL6	Total Jerk Threshold Level 6	2000	1	10000	1	m/s^3
P_TOT_J_LEVEL7	Total Jerk Threshold Level 7	2500	1	10000	1	m/s^3
P_TOT_J_FACTOR	Multiplying factor for z-jerk	0.80	0.01	1.0	0.01	n.a.

4.2.1.9 FNOL-REQ-400895/B-Response for calibration request

FNOL application shall support to parse and to validate the new Calibration, the schema for validating the new Calibration request shall be with the FNOL application.
Based on the validation results, the FNOL application shall update the 'FRCC_Calibration_Rsp' alert response message.

The status of the response message shall be

1. Success – When the FNOL Client finished updating the new calibration to its internal memory.
2. Parsing_Failed – When the FNOL application finds the new calibration request satisfies any of these criteria
    a. Missing parameters.
    b. Invalid parameters.
    c. SHA sent doesn't match the calculated SHA of the config.
    d. The new Calibration doesn't match the schema.
    e. Error in the JSON file.
3. Config_Mismatch – When the FNOL application finds the new calibration request has earlier timestamp than the current one or the SHA value is same as the current one used by the FNOL application.

The 'FRCC_Calibration_Parameters' field shall contain the updated values when the status is 'Success', or the current persisted values when the status is 'Parsing_Failed' or 'Config_Mismatch'.

4.2.1.10 FNOL-REQ-400896/A-Model Calibration update via debug command

The FNOL Client shall support for EDT debug command to modify the FRCC calibration parameters through JSON file. Before updating the new debug calibration parameters, the FNOL Client shall support to validate the debug calibration parameters against the relevant schema.

1. If the schema validation fails, then the FNOL client **shall not** apply the new debug calibration.
2. If the schema validation succeeds, then the FNOL Client shall apply the new debug calibration changes immediately. The new debug calibration changes **shall not** be persisted over an ignition cycle.

The FNOL Client shall also support to read the current debug calibration parameters (if applicable) and to read the current persisted calibrations. The FNOL Client shall output the calibration parameters in EDT command line.

4.2.2 Use Cases

4.2.2.1 FNOL-UC-REQ-400942/A-FNOL Client receives a valid Cloud Calibration

Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON.
Scenario Description	1. New model calibration file is received from the FNOL OffBoard Client.
Post-conditions	1. The new Calibration settings received from the FNOL OffBoard Client, satisfies the schema, time stamp and SHA value validation. 2. The FNOL Client shall respond with a positive response for the new calibration request from 'FNOL OffBoard Client'. 3. The new Calibration settings shall come in effect on the next ignition cycle.
List of Exception Use Cases	E1- Schema Validation, SHA Value and/or Time stamp validation fails at the FNOL Client
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

4.2.2.2 FNOL-UC-REQ-400943/A-FNOL Client receives an invalid Cloud Calibration

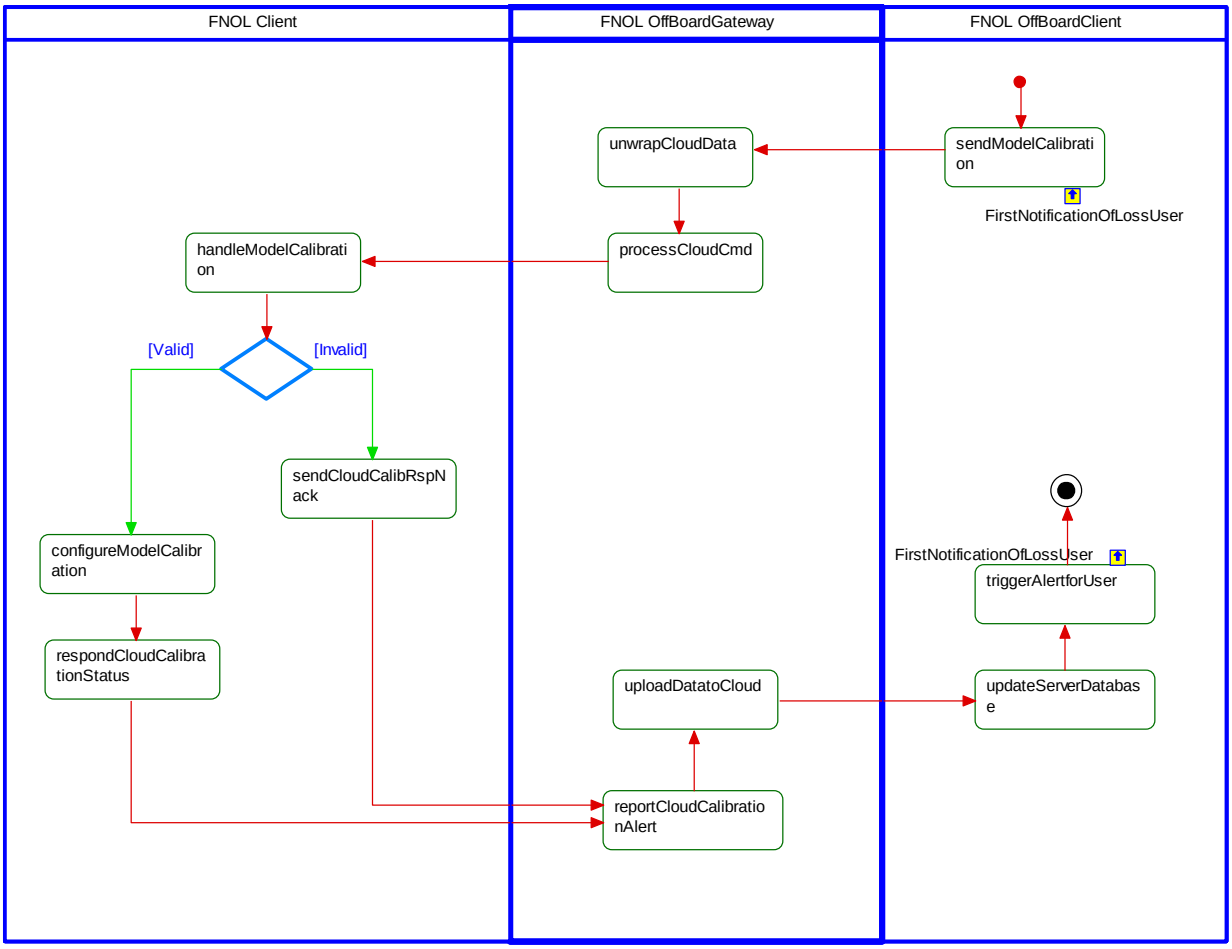
Actors	FNOL User
Pre-conditions	1. Vehicle Ignition ON.

Scenario Description	1. New model calibration file is received from the FNOL OffBoard Client.
Post-conditions	1. The new Calibration settings received from the FNOL OffBoard Client, does not satisfy the schema, time stamp and/or SHA value validation. 2. The FNOL Client shall respond with a negative response for the new calibration request from 'FNOL OffBoard Client'. 3. FNOL Client shall continue to operate on last know calibration settings.
List of Exception Use Cases	
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

4.2.3 White Box View

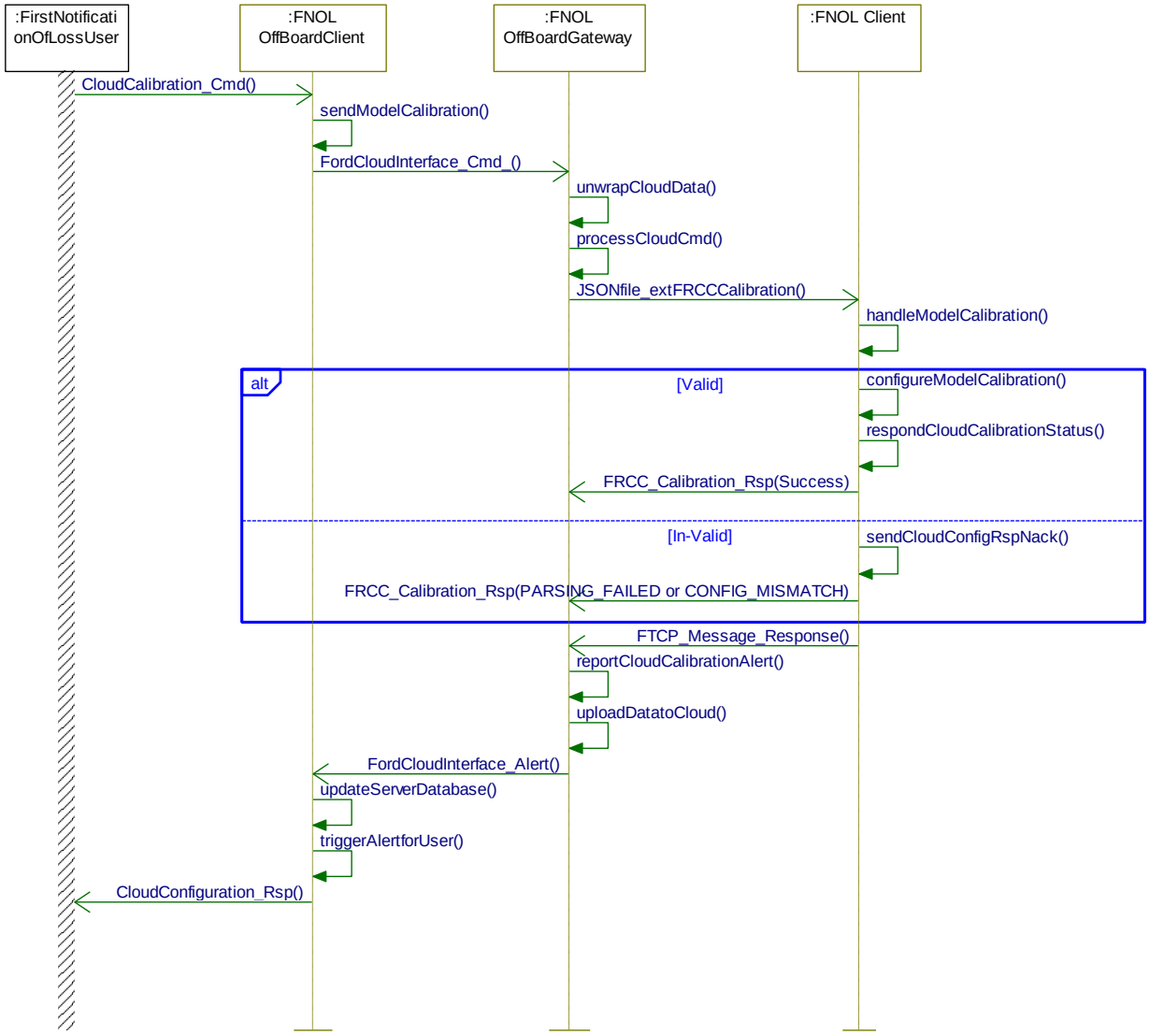
4.2.3.1 Activity Diagram

4.2.3.1.1 FNOL-ACT-REQ-400948/A-FNOL Model Calibration update via Cloud



4.2.3.2 Sequence Diagram

4.2.3.2.1 FNOL-SD-REQ-400949/A-FNOL Model Calibration update via Cloud



4.3 FNOL-FUN-REQ-413864/A-FNOL Near Alerts

4.3.1 Requirements

4.3.1.1 FNOL-REQ-416450/A-High Impact Alert notification event

The FNOL Client shall continuously monitor the CAN signal RCM_ImpactSeverityThreshold_St while the ignition status is at 'Run'/'Start' to identify whether crash event severity thresholds are exceeded or not. Please refer to "Alert trigger conditions" for when to send the VehicleHighImpactEvent alert.

4.3.1.2 FNOL-REQ-416451/A-Medium Impact Alert notification event

The FNOL Client shall continuously monitor the CAN signal EDR_EventTriger_St while the ignition status is at 'Run'/'Start' to identify if there is a medium impact event. Please refer to "Alert trigger conditions" for when to send the VehicleMediumImpactEvent alert.

4.3.1.3 FNOL-REQ-416452/A-EACall Alert notification event

The FNOL Client shall continuously monitor the CAN signal Ecall_Notification_St while the ignition status is at 'Run'/'Start'. Please refer to "Alert trigger conditions" for when to send the EACallStatus alert.

4.3.1.4 FNOL-REQ-416453/A-Data bundles for alerts

Table below lists the FTCP data bundles for each alert. The FNOL Client shall include their corresponding data bundles if available and to use the most recent values when sending the alert. The FNOL Client shall omit the bundle if the data is not available.

	FTCP Data Bundles			
	vehiclePositionData	vehicleEmergencyData	vstat (VehicleStatus)	driverSafetyData
VehicleHighImpactEvent Alert	Yes	Yes	-	Yes
VehicleMediumImpactEvent Alert	Yes	-	Yes	Yes
EACallStatus Alert	Yes	Yes	-	-

Note: Please refer to the latest FTCP protofile for the most up-to-date contents for these data bundles.

4.3.1.5 FNOL-REQ-416454/A-Alerts trigger conditions

The FNOL Client shall send VehicleHighImpactEvent alert, VehicleMediumImpactEvent alert or EACallStatus alert upon detecting the trigger conditions in the table below. The trigger conditions shall be considered met and the corresponding alert shall be immediately sent if the FNOL Client receives a minimum of one transmission of the values listed in the table.

Alert Names	Alert Trigger Conditions
VehicleHighImpactEvent Alert	RCM_ImpactSeverityThreshold_St transitions from 1) Normal (0x0) to Threshold_1_Exceeded (0x3) Or 2) Normal (0x0) to Threshold_2_Exceeded (0x5) Or 3) Threshold_1_Exceeded (0x3) to Threshold_2_Exceeded (0x5)
VehicleMediumImpactEvent Alert	EDR_EventTriger_St transitions from 1) Normal (0x0) to Threshold_Exceeded (0x1)
EACallStatus Alert	Any transition / value change for *Ecall_Notification_St*

4.3.1.6 FNOL-REQ-416596/A-FNOL Near Alert Configuration

The FNOL Client shall support for EOL configuration for FNOL near alerts. Only when the configuration is enabled, the FNOL Client shall support to detect and send the corresponding alert notification.

Data Identifier	Description	Default Value	Range/ Values
Vehicle high Impact	VehicleHighImpactEvent Alert	Disable	0: Disable 1: Enable
Vehicle medium Impact	VehicleMediumImpactEvent Alert	Disable	0: Disable

			1: Enable
EACallStatus	EACallStatus Alert	Disable	0: Disable 1: Enable

The new configuration shall come in effect on next ignition cycle or after reset.
Note: Refer Part 2 Diagnostics Specification for more information.

4.3.1.7 FNOL-REQ-413865/A-Impact on FNOL Near Alerts by CCS Settings

The FNOL Client shall not offboard FNOL Near Alerts when the CCS settings for FNOL is disabled.

Note: Refer FNOL-REQ-361284 for more information on FNOL CCS settings.

4.3.2 Use Cases

4.3.2.1 FNOL-UC-REQ-413869/A-EACall Alert notification - When Enabled

Actors	FNOL User
Pre-conditions	- FNOL Application is running in the FNOL Client. - DID configuration for FNOL EACall Alert is enabled.
Scenario Description	- The FNOL client detects any change in 'Ecall_Notification_St' signal.
Post-conditions	- FNOL Client shall bundle the alert notification for EACall. - FNOL Client shall send the alert notification 'EACallStatus Alert' to FNOL Offboard Client.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Notes	- When the DID configuration for FNOL EACall Alert is disabled, the alert notification is not sent by the FNOL Client even when the medium impact is detected.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

4.3.2.2 FNOL-UC-REQ-416482/A-Medium impact Alert notification - When Enabled

Actors	FNOL User
Pre-conditions	- FNOL Application is running in the FNOL Client. - DID configuration for FNOL Medium Impact Alert is enabled.
Scenario Description	- Vehicle Impact is detected and FNOL Client detects the impact level as medium on the 'EDR_EventTriger_St' signal from FNOL Server.
Post-conditions	- FNOL Client shall bundle the alert notification for 'medium impact'. - FNOL Client shall send the alert notification 'VehicleMediumImpactEvent Alert' to FNOL Offboard Client.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Notes	- When the DID configuration for FNOL Medium Impact Alert is disabled, the alert notification is not sent by the FNOL Client even when the medium impact is detected.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

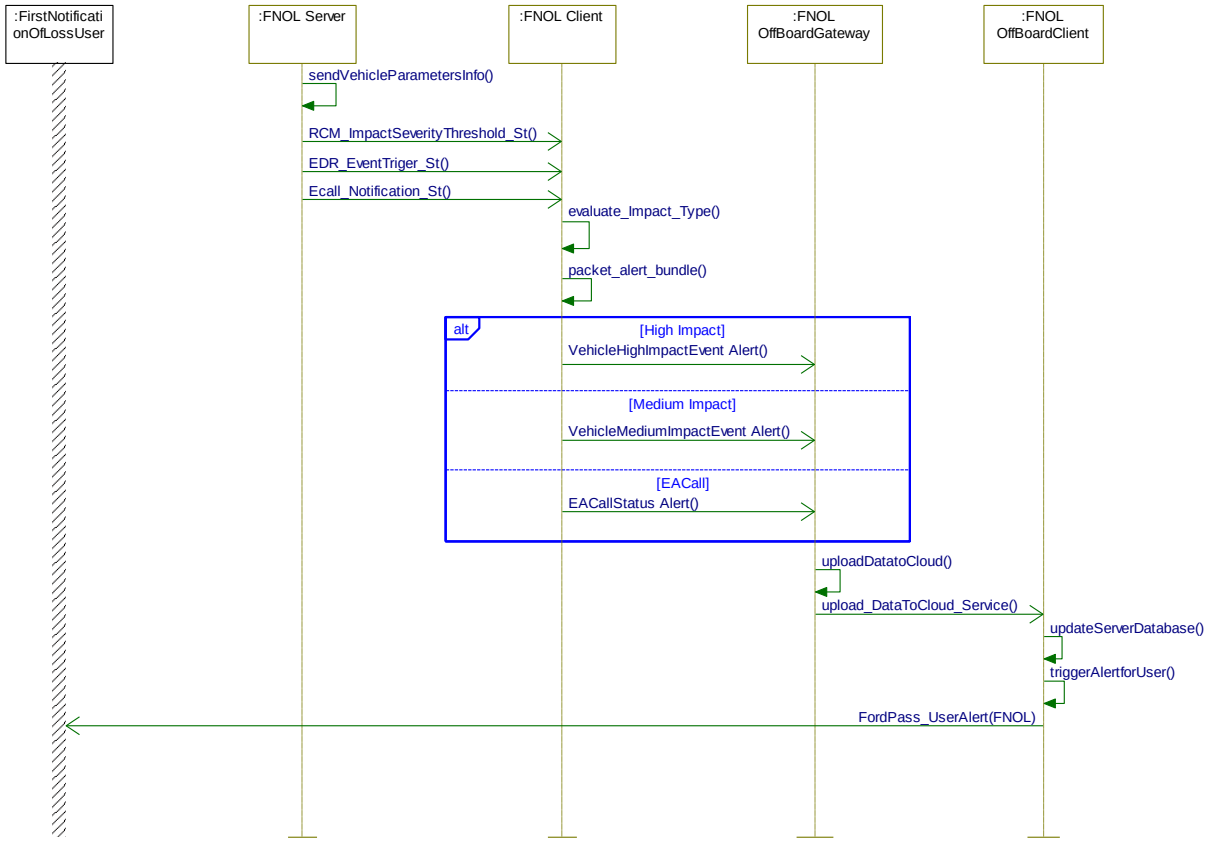
4.3.2.3 FNOL-UC-REQ-400945/A-High impact Alert notification - When Enabled

Actors	FNOL User
Pre-conditions	- FNOL Application is running in the FNOL Client. - DID configuration for FNOL High Impact Alert is enabled.
Scenario Description	- Vehicle Impact is detected and FNOL Client detects the impact level as High on the 'RCM_ImpactSeverityThreshold_St' signal from FNOL Server.
Post-conditions	- FNOL Client shall bundle the alert notification for 'high impact'. - FNOL Client shall send the alert notification 'VehicleHighImpactEvent Alert' to FNOL Offboard Client.
List of Exception Use Cases	E1- FNOL Client losses Connection with FNOL OffBoard Client.
Notes	- When the DID configuration for FNOL high Impact Alert is disabled, the alert notification is not sent by the FNOL Client even when the high impact is detected.
Interfaces	FNOL Client, FNOL Server, FNOL OffBoard Client

4.3.3 White Box View

4.3.3.1 Sequence Diagrams

4.3.3.1.1 FNOL-SD-REQ-413870/A-FNOL Near Alert notification



5 Appendix: Reference Documents

Reference #	Document Title
1	“FRCC_Feature_Guide”
2	“FNOL_IR_PRESENTATION_20200422”
3	Diagnostics Part 2 Specification
4	Ford Telematics Communication Protocol Specification
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	

6 Appendix: Sample File format

1. Reference file format for FRCC Calibration: extFRCCCalibration.json


```
{
   "Release_notes01": "FirstNotificationOfLoss calibration - v1.0, 2021-04-06",

   "P_USE_VEH_PARAM": 0,
   "P_USE_COMP_SIGNAL": 0,
   "P_BUFFER_FLAG": 1,
   "P_SAMPLE_TIME": 0.01,
   "P_BUFFER_SIZE": 10,
   "P_FRCC_HOLD": 10,
   "P_M": 2470,
   "P_IZ": 6755,
   "P_TW": 1.73,
   "P_TWF": 0.87,
   "P_TWR": 0.86,
   "P_WB": 3.69,
   "P_WBF": 1.54,
   "P_WBR": 2.15,
   "P_LFCG": 2.34,
   "P_LRCG": 2.95,
   "P_TIRE_WIDTH_SPEC": 255,
   "P_TIRE_H2W_RATIO_SPEC": 65,
   "P_WHEEL_DIAMETER_SPEC": 17,
   "P_EPSILON": 0.35,
   "P_SPEED_THRSH": 0.0,
   "P_VERT_ACC_OFFSET": 9.81,
   "P_IMPACT_T1_THRSH_20MS": 0.1,
   "P_IMPACT_T2_THRSH_20MS": 1.0,
   "P_LONG_CHANGE_V_THRSH_20MS": 2.0,
   "P_LAT_CHANGE_V_THRSH_20MS": 2.0,
   "P_SIDESLIP_RATE_FRONT_THRSH_20MS": 0.2,
   "P_SIDESLIP_RATE_REAR_THRSH_20MS": 0.2,
   "P_LANE_DEPT_V_THRSH_20MS": 5.0,
   "P_LAT_ACC_CHANGE_THRSH_10MS": 0.5,
   "P_YSI_CHANGE_THRSH_10MS": 5,
   "P_YAW_RATE_THRSH_10MS": 0.4,
   "P_ROLL_RATE_THRSH_10MS": 0.4,
   "P_YAW_RATE_CHANGE_THRSH_10MS": 0.1,
   "P_ROLL_RATE_CHANGE_THRSH_10MS": 0.1,
   "P_SW_ANG_CHANGE_THRSH_10MS": 0.2,
   "P_ACC_PED_THRSH_10MS": 50,
   "P_BRK_TRQ_THRSH_10MS": 500,
   "P_WHLSPEED_CHANGE_THRSH_10MS": 1.5,
   "P_WHLSPEED_VEHSPEED_DIFF_THRSH_10MS": 6.0,
   "P_TOT_A_LEVEL0": 0.2,
   "P_TOT_A_LEVEL1": 0.5,
   "P_TOT_A_LEVEL2": 0.8,
   "P_TOT_A_LEVEL3": 1.2,
   "P_TOT_A_LEVEL4": 1.5,
   "P_TOT_A_LEVEL5": 2.0,
   "P_TOT_A_LEVEL6": 3.0,
   "P_TOT_A_LEVEL7": 5.0,
   "P_TOT_A_FACTOR": 0.70,
   "P_TOT_J_LEVEL0": 100,
   "P_TOT_J_LEVEL1": 250,
   "P_TOT_J_LEVEL2": 500,
```

```
  "P_TOT_J_LEVEL3": 750,
  "P_TOT_J_LEVEL4": 1000,
  "P_TOT_J_LEVEL5": 1500,
  "P_TOT_J_LEVEL6": 2000,
  "P_TOT_J_LEVEL7": 2500,
  "P_TOT_J_FACTOR": 0.80
}
```

2. Reference file format for FRCC Calibration schema: extFRCCCalibration.schema

```
{
  "$schema": "http://json-schema.org/schema#",
  "type": "object",
  "title": "extFRCCCalibration",
  "description": "This schema is used to validate the FRCC calibration file on the ECG.",
  "properties": {
    "Release_notes01": {
      "type": "string"
    },
    "P_USE_VEH_PARAM": {
      "type": "integer",
      "minimum": 0,
      "maximum": 10,
      "default": 0
    },
    "P_USE_COMP_SIGNAL": {
      "type": "integer",
      "minimum": 0,
      "maximum": 1,
      "default": 0
    },
    "P_BUFFER_FLAG": {
      "type": "integer",
      "minimum": 0,
      "maximum": 1,
      "default": 1
    },
    "P_SAMPLE_TIME": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 1,
      "default": 0.01,
      "multipleOfPrecision": 0.01
    },
    "P_BUFFER_SIZE": {
      "type": "integer",
      "minimum": 0,
      "maximum": 100,
      "default": 10
    },
    "P_FRCC_HOLD": {
      "type": "integer",
      "minimum": 0,
      "maximum": 1000,
      "default": 10
    },
    "P_M": {
      "type": "integer",
      "minimum": 100,
      "maximum": 10000,
```

```
      "default": 2470
    },
    "P_IZ": {
      "type": "integer",
      "minimum": 100,
      "maximum": 10000,
      "default": 6755
    },
    "P_TW": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 1.73,
      "multipleOfPrecision": 0.01
    },
    "P_TWF": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 0.87,
      "multipleOfPrecision": 0.01
    },
    "P_TWR": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 0.86,
      "multipleOfPrecision": 0.01
    },
    "P_WB": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 3.69,
      "multipleOfPrecision": 0.01
    },
    "P_WBF": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 1.54,
      "multipleOfPrecision": 0.01
    },
    "P_WBR": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 2.15,
      "multipleOfPrecision": 0.01
    },
    "P_LFCG": {
      "type": "number",
      "minimum": 0.01,
      "maximum": 10,
      "default": 2.34,
      "multipleOfPrecision": 0.01
    },
    "P_LRCG": {
      "type": "number",
```

```
    "minimum": 0.01,
    "maximum": 10,
    "default": 2.95,
    "multipleOfPrecision": 0.01
  },
  "P_TIRE_WIDTH_SPEC": {
    "type": "integer",
    "minimum": 100,
    "maximum": 1000,
    "default": 255
  },
  "P_TIRE_H2W_RATIO_SPEC": {
    "type": "integer",
    "minimum": 10,
    "maximum": 100,
    "default": 65
  },
  "P_WHEEL_DIAMETER_SPEC": {
    "type": "number",
    "minimum": 10,
    "maximum": 50,
    "default": 17,
    "multipleOfPrecision": 0.1
  },
  "P_EPSILON": {
    "type": "number",
    "minimum": 0.01,
    "maximum": 1,
    "default": 0.35,
    "multipleOfPrecision": 0.01
  },
  "P_SPEED_THRSH": {
    "type": "number",
    "minimum": 0,
    "maximum": 100,
    "default": 0,
    "multipleOfPrecision": 0.1
  },
  "P_VERT_ACC_OFFSET": {
    "type": "number",
    "minimum": 0,
    "maximum": 10,
    "default": 9.81,
    "multipleOfPrecision": 0.01
  },
  "P_IMPACT_T1_THRSH_20MS": {
    "type": "number",
    "minimum": 0.01,
    "maximum": 100,
    "default": 0.1,
    "multipleOfPrecision": 0.01
  },
  "P_IMPACT_T2_THRSH_20MS": {
    "type": "number",
    "minimum": 0.01,
    "maximum": 100,
    "default": 1,
    "multipleOfPrecision": 0.01
  },
```

```
"P_LONG_CHANGE_V_THRSH_20MS": {
    "type": "number",
    "minimum": 0.1,
    "maximum": 10,
    "default": 2,
    "multipleOfPrecision": 0.01
},
"P_LAT_CHANGE_V_THRSH_20MS": {
    "type": "number",
    "minimum": 0.1,
    "maximum": 10,
    "default": 2,
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    "default": 0.2,
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"P_LANE_DEPT_V_THRSH_20MS": {
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    "maximum": 10,
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"P_YSI_CHANGE_THRSH_10MS": {
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    "default": 5
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"P_YAW_RATE_THRSH_10MS": {
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    "maximum": 10,
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    "multipleOfPrecision": 0.01
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    "maximum": 10,
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  "P_ACC_PED_THRSH_10MS": {
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    "default": 50
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    "default": 500
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    "maximum": 100,
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    "minimum": 0.01,
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    "P_LRCG",
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    "P_TIRE_H2W_RATIO_SPEC",
    "P_WHEEL_DIAMETER_SPEC",
    "P_EPSILON",
    "P_SPEED_THRSH",
    "P_VERT_ACC_OFFSET",
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    "P_IMPACT_T2_THRSH_20MS",
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    "P_LAT_CHANGE_V_THRSH_20MS",
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    "P_SIDESLIP_RATE_REAR_THRSH_20MS",
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    "P_YSI_CHANGE_THRSH_10MS",
    "P_YAW_RATE_THRSH_10MS",
    "P_ROLL_RATE_THRSH_10MS",
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    "P_ROLL_RATE_CHANGE_THRSH_10MS",
    "P_SW_ANG_CHANGE_THRSH_10MS",
    "P_ACC_PED_THRSH_10MS",
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