Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Neutral Flat Tow

Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.5
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Version Date: Apr 12, 2023

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Revision History

Date	Version	Notes	
Feb 14, 2023	**1.1**	**Initial Release**	**Yzhan482**
Feb 23, 2023	**1.2**	Add TrnGearMsgTxt_D_Rq Delete TrnNtrlTowCmd_D_Actl	**Yzhan482**
Feb 24, 2023	**1.3**	3.1.5 Delete 'TrnGearNtmAllow_B_Stat' != 'YES' condition Update TrnGearMsgTxt_D_Rq Add TrnGearMsgTxt_D_Rq=0x7 Update Activity Diagram Update Place Vehicle in Neutral'	**Yzhan482**
Mar 1, 2023	**1.4**	Update 3.1.6 Popup information Update Timer	**Yzhan482**
Apr 12, 2023	**1.5**	Update 3.1.6.3 Update 3.1.5 Send User Requested Option	**Yzhan482**

Table of Contents

1   Overview

The Neutral Tow Control Function for vehicles with Transfer Case Control Module allows the driver to Enable Neutral Tow through the message center.

2 Architectural Design

2.1 NFT Client

Neutral Flat Tow Client is responsible for the tasks listed below:
- Providing a user interface for the Neutral Flat Tow Feature.
- Transmitting user input to NFT Server.
- Display various information from the server.

2.2 NFT Server

The Neutral Flat Tow Server is responsible for the control of the Neutral Flat Tow function and interfaces with the Neutral Flat Tow Client.

2.3 Logical Signal Mapping

The logical methods mentioned below shall refer to Can signal names. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names.

Logical Name	CAN Signal Name
	TrnGearNtmAllow_B_Stat
	TrnGearMsgTxt_D_Rq
	GearLvrPos_D_Actl
	NtrlTowMdeEnbl_B_RqDrv
	Ignition_Status

2.4 NFT Client Tx

2.4.1 NtrlTowMdeEnbl_B_RqDrv

Message Type: Request

The signal is used to request the Neutral Flat Tow Server to change its state by the user through the Client HMI interface.

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
NtrlTowMdeEnbl_B_RqDrv	1		SED	1	0		0 (0x0)	1 (0x1)
		Disable				0 (0x0)		
		Enable				1 (0x1)		

2.5 NFT Client Rx

2.5.1 TrnGearNtmAllow_B_Stat

Message Type: Status

Note: Status signal from the Neutral Flat Tow Server indicating if the Neutral Tow HMI needs to be greyed out or not

Signal Name	Literals	Value	Description
TrnGearNtmAllow_B_Stat	No	0x0	Grey out HMI for Neutral Tow
	Yes	0x1	This signal encoding does not cause the Neutral Tow Setting HMI to be greyed out

2.5.2 TrnGearMsgTxt_D_Rq

Message Type: Status

Note: This signal is sent by the server to the client to indicate the current state of the Neutral Flat Tow Feature.

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrnGearMsgTxt_D_Rq	5		SED	1	0		0 (0x0)	31 (0x1F)
		No message				0x0		
		Message 1				0x1		
		Message 2				0x2		
		Message 3				0x3		
		Message 4				0x4		
		Message 5				0x5		
		Neutral Tow Enabled				0x6		
		Neutral Tow Disabled				0x7		
		Message 8				0x8		
		Message 9				0x9		
		Message 10				0xA		
		Message 11				0xB		
		Message 12				0xC		
		Message 13				0xD		
		Message 14				0xE		
		Message 15				0xF		
		Message 16				0x10		
		Message 17				0x11		
		Message 18				0x12		
		Message 19				0x13		
		Message 20				0x14		
		Message 21				0x15		
		Message 22				0x16		
		Message 23				0x17		
		Message 24				0x18		
		Message 25				0x19		
		Message 26				0x1A		
		Message 27				0x1B		
		Message 28				0x1C		
		Message 29				0x1D		
		Message 30				0x1E		
		Message 31				0x1F		

2.5.3 GearLvrPos_D_Actl

Message Type: Status

Note: Status signal indicating the Gear position

Logical Signal Name	Literals	Value	Description
	Park	0x0	
	Reverse	0x1	

GearLvrPos_D_Actl	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 fault	0xD	
	Unknown_Position	0xE	
	Fault	0xF	

2.5.4   Ignition_Status

Message Type: Status

This signal is used to indicate the processed value for current Ignition state.

Signal Name	Literals	Value	Description
Ignition_Status	-	-	Indicates ignition state
	Unknown	0x0	
	Off	0x1	
	Accessory	0x2	
	Run	0x4	
	Start	0x8	
	Invalid	0xF	

3   Functional Requirements

3.1   Requirements

3.1.1   Feature Configuration

The NFT Client shall support for a Diagnostics DID configuration to enable or disable the Neutral Flat Tow (NFT) feature.

3.1.2   Power Mode Operation

The feature should not be accessible for interaction to the user while signal Ignition_Status is 0x1 (OFF).

3.1.3   System Accuracy

Within a 100 msec of receiving data that results in a change of state the client will update the display to the proper status.

3.1.4   Feature Unavailibility

The Centerstack Settings HMI Client shall grey out the Neutral Tow HMI setting whenever:
1. The Centerstack Settings HMI Client receives TrnGearNtmAllow_B_Stat = No, OR
2. The Centerstack Setting HMI Client receives the TrnGearMsgTxt_D_Rq = Neutral Tow enabled (0x6)

Else:

Don't grey out the Neutral Tow "Initialize for Neutral Tow" setting in the HMI.

3.1.5   Send User Requested Option

The NFT Client shall allow the user to toggle Neutral Flat Tow feature through user display. The ATC Client shall make use of 'NtrlTowMdeEnbl_B_RqDrv' to request the NFT Server to toggle the feature state.

The Neutral Tow setting (ie Initialize for Neutral Tow) is only available to be selected when Neutral Tow is not greyed out.

- HMI setting being pressed and held for 2 seconds before NFT Client shall send 'NtrlTowMdeEnbl_B_RqDrv'= ' Enable '.
- HMI Hold button to Initialize Neutral Tow" and the user holds down the button less than 2 seconds **OR** TrnGearMsgTxt_D_Rq != Neutral Tow enabled (0x6), NFT Client shall send 'NtrlTowMdeEnbl_B_RqDrv'= 'Disable'.

3.1.6   Pop Up Information

3.1.6.1   Initializing

HMI setting being pressed and held for 250ms will pop up 'Initializing...'

3.1.6.2   Initialization Cancelled

HMI setting being pressed and held <2 sec will pop up 'Initialization Cancelled'.

3.1.6.3   Place Vehicle in Neutral

HMI setting being pressed and held for 2s **AND** GearLvrPos_D_Actl !=Neutral will pop up 'Place Vehicle in Neutral' The NFT Client receives TrnGearMsgTxt_D_Rq = Neutral Tow enabled(0x6) **OR** Neutral Tow Disabled(0x7), 'Place Vehicle in Neutral' will be closed, otherwise it will be keep.

3.1.6.4   Initialization Complete

The NFT Client shall pop up 'Initialization Complete' when receive the 'TrnGearMsgTxt_D_Rq = Neutral Tow enabled.

3.1.7   Timer

		Timers shall be programmable within the following range :			*
Timer Name	**Duration**	**Description**	**Min**	**Max**	**Resolution**
Timer	Reference HMI Specification	Duration that a "Checked" selection will be displayed before displaying a Popup confirmation message.	0 s	4 s	100 ms

3.1.8 Break the process

- When the "Place Vehicle in Neutral" HMI is shown, that HMI screen shall be exited to the appropriate HMI screen whenever the Centerstack Settings HMI Client receives:
  1. TrnGearNtmAllow_B_Stat = No (setting greyed out), or
  2. TrnGearMsgTxt_D_Rq = Neutral Tow enabled (setting greyed out)

- If the signal TrnGearNtmAllow_B_Stat = No at any time, then exit the screen flow and the Neutral Tow setting shall be greyed out.
- When TrnGearNtmAllow_B_Stat = Yes and GearLvrPos_D_Actl=Neutral, then if the user exits the Neutral Tow HMI on the screen for "Place the Vehicle in Neutral" and re-enters the Neutral Tow settings screen the Initialize for Neutral Tow settings is allowed to be sent 'NtrlTowMdeEnbl_B_RqDrv= Enable(0x1)' again.(If support)

3.2 Use Cases

3.2.1 Function Unavailable

Actors	User
Pre-conditions	1. The Centerstack Settings HMI Client receives TrnGearNtmAllow_B_Stat = No, OR 2. The Centerstack Setting HMI Client receives the TrnGearMsgTxt_D_Rq = Neutral Tow enabled
Scenario Description	Check Neutral Flat Tow menu HMI display
Post-conditions	The Centerstack Settings HMI Client shall grey out the Neutral Tow HMI setting
List of Exception Use Cases	
Interfaces	NFT Client HMI

3.2.2 Pop up 'Initializing...'

Actors	User
Pre-conditions	Ignition Run TrnGearNtmAllow_B_Stat = Yes AND TrnGearMsgTxt_D_Rq != Neutral Tow Enabled
Scenario Description	User press and hold NFT button ≥250ms
Post-conditions	The Centerstack Settings HMI Client shall Pop up 'Initializing...'
List of Exception Use Cases	
Interfaces	NFT Client HMI

3.2.3 Pop up 'Initialization Cancelled'

Actors	User
Pre-conditions	Ignition Run TrnGearNtmAllow_B_Stat = Yes AND TrnGearMsgTxt_D_Rq != Neutral Tow Enabled
Scenario Description	User press and hold NFT button ≥250ms, <2s
Post-conditions	The Centerstack Settings HMI Client shall Pop up 'Initialization Cancelled'
List of Exception Use Cases	

Interfaces	NFT Client HMI

3.2.4   NFT Client send request

Actors	User
Pre-conditions	Ignition Run TrnGearNtmAllow_B_Stat = Yes AND TrnGearMsgTxt_D_Rq != Neutral Tow Enabled
Scenario Description	User press and hold NFT button =2s
Post-conditions	NFT Client shall send 'NtrlTowMdeEnbl_B_RqDrv'= ' Enable '.
List of Exception Use Cases	
Interfaces	NFT Client HMI

3.2.5   Pop Up 'Place Vehicle in Neutral'

| Actors	User
Pre-conditions	Ignition Run TrnGearNtmAllow_B_Stat = Yes AND TrnGearMsgTxt_D_Rq != Neutral Tow Enabled
Scenario Description	User press and hold NFT button =2s GearLvrPos_D_Actl does not equal Neutral
Post-conditions	The Centerstack Settings HMI Client shall Pop up 'Place Vehicle in Neutral'
List of Exception Use Cases	
Interfaces	NFT Client HMI

3.2.6   Pop up 'Initialization Complete'

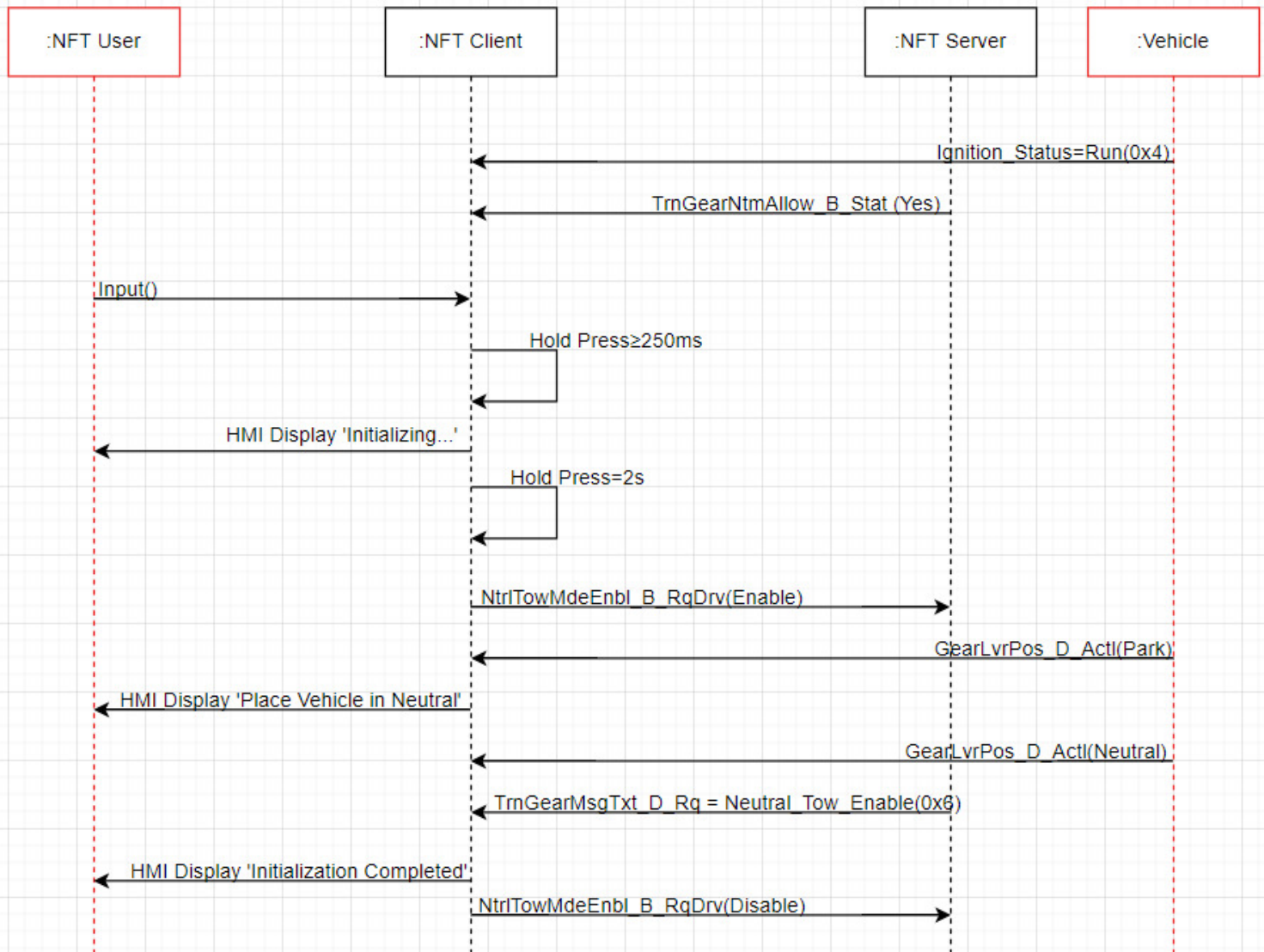| Actors	User
Pre-conditions	Ignition Run TrnGearNtmAllow_B_Stat = Yes AND TrnGearMsgTxt_D_Rq != Neutral Tow Enabled
Scenario Description	User press and hold NFT button ⩾2s Place Vehicle Gear to Neutral TrnGearMsgTxt_D_Rq = Neutral Tow Enabled
Post-conditions	The Centerstack Settings HMI Client shall Pop up 'Initialization Complete'
List of Exception Use Cases	'NtrlTowMdeEnbl_B_RqDrv'= ' Disable '.
Interfaces	NFT Client HMI

3.3 White Box Views

3.3.1 Activity Diagrams
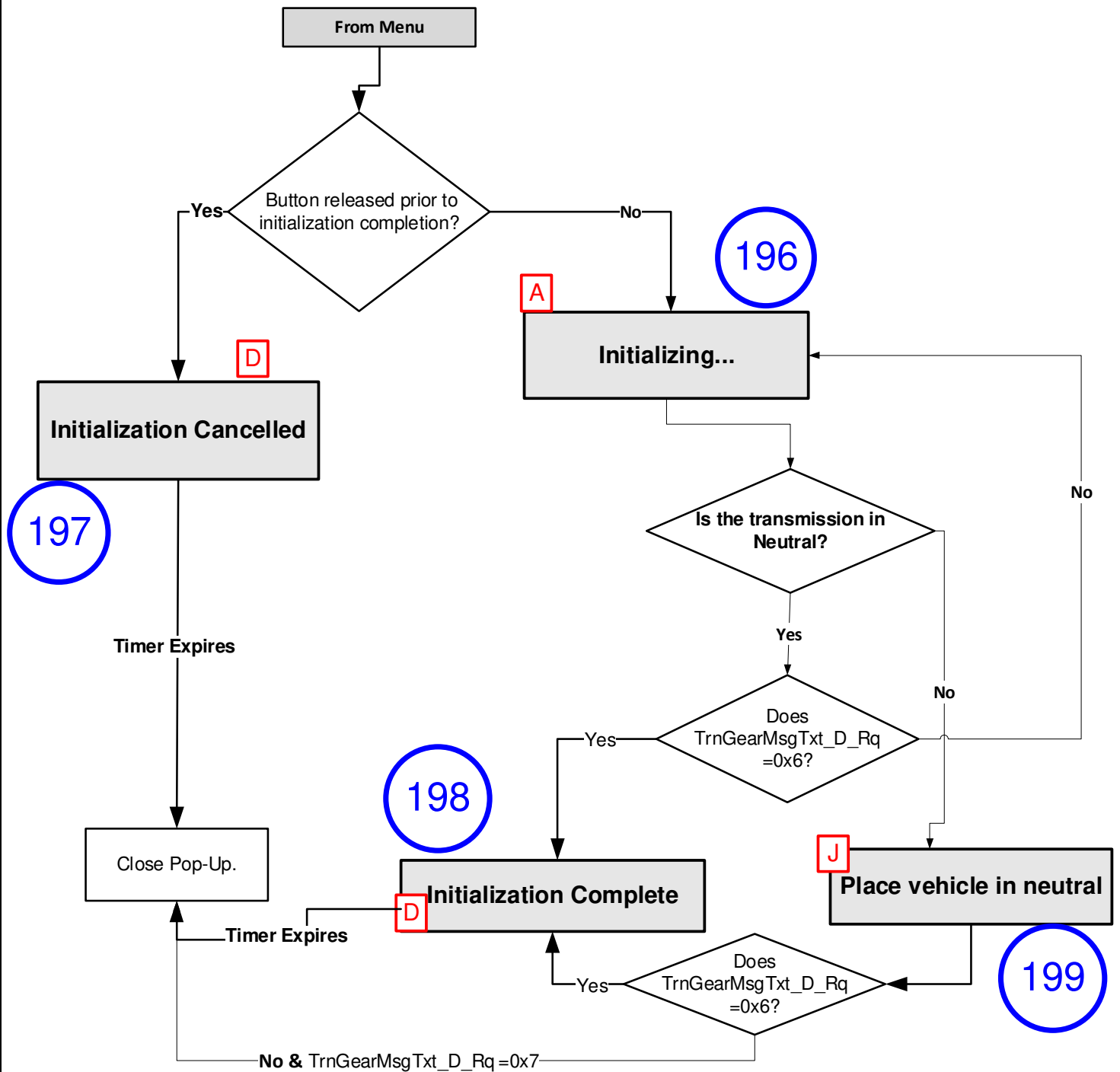
Note: Initialization completion means initializing operation completion, not 'Initialization Complete' Pop up.

FILE: NAVIGATION BASED PILOT SPSS V1.0
DEC 23, 2022

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3.3.2 Sequence Diagrams

4 Appendix: Reference Documents

1	Neutral Tow Control Function for vehicles with Transfer Case Control Module - CGEA1.3_v2.4
2	Settings In Infotainment CenterStack SPSS v1.26 May 5, 2022
3	Shift by Wire Control Function - CGEA1.3_v10.0