

Ford

Subsystem Technology Specific Specification

HUD V2I LITE IOD – FNV2

Functional Description

This STSS handles the functions associated with the V2I LITE feature. V2I LITE feature. V2I LITE (Vehicle to Infrastructure) Floating IOD (Information on Demand) provides display of Traffic Light information by IVI (in-vehicle infotainment system). When the information is available, V2I LITE IOD displays the corresponding UI in HUD. HUD receives the pre-defined CAN signals from IVI.

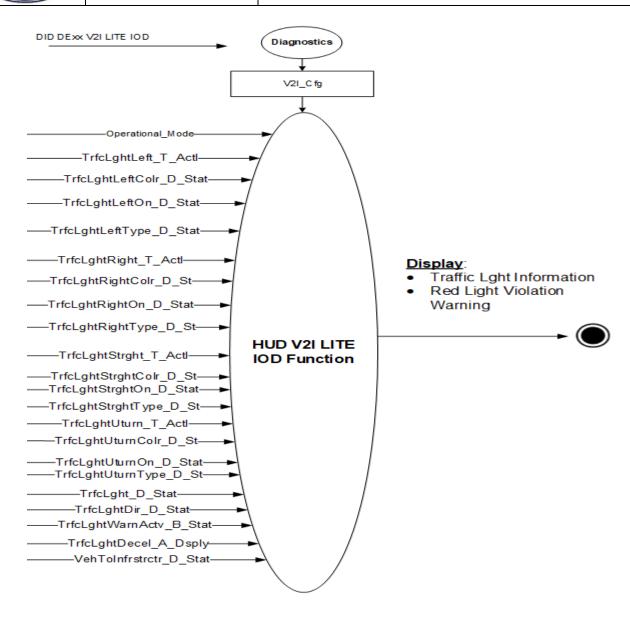
HUD support following 2 V2I LITE features:

- Traffic Light Information (TLI)
 Red Light Violation Warning

1. Interfaces

REQ-436907/A-Interface Context Diagram (I/O Block Diagram)

V2I LITE IOD Function Context Diagram



2. Inputs

1. INTERNAL:

- Signals are divided into two messages, 0x276 (TrafficLight_Data_2) & 0x273 (TrafficLight_Data_1) CAN Bus Signal Inputs from V2I LITE APP on APIM(SYNC+)

MUX message on the CAN Bus 1.

SIG-REQ-436879/A-TrfcLghtLeft_T_Actl Signal 1.

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtLeft_T_Actl	8		second	1	0		0 (0x0)	253 (0xFD)
		NoDataExists				0xFE		
		Faulty				0xFF		

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2. SIG-REQ-436880/A-TrfcLghtLeftColr_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtLeftColr_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		Red				0x1		
		Orange				0x2		
		Green				0x3		
		NotUsed_1				0x4		
		NotUsed_2				0x5		
		NoDataExists				0x6		
		Faulty				0x7		

3. SIG-REQ-436881/A-TrfcLghtLeftOn_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtLeftOn_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		On				0x1		
		Blink				0x2		
		FocusedOn				0x3		
		FocusedBlink				0x4		
		NotUsed				0x5		
		NoDataExist				0x6		
		Faulty				0x7		

4. SIG-REQ-436882/A-TrfcLghtLeftType_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtLeftType_D_Stat	2		SED	1	0		0 (0x0)	3 (0x3)
		Inactive				0x0		
		RoundBall				0x1		
		DirectionalArrow				0x2		
		Faulty				0x3		

5. SIG-REQ-436883/A-TrfcLghtRight_T_Actl Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtRight_T_Actl	8		second	1	0		0 (0x0)	253 (0xFD)
		NoDataExists				0xFE		
		Faulty				0xFF		

6. SIG-REQ-436884/A-TrfcLghtRightColr_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
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TrfcLghtRightColr_D_St	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		Red				0x1		
		Orange				0x2		
		Green				0x3		
		NotUsed_1				0x4		
		NotUsed_2				0x5		
		NoDataExists				0x6		
		Faulty				0x7		

7. SIG-REQ-436885/A-TrfcLghtRightOn_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtRightOn_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		On				0x1		
		Blink				0x2		
		FocusedOn				0x3		
		FocusedBlink				0x4		
		NotUsed				0x5		
		NoDataExist				0x6		
		Faulty	·			0x7		

8. SIG-REQ-436886/A-TrfcLghtRightType_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtRightType_D_St	2		SED	1	0		0 (0x0)	3 (0x3)
		Inactive				0x0		
		RoundBall				0x1		
		DirectionalArrow				0x2		
		Faulty				0x3		

9. SIG-REQ-436887/A-TrfcLghtStrght_T_Actl Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtStrght_T_Actl	8		second	1	0		0 (0x0)	253 (0xFD)
		NoDataExists				0xFE		
		Faulty				0xFF		

10. SIG-REQ-436888/A-TrfcLghtStrghtColr_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtStrghtColr_D_St	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		Red				0x1		
		Orange				0x2		
		Green				0x3		

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NotUsed_1	0x4	
NotUsed_2	0x5	
NoDataExists	0x6	
Faulty	0x7	

11. SIG-REQ-436889/A-TrfcLghtStrghtOn_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtStrghtOn_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		On				0x1		
		Blink				0x2		
		FocusedOn				0x3		
		FocusedBlink				0x4		
		NotUsed				0x5		
		NoDataExist				0x6		
		Faulty				0x7		

12. SIG-REQ-436890/A-TrfcLghtStrghtType_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtStrghtType_D_St	2		SED	1	0		0 (0x0)	3 (0x3)
		Inactive				0x0		
		RoundBall				0x1		
		DirectionalArrow				0x2		
		Faulty				0x3		

13. SIG-REQ-436891/A-TrfcLghtUturn_T_Actl Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtUturn_T_Actl	8		second	1	0		0 (0x0)	253 (0xFD)
		NoDataExists				0xFE		
		Faulty				0xFF		

14. SIG-REQ-436892/A-TrfcLghtUturnColr_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtUturnColr_D_St	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		Red				0x1		
		Orange				0x2		
		Green				0x3		
		NotUsed_1				0x4		
		NotUsed_2				0x5		
		NoDataExists				0x6		
		Faulty				0x7		

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15. SIG-REQ-436893/A-TrfcLghtUturnOn_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Мах
TrfcLghtUturnOn_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		On				0x1		
		Blink				0x2		
		FocusedOn				0x3		
		FocusedBlink				0x4		
		NotUsed				0x5		
		NoDataExist				0x6		
		Faulty				0x7		

16. SIG-REQ-436894/A-TrfcLghtUturnType_D_St Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtUturnType_D_St	2		SED	1	0		0 (0x0)	3 (0x3)
		Inactive				0x0		
		RoundBall				0x1		
		DirectionalArrow				0x2		
		Faulty				0x3		

17. SIG-REQ-436895/A-TrfcLght_D_Stat Signal

Signal Name	Size (bits)	Detail	Unit s	Res.	Offs et	State Encoded	Min	Max
TrfcLght_D_Stat	3		SED				0 (0x0)	7 (0x7)
		OffOrNoMatchedLight				0x0		
		One				0x1		
		Two				0x2		
		Three				0x3		
		Four				0x4		
		NotUsed				0x5		
		NoDataExists				0x6		
		Faulty				0x7		

18. SIG-REQ-436896/A-TrfcLghtDir_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtDir_D_Stat	3		SED	1	0		0 (0x0)	7 (0x7)
		Inactive				0x0		
		StraightActivated				0x1		
		LeftActivated				0x2		
		RightActivated				0x3		
		UtrunActivated				0x4		
		NotUsed				0x5		
		NoDataExist				0x6		
		Faulty				0x7		

19. SIG-REQ-436897/A-TrfcLghtWarnActv_B_Stat Signal

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Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
TrfcLghtWarnActv_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Off				0x0		
		On				0x1		

20. SIG-REQ-436898/A-VehToInfrstrctr_D_Stat Signal

Signal Name	Size (bits)	Detail		Res.	Off set	State Encoded	Min	Max
VehToInfrstrctr_D_Stat	3		S E D	1	0		0 (0x0)	7 (0x7)
		InServiceFunctionOK				0x0		
		InServiceWithoutV2IData				0x1		
		LostConnection				0x2		
		SubComponentUnknownE rror				0x3		
		NotUsed_1				0x4		
		NotUsed_2				0x5		
		NoDataExists				0x6		
		Faulty				0x7		

2. Outputs

- 1. INTERNAL:
- Display the designated UI

1. Function/Performance

1. F-REQ-436917/A-Operational Modes

Mode	Differentiating Vehicle Conditions
Sleep Mode	V2I LITE IOD Disabled
Limited Mode	V2I LITE IOD Disabled
Normal Mode	V2I LITE IOD Enabled / Disabled
Crank Mode	V2I LITE IOD Enabled / Disabled

2. Voltage Levels

Refer to the HUD Features table located in the Operational Modes and Voltage Range Strategies Section in this STSS.

3. Human-Machine Interface

1. Traffic Light Information (TLI)

TLI enables to Driver to be informed the Traffic light information from his/her intention with current light status, phases, countdown, types etc. Basically, four directional information will be provided to customer, Straight, Left, Right & U-turn with same CAN signals set and structure.

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Table 1.1 Maneuver and signal descriptions

Maneuver	Signal Name	Description
	TrfcLght_D_Stat	The total number of traffic information (maneuver)
	3 – –	lights.
Straight Traffic Light		, ,
	TrfcLghtStrght_T_Actl	The straight traffic light countdown to the current light color (phase).
	TrfcLghtStrghtColr_D_St	The straight traffic light color.
	TrfcLghtStrghtOn_D_Stat	The straight traffic light visual effect
	TrfcLghtStrghtType_D_St	The straight traffic light style.
Left Traffic Light	1 3 3 71 = =	
	TrfcLghtLeft_T_ActI	The Left traffic light countdown to the current light color (phase).
	TrfcLghtLeftColr_D_Stat	The Left traffic light color.
	TrfcLghtLeftOn_D_Stat	The Left traffic light visual effect.
	TrfcLghtLeftType_D_Stat	The Left traffic light style.
Right Traffic Light	1 3 71 = =	, , ,
V	TrfcLghtRight_T_Actl	The Right traffic light countdown to the current light color (phase).
	TrfcLghtRightColr_D_St	The Right traffic light color.
	TrfcLghtRightOn_D_Stat	The Right traffic light visual effect.
	TrfcLghtRightType_D_St	The Right traffic light style.
U-turn Traffic Light	1 3 3 71 = =-	<u> </u>
	TrfcLghtUturn_T_ActI	The U-turn traffic light countdown to the current light color (phase).
	TrfcLghtUturnColr_D_St	The U-turn traffic light color.
	TrfcLghtUturnOn_D_Stat	The U-turn traffic light visual effect.
	TrfcLghtUturnType_D_St	The U-turn traffic light style.

2. Red Light Violation Warning

RLVW (Red Light Violation Warning) enables the customer to be notified a warning under the emergency situation, when the vehicle comes to a Green or Yellow Light, t will give a warning for the customer to decelerate before the light changes and avoid the unintentionally violate the traffic rule before Stop Line. HUD may receive the CAN signals as followings.

Table 1.2 RLVW signal descriptions

Signal Name	Description
TrfcLghtDir_D_Stat	The maneuver on which Green Light Optimal Speed Advisory (GLOSA) / Red Light Violation Warning (RLVW) is activated.
TrfcLghtWarnActv_B_Stat	Deceleration rate for Red Light Violation Warning (RLVW).

3. Visual

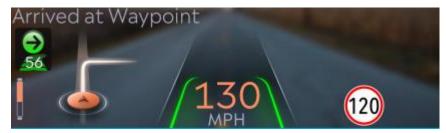
1. Indicator Graphics / Display Format

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2. **Indicator Color Coordinates**

XXXXXX

3. **Indicator Characteristics**

XXXXXX



4. Audio

None

5. Switch Control Logic

None.

4. PFM-REQ-436918/A-System Accuracy

Within a fixed 100ms of receiving two messages that the HUD will update the display to the proper status.

- 5. Operation: Performance and Functional
 - 1. Subsystem Algorithm Flowchart / State Diagram
 - 2. Operation Description (supports algorithm flowchart /state diagram)
 - 1. F-REQ-436919/A-V2I Traffic Light Information

			1		T	1	I	T	1	1		T	ı			T	1	1		T			1
Operational_Mode	(Ven I olnfrstrctr_D_Stat TrfcLght_D_Stat	TrfcLghtUturn_T_Actl	TrfcLghtUturnColr_D_St	TrfcLghtUturnOn_D_Stat	TrfcLghtUturnType_D_St	TrfcLghtLeft_T_ActI	TrfcLghtLeftColr_D_Stat	TrfcLghtLeftOn_D_Stat	TrfcLghtLeftType_D_Stat	TrfcLghtStrght_T_Actl	TrfcLghtStrghtColr_D_St	TrfcLghtStrghtOn_D_Stat	TrfcLghtStrghtType_D_St	TrfcLghtRight_T_Actl	TrfcLghtRightColr_D_St	TrfcLghtRightOn_D_Stat	TrfcLghtRightType_D_St	U Turn Light Countdown	Left Light Countdown	Straight Light Countdown	Right Light Countdown	Traffic Light Information
		One (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_Actl*	None	None	None	Display One V2I U Turn Light with RoundBall with either Red/Yellow/Gre en color
r Crank	}	unctionOK (0x0) One (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)		Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_Actl*	None	None	None	Display One V2I U Turn Light with Arrow with either Red/Yellow/Gre en color
Normal or	Ш Ц	Inservice-unc One (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	Value of TrfcLghtLeft_T_ActI*	None	None	Display One V2I Left Light with RoundBall with either Red/Yellow/Gre en color
		One (0x1)	NoDataExist s (0xFF)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	Directional Arrow (0x2)	NoDataExist s (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExist s (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	Value of TrfcLghtLeft _T_ActI*	None	None	Display One V2I Left Light with Arrow with either Red/Yellow/Gre en color
		One (0x1)	NoDataExists (0xFF)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	None	Value of TrfcLghtStrgh t_T_Actl*	None	Display One V2I Straight Light with RoundBall with either Red/Yellow/Gre en color

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One (0x1)	NoDataExists	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArr ow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	None	Value of TrfcLghtStrgh t_T_Actl*	None	Display One V2 Straight Light with Arrow with either Red/Yellow/Green color
One (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	RoundBall (0x1)	None	None	None	Value of TrfcLghtRight_T_Actl*	Display One V Left Light with RoundBall with either Red/Yellow/Gr en color
One (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	DirectionalArrow (0x2)	None	None	None	Value of TrfcLghtRight_T_Actl*	Display One V Left Light with Arrow with eith Red/Yellow/Gr en color
Two (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	Value of TrfcLghtLeft_T_Ac tl*	None	None	Display Two V2I Turn and Left lig with RoundBall with either Red/Yellow/Gre n color
Two (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	DirectionalArrow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	Value of TrfcLghtLeft_T_Ac tl*	None	None	Display Two V2I Turn and Left lig with Arrow with either Red/Yellow/Gre n color
Two (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	None	Value of TrfcLghtStrght_T_ Actl*	None	Display Two V2I Turn and Straigl light with RoundBall with either Red/Yellow/Gre n color
Two (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	Directional Arrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	Directional Arrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	None	Value of TrfcLghtStrght_T_ Actl*	None	Display Two V2 Turn and straigl light with Arrow with either Red/Yellow/Gre n color

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Two (0x2)	0 to FD*	0x1- Red or 0x2- Orange or 0x3- Green	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	2) RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4) On (0x1)	?) RoundBall (0x1)	Value of TrfcLghtUturn_T_Actl*	None	None	Value of TrfcLghtRight_T_Act1*	Display Turn a light w Round either Red/Ye n color
Two (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	No Data Exists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	DirectionalArrow (0x2)	Value of TrfcLghtUturn_T_Actl*	None	None	Value of TrfcLghtRight_T_Actl*	Display Turn a light w with ei Red/Ye
Two (0x2)	NoDataExists	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	Value of TrfcLghtLeft_T_Ac tl*	Value of TrfcLghtStrght_T_ ActI*	None	Display Left and light wi RoundE either Red/Ye n color
Two (0x2)	NoDataExists	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArr ow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArr ow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	None	Value of TrfcLghtLeft_T _Actl*	Value of TrfcLghtStrght _T_Actl*	None	Display Left and light wi with eit Red/Ye n color
Two (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	RoundBall (0x1)	None	Value of TrfcLghtLeft_T_Actl*	None	Value of TrfcLghtRight_T_Actl*	Display Left and light wi Roundle either Red/Ye n color
Two (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	Directional Arrow (0x2)	None	Value of TrfcLghtLeft_T_ActI*	None	Value of TrfcLghtRight_T_Actl*	Display Left an light wi with ei Red/Ye n color

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Two (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	2) RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4) On (0x1) OR Blink	2) RoundBall (0x1)	None	None	Value of * TrfcLghtStrght_T_Actl*	Value of TrfcLghtRight_T_Actl*	Displ Straight Rour eithe Red/ n col
Two (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExis t (0x6)	Inactive (0x0)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExists (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArrow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	(0x2) OR Focused On (0x3) OR Focused Blink (0x4)	DirectionalArrow (0x2)	None	None	Value of TrfcLghtStrght_T_Actl*	Value of TrfcLghtRight_T_Actl*	Displ Straig light with Red/ n col
Three (0x3)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	Value of TrfcLghtLeft_T_Ac tl*	Value of TrfcLghtStrght_T_ ActI*	None	Displ U Tur Straig with with Red/ n col
Three (0x3)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	DirectionalArrow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	Directional Arrow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExi sts (0x6)	Inactive (0x0) OR NoDataE xist (0x6)	Inactive (0x0)	Value of TrfcLghtUturn_T_ Actl*	Value of TrfcLghtLeft_T_Ac tl*	Value of TrfcLghtStrght_T_ ActI*	None	Displa U Tur Straig with eithe Red/\ n cold
Three (0x3)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	RoundBall (0x1)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	RoundBall (0x1)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	RoundBall (0x1)	Value of TrfcLghtUturn_T_Actl*	Value of TrfcLghtLeft_T_Actl*	None	Value of TrfcLghtRight_T_Actl*	Displa U Tur Right Roun eithe Red/\ n cold
Three (0x3)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli nk (0x4)	DirectionalArrow (0x2)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	DirectionalArrow (0x2)	NoDataExists (0xFE)	Inactive (0x0) OR NoDataExist s (0x6)	Inactive (0x0) OR NoDataExist (0x6)	Inactive (0x0)	0 to FD*	Red (0x1) OR Orange (0x2) OR Green (0x3)	On (0x1) OR Blink (0x2) OR Focused On (0x3) OR Focused Blink (0x4)	DirectionalArrow (0x2)	Value of TrfcLghtUturn_T_Actl*	Value of TrfcLghtLeft_T_Actl*	None	Value of TrfcLghtRight_T_Actl*	Displi U Tur Right Arrov Red/\ n cold

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On (0x1) OR Blink (0x2) OR Red (0x1) OR Orange (0x3) OR FocusedOn (0x3) OR FocusedBli nk (0x4)		nactive (0x0) OR (0x0) Ox0)	On (0x1) OR Red (0x1) Blink (0x2) OR OR Orange FocusedOn (0x3) OR Green (0x3) (0x4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR On (0x3) Orange OR Focused OR Orange OR Focused OR Orange OR Focused Blink (0x3) Ox4)	RoundBall (0x1) Value of TrfcLghtUturn_T_Actl* None Value of TrfcLghtStrght_T_Actl* TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl*
On (0x1) OR Blink (0x2) OR Red (0x1) FocusedOn (0x2) OR (0x2) OR FocusedBli nk (0x3) OR FocusedBli nk (0x4)	NoDataExists (0xE) NoDataExists (0x0) NoDataExists I	nactive (0x0) OR	On (0x1) OR Red (0x1) OR Orange OR Orange OR Ox2) OR OR FocusedOn (0x3) OR FocusedBlink Oreen (0x3) Ox4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR On (0x3) Orange OR Orange OR Focused OR Focused OR On (0x3) Orange OR (0x2) OR Focused Blink (0x4)	Value of TrfcLghtUturn_T_Actl* Value of TrfcLghtStrght_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl*
Three (0x3) NoDataExist (0x6) NoDataExist (0x0) OR (0x0) OR (0x0) NoDataExist NoDataExist (0x6) NoDataExist NoDataExist (0x6)	Red (0x1) OR (은 Orange (0x2) F 의 OR Green	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	On (0x1) OR Red (0x1) Blink (0x2) OR OR Orange FocusedOn (0x3) (0x2) OR OR FocusedBlink Green (0x3) (0x4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR On (0x3) Orange OR Orange OR Focused OS Orange OR Ox2) OR Focused OS Ox3) Ox4)	None Value of TrfcLghtLeft_T_Actl* Value of TrfcLghtStrght_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl*
Three (0x3) NoDataExists (0xE) NoDataExist (0x0) OR NoOataExist NoDataExiss (0x0) NoOataExist NoOataExis (0x0) NoOataExist NoOataExis (0x0)	Red (0x1) OR (은 Orange (0x2) F 의 OR Green	On (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBlink (0x4)	On (0x1) OR Red (0x1) Blink (0x2) OR OR Orange FocusedOn (0x3) OR FocusedBlink Green (0x3) (0x4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR On (0x3) Orange OR Orange OR Focused OR Green Blink (0x3) Ox3)	Directional Arrow (0x2) None Value of TrfcLghtLeft_T_Actl* Value of TrfcLghtStrght_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl*
On (0x1) OR Blink (0x2) OR Red (0x1) FocusedOn OR Orange (0x3) OR FocusedBli OR Oreen (0x3) Nk (0x4)	Red (0x1) OR (은 Orange (0x2) F 의 OR Green	OR FocusedBlink	On (0x1) OR Red (0x1) OR Blink (0x2) OR OR Orange (0x2) OR OR FocusedOn (0x3) OR FocusedBlink Oreen (0x3) Ox4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR On (0x3) Orange OR Orange OR (0x2) OR Focused OR On (0x3) Orange OR	RoundBall (0x1) Value of TrfcLghtUturn_T_Actl* Value of TrfcLghtLeft_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* u color
On (0x1) On (0x2) OR Red (0x1) OR Blink (0x2) OR FocusedOn (0x3) OR FocusedBli or CftionalAr Green (0x3) No (0x4)	Red (0x1) OR (은 Orange (0x2) F 의 OR Green	OR FocusedBlink 발 (0x4)	On (0x1) OR Red (0x1) OR Blink (0x2) OR OR Orange O(0x2) OR OR FocusedOn (0x3) OR FocusedBlink Office (0x3) Ox4)	On (0x1) OR Blink (0x2) OR Red (0x1) Focused OR OR On (0x3) Orange OR	Directional Arrow (0x2) Value of TrfcLghtUturn_T_Actl* Value of TrfcLghtStright_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl* Value of TrfcLghtRight_T_Actl*
Green (0x3) Nk (0x4) Green (0x3) Nk (0x4) Green (0x3) OxfocusedBillik OxfocusedBillik					

*Note:

The maximum countdown number can be presented on HUD is two digits (99). Any received value from TrfcLghtXXX_T_Actl bigger than 99 shall be presented as 99 on HUD.

Any received value from TrfcLghtXXX_T_Actl is equal or smaller than 3 seconds need to be hided/concealed.

2. F-REQ-436902/A-V2I Red Light Violation Warning

perational lode	V2I_Cfg	VehToInfrstrctr_D_Stat	TrfcLghtWarnActv_B_Stat	TrfcLghtDir_D_Stat	Red Light Violation Warning
<					W4411: Red Light
anl.		0x0	0x1	0x1 or 0x2 or 0x3 or 0x4	Ahead! {ICON}
or Cr	peld	0x0	0x1	0x0 or 0x5 or 0x6 or 0x7	None
Normal or Crank Enabled	Enak	0x0	0x0	x	None
Nor		0x1 or 0x2 or 0x3 or 0x4 or			
		0x5 or 0x6 or 0x7	X	X	None
	None				

3. F-REQ-436903/A-V2I LITE IOD Enable/Disable

HUD shall provide the V2I LITE IOD function if VehToInfrstrctr_D_Stat = 0x0(Enabled). HUD shall not provide the V2I LITE IOD function if VehToInfrstrctr_D_Stat! = 0x0 (Disabled).

4. F-REQ-436922/A-RLVW Warning Message

The RLVW need to be arbitrated with other Global Warning Message and the details finalized as followings.

ID	Se.#	System Name	Warn Type	Time Out	LM	ICON*	Message Color	Chime Type	Representative Text
W4411	102	V2I lite- Red Light	NGA	n/a	No	TBD	Red	No	Red Light Ahead! {ICON}
		warning							

5. F-REQ-436923/A-TrfcLghtXXX T Actl countdown

The maximum countdown number can be presented on HUD is two digits (99). Any received value from TrfcLghtXXX_T_Actl bigger than 99 shall be presented as 99 on HUD.

6. F-REQ-436924/A-TrfcLghtXXX_T_ActI when hided/concealed

Any received value from TrfcLghtXXX_T_Actl is equal or smaller than 3 seconds need to be hided/concealed.

3. Function Safety Classification (EMC)

Class B

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4. NVM-REQ-436904/A-Memory Storage

Parameter Name	Description	Value at Battery Connect	Value at Module Wake-up
Operational_Mode	4 state indicator for cluster operational mode.	Limited	Limited, Normal or Crank
TrfcLghtLeft_T_ActI	The Left traffic light countdown to the current light color (phase).	0x0	0x0
TrfcLghtLeftColr_D_Stat	The Left traffic light color.	0x0	0x0
TrfcLghtLeftOn_D_Stat	The Left traffic light visual effect.	0x0	0x0
TrfcLghtLeftType_D_Stat	The Left traffic light style.	0x0	0x0
TrfcLghtRight_T_Actl	The Right traffic light countdown to the current light color (phase).	0x0	0x0
TrfcLghtRightColr_D_St	The Right traffic light color.	0x0	0x0
TrfcLghtRightOn_D_Stat	The Right traffic light visual effect.	0x0	0x0
TrfcLghtRightType_D_St	The Right traffic light style.	0x0	0x0
TrfcLghtStrght_T_Actl	The straight traffic light countdown to the current light color (phase).	0x0	0x0
TrfcLghtStrghtColr_D_St	The straight traffic light color.	0x0	0x0
TrfcLghtStrghtOn_D_Stat	The straight traffic light visual effect	0x0	0x0
TrfcLghtStrghtType_D_St	The straight traffic light style.	0x0	0x0
TrfcLghtUturn_T_Actl	The U-turn traffic light countdown to the current light color (phase).	0x0	0x0
TrfcLghtUturnColr_D_St	The U-turn traffic light color.	0x0	0x0
TrfcLghtUturnOn_D_Stat	The U-turn traffic light visual effect.	0x0	0x0
TrfcLghtUturnType_D_St	The U-turn traffic light style.	0x0	0x0
TrfcLght_D_Stat	The total number of traffic information (maneuver) lights.	0x0	0x0
TrfcLghtDir_D_Stat	The maneuver on which Green Light Optimal Speed Advisory (GLOSA) / Red Light Violation Warning (RLVW) is activated.	0x0	0x0
TrfcLghtWarnActv_B_Stat	Deceleration rate for Red Light Violation Warning (RLVW).	0x0	0x0
VehToInfrstrctr_D_Stat	?	0x0	0x0

5. Reconfigurable Telltale

None

6. Prove Out

Not applicable

7. Message Center Msg

None. Refer to program specific menu structure for display text.

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8. Error Handling

1. <u>SR-REQ-436906/A-Missing Message Strategy</u>

The signals will be declared missing as per the Diagnostics section of this SPSS. DTCs states and history will be determined as per the Diagnostics section of this SPSS.

- 1. If CAN signal VehToInfrstrctr_D_Stat is not received < 2s, use last value received.
- 2. If CAN signal VehToInfrstrctr_D_Stat is not received >= 2s, use 0x6 value.
 - 1. Diagnostics
 - 1. Self-Test

None

2. Engineering Test Mode

None

- 3. Part II Performance
 - 1. DTC-REQ-436921/A-Supported Diagnostic Trouble Codes (DTCs)

DTC	Description
	None

2. DID-REQ-436920/A-Supported Diagnostic DIDs

None

3. DCR-REQ-436905/A-DID DExx:

Block								Comments/
Num	Block Description	Byte(s)	Bits	State: Description	"0"	"1"	Default	Information
PACKE	TED BLOCKS							
\$xx	Option Content (B&A)			V2I_Cfg	Disabled	Enabled	Enabled	Enabled turns on V2I IOD
*Byte an	*Byte and bit location to be identified in Part II Specification for this HUD							

2. Reference Specification

None.

3. Revision History SPSS Module Revision History

Revision Level	Name	Change Description	Date
1.0	F. Sethi	Initial Draft	8/19/2021

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