



Ford Motor Company

Subsystem Part Specific Specification
Engineering Specification



1 HUD Adjustable Speed Limiter Device (with Optional Intelligent Speed Assistance) Control Function – CGEA1.3

1.1 Functional Description

The purpose of the ASLD in HUD is to inform the driver if a speed limiter function is available in the vehicle and if the driver has activated the feature or not. Intelligent Speed Assistance (ISA) expands upon this functionality by allowing a driver to automatically limit vehicle speed to the current speed limit, as detected by the Traffic Sign Recognition (TSR) system, plus a driver selectable offset. Only a subset of vehicles equipped with ASLD will also be equipped with the ISA feature.

The ASLD and associated text correlates the AslChime_B_Rq, AslIconDsply_D_Rq, and Veh_V_DsplyCcSet signals as well as the Operational_Mode to display in HUD. On ISA equipped vehicles, the SIMde_D_RqDsply signal is also used in the logic.

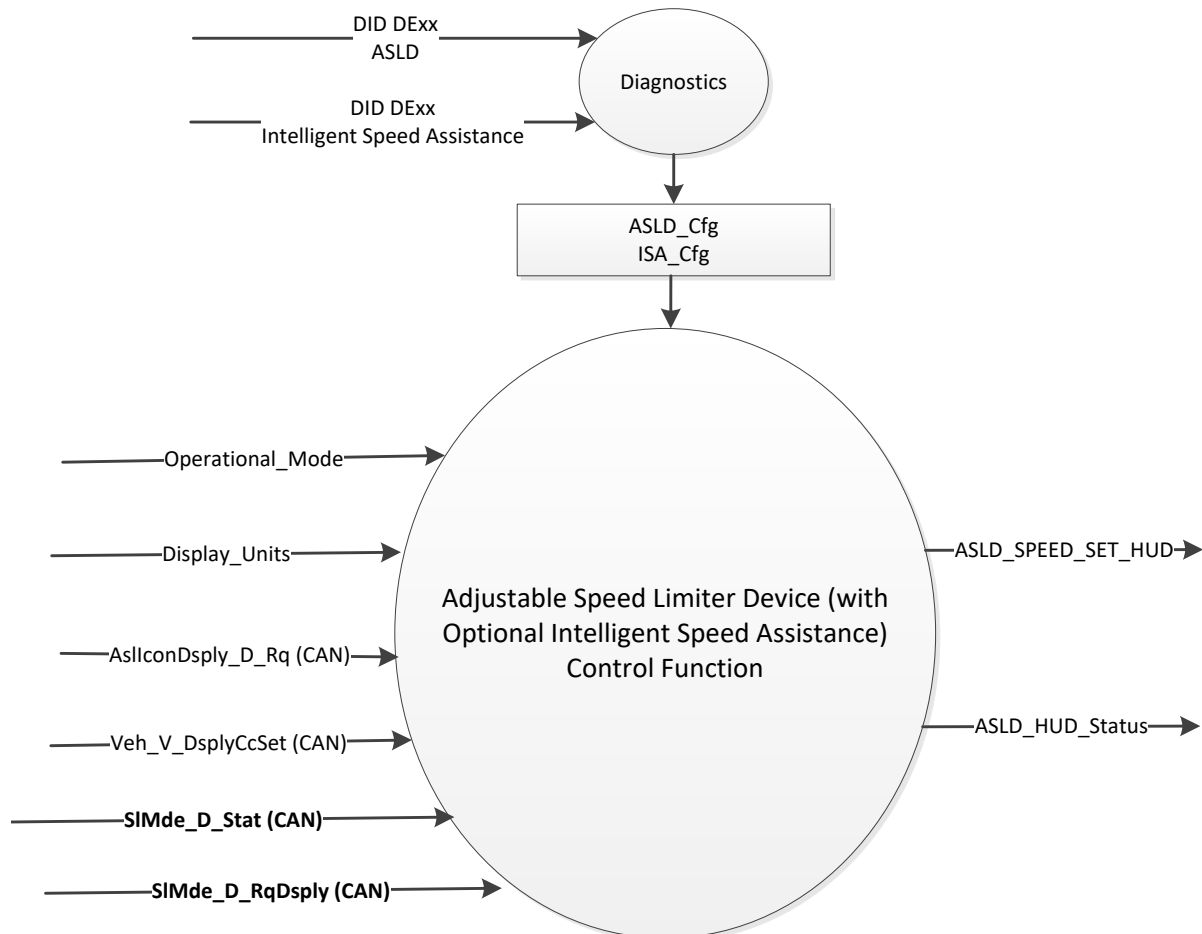
ASLD, ISA, are separately configured; however, if ISA_Cfg = Enabled (0x1), then ASLD_Cfg = Enabled (0x1)



1.2 Interfaces

1.2.1 Interface Context Diagram (I/O Block Diagram)

ASLD (with Optional ISA) Control Function Context Diagram



* The bolded input is required for ISA equipped vehicles only.

1.2.2 Inputs

1.2.2.1 IR-REQ-302490/A-INTERNAL:

- Operational_Mode
- Display_Units, used to determine display units currently set. Refer to HUD_Display Unit Selection STSS.
- ASLD_Cfg
- ISA_Cfg

**1.2.2.2 MUX signals on the CAN bus:****1.2.2.2.1 SIG-REQ-302479/A-AsllconDsply_D_Rq Signal**

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
AsllconDsply_D_Rq	2		SED	1	0		0 (0x0)	3 (0x3)
		Off				0x0		
		On - Passive				0x1		
		On - Active				0x2		
		On - Passive - Overridden				0x3		

1.2.2.2.2 SIG-REQ-302480/A-SIMde_D_RqDsply Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
SIMde_D_RqDsply	2		SED	1	0		0 (0x0)	3 (0x3)
		No speed limiter symbol				0x0		
		Auto speed limiter symbol				0x1		
		Manual speed lim. symbol				0x2		
		Not Used				0x3		

* This signal is required for ISA equipped vehicles only.

1.2.2.2.3 SIG-REQ-302481/A-Veh_V_DsplyCcSet Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
Veh_V_DsplyCcSet	8		Unitless	1	0		0 (0x0)	253 (0xFD)
		Unknown				0xFE		
		Fault				0xFF		

1.2.2.2.4 SIG-REQ-302482/A-SIMde_D_Stat Signal

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
SIMde_D_Stat	8		SED	1	0		0 (0x0)	3 (0x3)
		Null				0x0		
		Auto_Mode				0x1		
		Manual_Mode				0x2		
		IsaNotConfigured				0x3		

1.2.3 IR-REQ-302499/A-Outputs

- ASLD_HUD_Status, which is used to control the state of the ASLD / ISA Display
- ASLD_SPEED_SET_HUD which is used to display associated text related to ASLD / ISA.



1.3 Function/Performance

1.3.1 F-REQ-302497/A-Operational Modes

Mode	Differentiating Vehicle Conditions
Sleep Mode	ASLD (with Optional ISA) Control Function OFF
Limited Mode	ASLD (with Optional ISA) Control Function OFF
Normal Mode	ASLD (with Optional ISA) Control Function ON / OFF
Crank Mode	ASLD (with Optional ISA) Control Function ON / OFF

1.3.2 Voltage Levels

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

1.3.3 Human-Machine Interface

1.3.3.1 Visual

1.3.3.2 Indicator Graphics / Display Format

Refer Graphics section of the SPSS

1.3.3.3 Audio

None

1.3.3.4 Switch Control Logic

None

1.3.4 PFM-REQ-302498/A-System Accuracy

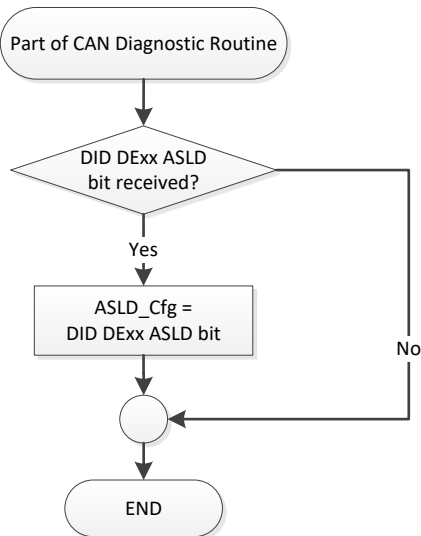
The HUD shall update the display to the proper status within 100ms of receiving a message that results in a change of state as indicated in Section 1.3.5 "Operation: Performance and Functional".



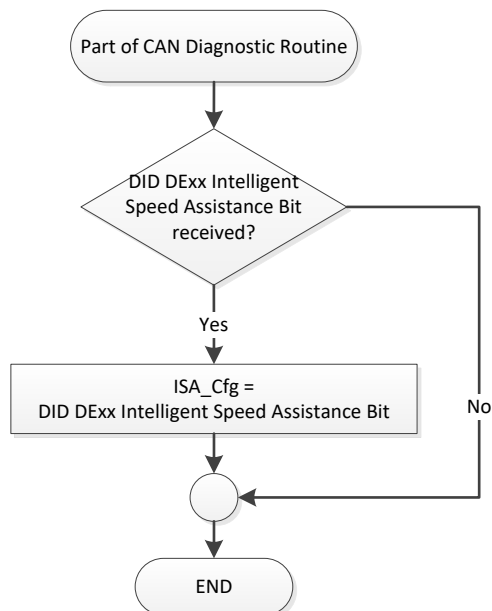
1.3.5 Operation: Performance and Functional

1.3.5.1 Subsystem Algorithm Flowchart / State Diagram

1.3.5.1.1 F-REQ-302483/A-ASLD Diagnostic Configuration Flowchart

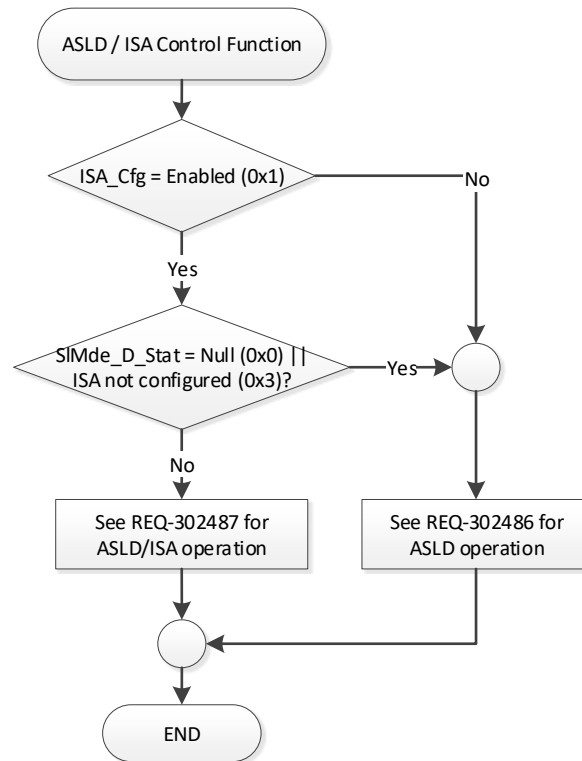


1.3.5.1.2 F-REQ-302484/A-Intelligent Speed Assistance Diagnostic Configuration Flowchart




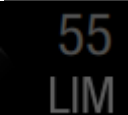
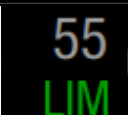

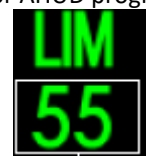


1.3.5.1.3 F-REQ-302485/A-ASLD / ISA Control Function Flowchart





1.3.5.1.4 F-REQ-302486/A-State Matrix for ASLD_HUD_Status and ASLD_SPEED_SET_HUD (ASLD ONLY)

Operational_ Mode	ASLD_Cfg	ISA_Cfg	AslIconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	Disabled (0x0)	Off (0x0)	X	X	OFF (0x0)	No graphic shown
			On-Passive (0x1)	0x0, 0xFE, 0xFF	Imperial (0x1)	ASLD_Standby (0x1)	
			On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby (0x1)	
			On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ASLD_Active (0x2)	
			On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby_Override (0x6)	 Turn the Digital speedo color RED *For AHUD programs  Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%

Continue...



Operational_ Mode	ASLD_Cfg	ISA_Cfg	AsllconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	Disabled (0x0)	On-Passive (0x1)	0x0, 0xFE, 0xFF	Metric (0x0)	ASLD_Standby (0x1)	
			On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby (0x1)	
			On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ASLD_Active (0x2)	
			On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby_Override (0x6)	 Turn the Digital speedo color RED *For AHUD programs Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%



All other Cases

OFF (0x0)

No graphics shown

*Notes: Veh_V_DsplyCcSet = 120 (0x78) in example graphics shown above when “120” is displayed. Veh_V_DsplyCcSet from the PCM should contain any sort of compensation factors (including the offset) in its signal value. The displayed limit speed should correspond to the value of Veh_V_DsplyCcSet.

The ASLD sample graphic is shown for reference only; ASLD_SPEED_SET_HUD refers to the text to the right of the ASLD graphic.

Graphics shown above are for example purposes only. Please refer to the program specific graphic library for accurate graphics.



1.3.5.1.5 F-REQ-302487/A-State Matrix for ASLD_HUD_Status and ASLD_SPEED_SET_HUD (ASLD with ISA)

Operational_Mode	ISA_Cfg	SIMde_D_RqDsply	AsllconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	No speed limiter symbol (0x0)	X	X	X	OFF (0x0)	No graphic shown
		X	Off (0x0)	X	X	OFF (0x0)	No graphic shown
		Manual speed lim. Symbol (0x2)	On-Passive (0x1)	0x0, 0xFE, 0xFF	Imperial (0x1)	ASLD_Standby (0x1)	
		Manual speed lim. Symbol (0x2)	On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby (0x1)	
		Manual speed lim. Symbol (0x2)	On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ASLD_Active (0x2)	
		Manual speed lim. Symbol (0x2)	On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby_Override (0x6)	 Turn the Digital speedo color RED
							*For AHUD programs Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%







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Operational_ Mode	ISA_Cfg	SIMde_D_RqDsply	AslIconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	Manual speed lim. Symbol (0x2)	On-Passive (0x1)	0x0, 0xFE, 0xFF	Metric (0x0)	ASLD_Standby (0x1)	
		Manual speed lim. Symbol (0x2)	On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby (0x1)	
		Manual speed lim. Symbol (0x2)	On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ASLD_Active (0x2)	
		Manual speed lim. Symbol (0x2)	On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ASLD_Standby_Override (0x6)	 Turn the Digital speedo color RED *For AHUD programs Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%



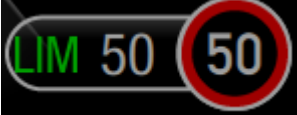




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Operational_ Mode	ISA_Cfg	SIMde_D_RqDsply	AsllconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	Auto speed limiter symbol (0x1)	On-Passive (0x1)	0x0, 0xFE, 0xFF	Imperial (0x1)	ISA_Standby (0x3)	
		Auto speed limiter symbol (0x1)	On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ISA_Standby (0x3)	
		Auto speed limiter symbol (0x1)	On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ISA_Active (0x4)	
		Auto speed limiter symbol (0x1)	On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ISA_Standby_Override (0x5)	<p>Turn the Digital speedo color RED</p> <p>*For AHUD programs</p>  <p>Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%</p>



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Operational_Mode	ISA_Cfg	SIMde_D_RqDsply	AsllconDsply_D_Rq	Veh_V_DsplyCcSet	Display_Units	ASLD_HUD_Status	ASLD_SPEED_SET_HUD <i>See Notes Below*</i>
Normal or Crank	Enabled (0x1)	Auto speed limiter symbol (0x1)	On-Passive (0x1)	0x0, 0xFE, 0xFF	Metric (0x0)	ISA_Standby (0x3)	
		Auto speed limiter symbol (0x1)	On-Passive (0x1)	<>(0x0, 0xFE, 0xFF)		ISA_Standby (0x3)	
		Auto speed limiter symbol (0x1)	On-Active (0x2)	<>(0x0, 0xFE, 0xFF)		ISA_Active (0x4)	
		Auto speed limiter symbol (0x1)	On - Passive - Overridden (0x3)	<>(0x0, 0xFE, 0xFF)		ISA_Standby_Override (0x5)	 Turn the Digital speedo color RED *For AHUD programs  Set Speed shall flash Frequency = 1 Hz Duty Cycle = 50%



All other Cases

OFF (0x0)

No graphics shown

*Notes: Veh_V_DsplyCcSet = 120 (0x78) in example graphics shown above when “120” is displayed. Veh_V_DsplyCcSet from the PCM should contain any sort of compensation factors (including the offset) in its signal value. The displayed limit speed should correspond to the value of Veh_V_DsplyCcSet.

The ASLD sample graphic is shown for reference only; ASLD_SPEED_SET refers to the text to the right of the ASLD graphic.

Graphics shown above are for example purposes only. Please refer to the program specific graphic library for accurate graphics.

**1.3.5.2 Operation Description (supports algorithm flowchart /state diagram)****1.3.5.2.1 F-REQ-302488/A-ASLD, ISA, and TSR**

- ASLD, ISA, and TSR are separately configured; however, if ISA_Cfg = Enabled (0x1), then ASLD_Cfg = Enabled (0x1) and TSR_Cfg = Enabled (0x1).

1.3.5.2.2 F-REQ-302489/A-Veh_V_DsplyCcSet

- The Veh_V_DsplyCcSet signal sent on the CAN network is the limit speed for the display. It has already been adjusted to match speedometer bias using DISPLAY_SPEED_OFFSET and DISPLAY_SPEED_SCALING as defined in the CADS STSS. This signal has also been adjusted according to the ISA offset value, if applicable.

1.3.5.3 FS-REQ-302500/A;1-Function Safety Classification (EMC)

Class B.

1.3.5.4 NVM-REQ-302491/A-Memory Storage

Parameter Name	Description	Value at Battery Connect	Value at Module Wake-up
ASLD_HUD_Status	Used to control the ASLD / ISA display in HUD. OFF means no graphics, Standby will gray display, active is bright display	OFF	OFF
ASLD_SPEED_SET_HUD	Output text associated with ASLD / ISA.	NO graphics	No Graphics
AslIconDsply_D_Rq (CAN)	Input CAN signal used as an input to the ASLD_SPEED_SET_HUD text.	OFF (0x0)	OFF (0x0)
SIMde_D_RqDsply (CAN)	Input CAN signal used as an input to the ASLD display when ISA is configured on.	Null (0x0)	Null (0x0)
Veh_V_DsplyCcSet (CAN)	Input CAN signal used as the input to ASLD_SPEED_SET_HUD text.	0 (0x0)	0 (0x0)
Display_Units	Input that controls the indicated units in the display.	Refer to Display Unit Selection Control Function STSS	Refer to Display Unit Selection Control Function STSS
Operational_Mode	4 state indicator for cluster operational mode	Limited	Limited, Normal or Crank

* Refer to Message Center X Display_Y Button Interface Section, where X and Y are appropriate values in this document.



1.4 Error Handling

1.4.1 Missing Message Strategy

1.4.1.1 Missing Reference

The signals will be declared missing as per the Diagnostics section of this STSS.

1.4.1.2 States and History

DTCs states and history will be determined as per the Diagnostics section of this STSS.

1.4.1.3 SR-REQ-302492/A-ASLD_Cfg

If ASLD_Cfg = Disabled (0x0), the cluster shall never log a missing message DTC for this feature.

1.4.1.4 SR-REQ-302493/A-Signal is declared as missing

If a signal is declared as missing, the display shall be done as "All other cases" in the tables. The last status shall not be kept.

1.5 Diagnostics

1.5.1 Self-Test

None

1.5.2 Engineering Test Mode

Reference section "Dealer / Engineering Test Mode (ETM)"

1.5.3 Part II Performance

1.5.3.1 *DCR-REQ-302494/A-DID DE00:*

Block Num	Block Description	Size (bits)	Byte(s)	Bits	State: Description	"0"	"1"	Default	Comments/ Information
PACKETED BLOCKS									
\$00	Option Content (B&A)	1	*	*	ASLD	Disabled	Enabled	Disabled	Disabled means feature is not present in the vehicle.

*Byte and bit location to be identified in Part II Specification for this cluster

**1.5.3.2 DCR-REQ-302495/A-DID DE02:**

Block Num	Block Description	Size (bits)	Byte(s)	Bits	State: Description	"0"	"1"	Default	Comments/ Information
PACKETED BLOCKS									
\$02	Option Content (B&A)	1	*	*	Intelligent Speed Assistance	Disabled	Enabled	Disabled	Disabled means feature is not present in the vehicle.

*Byte and bit location to be identified in Part II Specification for this cluster

1.5.3.3 DTC-REQ-302496/A-Supported Diagnostic Trouble Codes (DTCs)

DTCs shall be logged as per the diagnostics section of this SPSS.*

DTC	Description
C10000	Lost Communication with ECM/PCM
C40100	Invalid Data Received from ECM/PCM(Subtype: Invalid/Fault)
C40186	Invalid Data Received from ECM/PCM (Subtype: Unknown/Illegal value)

* If the missing signal has a related update bit, _UB, signal, then the "Invalid Data" DTC is to be logged. Otherwise, the "Lost Communication" DTC is logged.

For the error value FF, "Invalid Data" DTC C40100 shall be logged and for the error value FE "Invalid data" DTC C40181 shall be logged.

1.6 Reference Specifications**1.7 Revision History****STSS Revision History**

Revision Level	Name	Change Description	Date
1.0	A Mathai	Initial release for HUD based on IPC STSS Adjustable Speed Limiter Device (with Optional Intelligent Speed Assistance) Control Function – CGEA1.3 .	8/29/2014
1.1	A Mathai	Updated the review comments from review with Andreas Ediger and C519 HUD team. <ul style="list-style-type: none">- Replaced DE00 and DE02 with DExx- Changed ALSD_...to ASLD_...- Removed the Chime signal dependency on Set speed Flash per Andreas Ediger's request- Changed the Set speed flashing to Speedo changing Red and new values for ASLD_HUD_Status- Added new graphics for HUD	11/20/15
1.2	A Mathai	Added DTC C40186	7/29/16
1.3	A. Salameh	Fixed typos with Table numbering and referencing in flowcharts. Updated figure 1	11/20/2017
1.4	A. Salameh	Updated Tables 1.4 and 1.5 to include the flash rate for the Override state	1/23/2018
1.5	P.Denduku	Initial VSEM RM Release	03/22/2018