# Predictive Lighting Control Function – CGEA1.3

## Functional Description

This STSS handles the Predictive Lighting set-up/personalization feature, which provides customers the choice to activate or deactivate the camera based dynamic bending of the via the settings menu. The Instrument Cluster uses the Personalization signals from the HCM module for the Message Center function to enable or disable the Predictive Lighting feature in the HCM module.

Starting in MY2019 with U625/U611 the Settings are migrating from the cluster to Center stack. This STSS supports displaying settings in the cluster or configuring the cluster settings off if they are displayed in the Center stack.

The customer uses the message center switches and display to enable and/or change the Predictive Lighting settings in the vehicle.

## Interfaces

### Interface Context Diagram (I/O Block Diagram)

Predictive Lighting Control Function Context Diagram



### Inputs

#### IR-REQ-344320/A-INTERNAL:

* Operational\_Mode
* M/C Switch Event
* M/C\_Display\_Status
* Predictive\_Lights\_Cfg
* Settings\_Menu\_Cfg

#### MUX signals on the CAN Bus from HCM

##### SIG-REQ-344308/A-FeatConfigHcmActl Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| FeatConfigHcmActl | 16 | - | Undefined | 1 | 0 |  | 0  (0x0) | 65535  (0xFFFF) |

##### SIG-REQ-344309/A-FeatNoHcm\_No\_Actl Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| FeatNoHcm\_No\_Actl | 16 | - | Number | 1 | 0 |  | 0  (0x0) | 65535  (0xFFFF) |

### Outputs

#### IR-REQ-344321/A-INTERNAL:

* Predictive\_Lights\_Setup\_MC

#### MUX signals on the CAN Bus

##### SIG-REQ-344310/A-MsgCntrDsplyOp\_D\_Rq Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| MsgCntrDsplyOp\_D\_Rq | 3 |  | SED | 1 | 0 |  | 0  (0x0) | 1  (0x7) |
|  |  | NULL |  |  |  | 0 (0x0) |  |  |
|  |  | QUERY |  |  |  | 1 (0x1) |  |  |
|  |  | SET |  |  |  | 2 (0x2) |  |  |
|  |  | UPLOAD |  |  |  | 3 (0x3) |  |  |
|  |  | RESTORE |  |  |  | 4 (0x4) |  |  |
|  |  | COPY |  |  |  | 5(0x5) |  |  |
|  |  | Not used |  |  |  | 6 (0x6) |  |  |
|  |  | Not Used |  |  |  | 7 (0x7) |  |  |

##### SIG-REQ-344311/A-MsgCntrFeatConfigRq Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| MsgCntrFeatConfigRq | 16 |  | Undefined | 1 | 0 |  | 0  (0x0) | 65535  (0xFFFF) |

##### SIG-REQ-344312/A-MsgCntrFeatNoRq Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| MsgCntrFeatNoRq | 16 |  | Number | 1 | 0 |  | 0  (0x0) | 65535  (0xFFFF) |

##### SIG-REQ-344313/A-MsgCntrPersIndex\_D\_Rq

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State Encoded** | **Min** | **Max** |
| MsgCntrPersIndex\_D\_Rq | 3 |  | SED | 1 | 0 |  | 0  (0x0) | 1  (0x7) |
|  |  | PERS\_1 |  |  |  | 0 (0x0) |  |  |
|  |  | PERS\_2 |  |  |  | 1 (0x1) |  |  |
|  |  | PERS\_3 |  |  |  | 2 (0x2) |  |  |
|  |  | PERS\_4 |  |  |  | 3 (0x3) |  |  |
|  |  | Vehicle |  |  |  | 4 (0x4) |  |  |
|  |  | Not Used |  |  |  | 5 (0x5) |  |  |
|  |  | Not Used |  |  |  | 6 (0x6) |  |  |
|  |  | Not Used |  |  |  | 7 (0x7) |  |  |

## Function/Performance

### F-REQ-344326/A-Operational Modes

|  |  |
| --- | --- |
| **Mode** | **Differentiating Vehicle Conditions** |
| Sleep Mode | Predictive Lighting Control Function Text Messages Disabled |
| Limiting Mode | Predictive Lighting Control Function Text Messages Disabled |
| Normal Mode | Predictive Lighting Control Function Text Messages Enabled / Disabled |
| Crank Mode | Predictive Lighting Control Function Text Messages Enabled / Disabled |

### Voltage Levels

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

### Human-Machine Interface

#### Visual

#### Indicator Graphics / Display Format

For program specific display, refer to “<*Program*> Cluster Menu Structure.xls” and Program VAPS Model.

**Example Graphics:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Menu level 2** | **Menu Level 3** | **Menu level 4** |  | **Menu level 5** |
| Settings | Vehicle | Predictive Lighting | 🞎 | OFF (Default Setting) |
|  | ON |

##### Indicator Color Coordinates

Reference section COLOR & ILLUMINATION REQUIREMENTS (GRAPHICS)

##### Indicator Characteristics

Refer to Message Center X Display\_Y Button Interface Section, where X and Y are appropriate values in this document.

#### Audio

None

#### Switch Control Logic

Consumer access to the Silent Mode Control setting shall be as specified in the message center basic functionality display as specified in Message Center X Display\_Y Button Interface Section, where X and Y are appropriate values in this document.

### PFM-REQ-344325/A-System Accuracy

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

### Operation: Performance and Functional

#### Subsystem Algorithm Flowchart / State Diagram

##### F-REQ-344314/A-Predictive Lighting Diagnostic Configuration Flowcharts



##### F-REQ-344315/A-Predictive Lighting Control Function Inputs request Flowchart



##### F-REQ-344316/A-Predictive Lights Control output SET request Flowchart



**NOTE:** In the Predictive Lighting control Flowchart, the definition of "M/C Switch Event" is defined in Message Center X Display\_Y Button Interface Section, where X and Y are appropriate values in this document.

#### Operation Description (supports algorithm flowchart /state diagram)

##### F-REQ-344317/A-Predictive\_Lights\_Setup\_MC State Assignment

|  |  |  |  |
| --- | --- | --- | --- |
| **FeatNoHcm\_No\_Actl** | **FeatConfigHcmActl** | **Predictive\_Lights\_**  **Setup\_MC** | **Current\_PERS (3)** |
| 0x041B (1) | Disabled  (0x0000) | OFF  (0x0) | 0x0 – 0x4 |
| Enabled  (0x0001) | ON  (0x1) | 0x0 – 0x4 |
| Other (2) | Error  (0x2) | Last Known |
| Missing per Section 1.4.1 (2) | |

(1) Predictive Lighting Feature Number. Reference is Feat Num table in “Vehicle Personalization FS”

(2) Message Response is Faulted

(3) Equal to the received “PersIndex<--->” signal value . When faulted Keep last known value.

##### F-REQ-344318/A-Message Center Display and MC Predictive Lights Request Messages based upon Predictive\_Lights\_Setup\_MC

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Predictive Lights\_**  **Setup\_MC** | **Display Menu** | **M/C Switch Selection Event** | **MsgCntrDsplyOp\_D\_Rq**  **Signal** | **MsgCntrFeatNoRq**  **Signal** | **MsgCntrFeatConfigRq**  **Signal** | **MsgCntrPersIndex\_D\_Rq**  **Signal** |
| OFF  (0x0) | PredictiveLighting | OK (Select ON) | SET (0x2) | 0x041B | 0x0001 (to enable) | Current\_PERS |
| Enabled  (0x1) | PredictiveLighting | OK (Select OFF) | SET (0x2) | 0x041B | 0x0000 (to disable) | Current\_PERS |
| Error  (0x2) | PredictiveLighting | OK (Select Any) | SET (0x2) | 0x041B | 0x0000 (to disable)  0x0001 (to enable) | Current\_PERS |

#### FS-REQ-344328/A-Function Safety Classification (EMC)

Class B

#### Memory Storage

##### NVM-REQ-344319/A-Parameters Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Description** | **Value at**  **Battery Connect** | **Value at**  **Module Wake-up** |
| Predictive\_Lights\_Setup\_MC | Output displayed in the M/C | Off (0x0) | Do Not Init |
| MsgCntrDsplyOp\_D\_Rq Signal | Output Signal to indicate Request Type. | NULL (0x0) | Do Not Init |
| MsgCntrFeatNoRq Signal | Output Signal to indicate Feature Number. | (0x0000) | Do Not Init |
| MsgCntrFeatConfigRq Signal | Output Signal to Specify the desired feature Value. | (0x0000) | Do Not Init |
| MsgCntrPersIndex\_D\_Rq Signal | Output Signal to indicate which personality profile is being accessed. | Vehicle (0x4) | Do Not Init |
| FeatNoHcm\_No\_Actl Signal | Input signal sent from BCM to indicate Feature Number. | (0x0000) | Do Not Init |
| FeatConfigHcmActl Signal | Input signal sent from BCM to indicate current value of the feature setting for the feature that is being set or queried. | (0x0000) | Do Not Init |
| Predictive\_Lights\_Cfg | Configures cluster to allow Silent Mode. Set to Disabled at Cluster Supplier Manufacturing Plant. | Use Stored Value | Use Stored Value |
| Settings\_Menu\_Cfg | Configures cluster to display items in the Settings menu (Set to “cluster” at cluster supplier manufacturer plant) | Use Stored Value | Use Stored Value |
| M/C\_Display\_Status | State Indicator to identify which text is currently being displayed on Message Center display. See \* | See \* below | See \* below |
| M/C Switch Event | Event that is indicated as per the switch interface for the Message Center. See \* | See \* below | See \* below |
| 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.

#### Reconfigurable Telltale

Not Applicable

#### Prove Out

Not applicable

#### Message Center Msg

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

## Error Handling

### Missing Message Strategy

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.

#### SR-REQ-344322/A-Config

If Predictive\_Lights\_Cfg = Disabled, the cluster shall never log a missing message for this feature.

## Diagnostics

### Self Test

None

### Engineering Test Mode

Reference section “Dealer / Engineering Test Mode (ETM)”

### Part II Performance

#### DTC-REQ-344323/A-Supported Diagnostic Trouble Codes (DTCs)

|  |  |
| --- | --- |
| **DTC** | **Description** |
| C24100 | Lost Communication with Headlamp Control Module “A” (if configured for HCM) |

#### DCR-REQ-344324/A-DID DExx:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Block**  **Num** | **Block Description** | **Byte(s)** | **Bits** | **State: Description** | **"0"** | **"1"** | **Default** | **Comments/**  **Information** |
| PACKETED BLOCKS | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| $09 | Option Content (B&A) | \* | \* | Predictive Lights | Disabled | Enabled | Disabled | This parameter allows the Predictive Lighting - On/Off settings menu to be displayed in the cluster. It can be over-ridden by the Settings Menu config. |
|  |  |  |  |  |  |  |  |  |
| $09 | Option Content (B&A) | \* | \* | Settings Menu | Cluster | Center Stack | Cluster | This parameter allows the Settings menu to be displayed in the cluster when 0x0. When 0x1, the expectation is that settings are displayed in the Centerstack. For this feature (when 0x1), the cluster will remove almost all items from settings menu. (Cluster display choices remain). Note this is a global config, each feature still has its own config for presence on vehicle. |
|  |  |  |  |  |  |  |  |  |
| \*Byte and bit location to be identified in Part II Specification for this cluster | | | | | | | | |

## Reference Specification

None.

## Revision History

**SPSS Module Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision Level** | **Name** | **Change Description** | **Date** |
| 1.0 | V. Patel | Initial release.  Feature owner: Max Schumacher  DI CC Approval: 9/1/2016 | 10/5/2016 |
| 2.0 | S. Watkins | Starting in MY2019 with U625/U611 the Settings are migrating from the cluster to Centerstack. This STSS update is to support this effort. A configuration is added to ensure backward compatiblity.  Changes shown in yellow:   1. Section 1.1 – Updated description to mention Center Stack 2. Section 1.2.1, Figure 1 – Added DE09 Settings Menu 3. Section 1.2.2 – Added Settings\_Menu\_Cfg 4. Section 1.3.5.1, Figure 2 – Added DE09 Settings Menu 5. Section 1.3.5.1, Figure 4 – Added decision box for Settings\_Menu\_Cfg 6. Section 1.3.5.4 – Added Settings\_Menu\_Cfg 7. Section 1.5.3 – Added Settings Menu to DE09 | 1/16/2017 |
| 2.1 | V. Patel | Initial release for VSEM requirements migration | 2/27/2019 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |