



Global A Illumination Control Component Requirements

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Scope. This document details the illumination control (specifically dimming) implementation requirements for **slave** components. It is intended to provide a common methodology to aid in the development of a cohesive interior lighting strategy. Reference the Interior Lighting Subsystem Technical Specification (SSTS) for details on the overall system and the role of the **illumination master**.

1.2 Mission/Theme. To provide illumination control implementation requirements for **slave** components in an effort to achieve a harmonized vehicle interior.

1.3 Classification. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059

2.3 Additional References.

Component Technical Specification (CTS)

Global A Interior Lighting SSTS

3 Requirements

3.1 Performance Requirements.

3.1.1 Illumination Requirements.

3.1.1.1 The interior dimming function is performed through the use of the Interior Dimming Level and Interior Dimming Display Level GM Local Area Network (GMLAN) signals as defined in the Lighting Subsystem Specification.

3.1.1.2 Components that drive multiple displays shall have the ability to drive each display independently in order to achieve visual coordination throughout the dimming range.

3.1.1.3 The component shall detect loss of dimming information on the GMLAN bus and set a fail-soft dimming level as follows: The component shall supervise both the Interior Display Dimming Level and Interior Dimming Level signals. Upon notification of loss of either signal from the Low Speed GMLAN (LSGMLAN) handler, the component shall set all dimming levels to *Max_Day_Level_xx*.

3.1.1.4 The Component CTS will specify the individual displays, backlit areas, and indicators which shall be independently controlled as per the following requirements.

3.1.1.4.1 It is the supplier's responsibility to verify this list with the design release engineer (DRE).

3.1.1.4.2 If the supplier is unsure of the requirement, they shall notify the component DRE in writing asking for clarification.

3.1.1.4.3 Supplier assumptions in the absence of requirements are at their own risk.

3.1.2 Electronic Displays.

3.1.2.1 All components that drive dimmable electronic displays shall incorporate a calibratable table for each display as follows:

3.1.2.1.1 A separate calibratable table and drive circuitry shall exist for every electronic display in order to achieve visual coordination throughout the entire dimming range.

3.1.2.1.2 The table(s) shall be structured such that it maps serial data values into luminance.

Note: The recommended initial values in the table are luminance, not pulse width modulation (PWM). The supplier shall perform luminance measurements and calibrate PWM values to match them prior to Tactile, Appearance, Lighting, Color (TALC) reviews.

3.1.2.1.3 The table(s) shall contain 19 points. It is recommended that the initial calibration align with the entries of Table 1 to simplify the calibration process that is part of the TALC Review Process.

3.1.2.1.4 The table(s) shall be located in a modifiable memory location and have the capability to be plant programmable within the framework established by the Flash Programming Requirements.

3.1.2.1.5 Both axes of the calibration table shall be calibratable.

3.1.2.2 All dimmable electronic displays shall follow the dimming values specified in Table 1, whenever all of the following conditions are met:

3.1.2.2.1 The GMLAN *Interior Dimming Display Level* signal is not \$00 or \$FF (i.e., the value is between \$01 and \$FE).

3.1.2.2.2 Night Panel Mode is not active.

3.1.2.3 When following the dimming values, linear interpolation shall be applied to the output for input states between table entries.

3.1.2.4 All dimmable electronic displays shall be at *Max_Day_Level_xx* luminance whenever the GMLAN *Interior Dimming Display Level* signal is \$FF unless regulatory or other subsystem requirements dictate otherwise, in which case they should be the maximum allowed luminance.

3.1.2.5 All dimmable electronic displays shall be off whenever the GMLAN *Interior Dimming Display Level* signal is \$00 unless regulatory or other subsystem requirements dictate otherwise in which case they should be at the minimum allowed luminance.

3.1.2.6 All electronic displays shall utilize a first order lag filter algorithm to insure smooth and coordinated changes in the luminance and provide linearity of appearance as follows:

3.1.2.6.1 The filter shall only be applied when transitioning between dimming values. Transitions to or from the Day luminance (or equivalent per or off state (or equivalent per shall not have this filter applied).

3.1.2.6.2 The filtering algorithm shall be:

$$\text{Filtered value} = \text{Previous value} + (\text{New value} - \text{Previous value}) \times (1 - e^{-\text{filter_const}t})$$

Where:

Previous value = Previous filtered value

New value = Commanded value of the input

filter_const = Filter time constant

t = Filter execution rate in seconds

Note: The initial value for filter_const should be 4.6. If required, modifications to this calibration value will be determined during the TALC Review Process.

3.1.2.6.3 The filtering algorithm shall be run faster than 60 msec (i.e., t shall be ≤ 60 msec) and continue to be executed until the filtered value equals the commanded value.

3.1.2.6.4 The component shall implement a LAG_FILTER_LOW_END_THRESHOLD calibration on the output of each dimming curve lag filter. When Filtered Value is ≤ this threshold, the output of the Filtered Value shall be set to zero.

3.1.2.7 All displays shall support Night Panel Mode.

3.1.2.7.1 Night Panel Mode shall be considered active when the following condition is met:

3.1.2.7.1.1 The Night Panel Mode serial data message is received with data = True.

3.1.2.7.2 A separate Night Panel Mode calibration (*Night_Panel_Mode_Level_xx*) shall exist for each display. The term xx is used to differentiate between display calibrations.

3.1.2.7.3 When Night Panel Mode is active, the component shall:

3.1.2.7.3.1 Illuminate each display to its respective level (*Night_Panel_Mode_Level_xx*).

3.1.2.7.3.2 Disregard Night Panel Mode and resume normal illumination when any of the Night Panel Override conditions contained in the CTS are met.

3.1.3 Backlighting.

3.1.3.1 All components that drive backlighting shall incorporate a calibratable table(s) for dimming as follows:

3.1.3.1.1 A separate calibratable table and drive circuitry shall exist for every different backlighting area (i.e., graphics, glow rings, etc.) utilized in order to achieve visual coordination throughout the entire dimming range. The individual areas which are to be separately controlled for each component will be detailed in the component CTS.

3.1.3.1.2 The table(s) shall be structured such that it maps serial data values into an output PWM rate for modules that drive the backlighting of other components (e.g., switches or displays) and backlighting luminance for components directly controlling their own backlighting.

3.1.3.1.3 The table(s) shall contain 19 points. It is recommended that the initial calibration align with the entries of Table 1 to simplify the calibration process that is part of the TALC Review Process.

3.1.3.1.4 The table(s) shall be located in a modifiable memory location and have the capability to be plant programmable within the framework established by the Flash Programming Requirements.

3.1.3.1.5 Both axis of the calibration table shall be calibratable.

3.1.3.2 All backlit areas shall follow the dimming values specified in Table 1 whenever all of the following conditions are met:

3.1.3.2.1 The GMLAN *Interior Dimming Display Level* signal is not \$00 or \$FF (i.e., the value is between \$01 and \$FE).

3.1.3.2.2 Night Panel Mode is not active.

3.1.3.3 When following the dimming values, linear interpolation shall be applied to the output for input states between table entries.

3.1.3.4 All backlit areas shall be at *Max_Day_Level_xx* luminance whenever the GMLAN *Interior Dimming Display Level* signal is \$FF unless regulatory or other subsystem requirements dictate otherwise, in which case they should be the maximum allowed luminance.

3.1.3.5 All components that drive backlighting shall utilize a first order lag filter algorithm to insure smooth and coordinated changes in the luminance and provide linearity of appearance as follows:

3.1.3.5.1 The filter shall only be applied when transitioning between dimming values (i.e., within requirement Transitions to or from the off state (or equivalent shall not have this filter applied).

3.1.3.5.2 The filtering algorithm shall be:

$$\text{Filtered value} = \text{Previous value} + (\text{New value} - \text{Previous value}) \times (1 - e^{-(\text{filter_const})t})$$

Where:

Previous value = Previous filtered value

New value = Commanded value of the input

filter_const = Filter time constant

t = Filter execution rate in seconds

Note: The initial value for filter_const should be 4.6. If required, modifications to this calibration value will be determined during the TALC Review Process.

3.1.3.5.3 The filtering algorithm shall be run faster than 60 msec (i.e., t shall be ≤ 60 msec) and continue to be executed until the filtered value equals the commanded value.