



## Daytime Running Lamp Day/Night Detection

### 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 Purpose.** To provide a uniform method for validating that the Day/Night Detection feature of the Daytime Running Lamps (DRL) subsystem meets the specified Vehicle Technical Specification (VTS) and Subsystem Technical Specifications (SSTS) for proper Daytime to Nighttime (D/N) and Nighttime to Daytime (N/D) transitions.

**1.2 Applicability.** This procedure applies to all vehicles with automatic headlamp switching systems that use an Ambient Light Sensor (ALS) to sample ambient sunlight level. Systems in use include DRL, Automatic Headlamps (AHL) and Twilight Sentinel System (TSS). Legal requirements for the DRL Subsystem are validated in GMW14952 Lamps – Vehicle Installation. This procedure can be applied for development and validation purposes.

**1.3 Remarks.** The Day/Night Detection feature of the DRL Subsystem uses an ALS to distinguish between daytime and nighttime ambient lighting conditions. A control module then uses this ambient light measurement to automatically switch the vehicle's exterior lighting between daytime and nighttime modes. This is done through the use of calibration in either hardware or software control. This feature is commonly referred to as AHL.

The primary use for this procedure is to validate statically the ambient light levels at which the D/N and N/D transitions occur. This procedure is also to be used to evaluate these ambient light levels statically and dynamically for customer satisfaction in various weather conditions and to develop new calibrations for the D/N and N/D transitions.

### 2 References

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

#### 2.1 External Standards/Specifications.

None

#### 2.2 GM Standards/Specifications.

GMW14952

#### 2.3 Additional References.

- Global A Architecture Exterior Lighting Electrical SSTS
- Global A Architecture VTS

### 3 Resources

#### 3.1 Facilities.

**3.1.1 Calibration.** The test facilities and equipment shall be in good working order and shall have a valid calibration label.

**3.1.2 Alternatives.** Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

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**3.1.3** For the **Static** Test, use any open and level area that is free from obstructions (trees, buildings, etc.) that would cause shadows on the ALS during the dawn/dusk test times, and is free from artificial external light sources (street lights, vehicle traffic, etc.) that would cast excess light on the ALS.

**3.1.4** For the **Dynamic** Test, use any roadway that travels East/West. A highway or expressway is preferred because it can be driven in the same direction for extended periods of time.

**3.2 Equipment.** Complete the Instrumentation Calibration Data Sheet A1 in Appendix A.

**3.2.1 Photometer.** Tektronix J18, or equivalent, capable of reading 0 lux to 10 000 lux (0 foot-candle (fc) to 1000 fc).

**3.2.2 Light sensor.** Tektronix J1811 cosine corrected luminance head for lighting, or equivalent.

**3.2.3 Multimeter.** Two (2) Fluke 87, or equivalent, capable of reading 0 V to 5 V and 0 mA to 10 mA with an accuracy of  $\pm 0.5\%$ .

**3.2.4 Test Wiring Harness.** Build to monitor voltage and current at the ALS with multimeters (if voltage and current measurements are required by the requesting engineer). Needs mating connector to the ALS and plugs for the multimeters being used.

**3.2.5 Laptop computer with serial data interface software.** Vehicle Spy, Vehicle Link Tester (VLT), Controller area network Analysis Tool (CAT), or equivalent, to monitor ALS calibration values (Parameter Identifier (PID), Data Packet Identifier (DPID), Data Identifier (DID), etc.), if required by the requesting engineer.

**3.2.6 Timepiece.** Wrist watch or stop watch with graduated increments of 1 s and an accuracy of at least 1 s.

**3.2.7 Temperature Gauge.** To measure ambient temperatures of  $-30\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$  ( $-20\text{ }^{\circ}\text{F}$  to  $120\text{ }^{\circ}\text{F}$ ) with an accuracy of  $\pm 1\%$ .

**3.3 Test Vehicle/Test Piece.** Test vehicle equipped with the DRL system to be tested (ALS and control module). For validation testing, vehicle shall be of the latest build phase with production intent wire harnesses and routings. The ALS shall be mounted in the production intent location and orientation. Trim pieces shall have the production intent graining and reflectivity.

#### 3.4 Test Time.

Calendar time: 5 to 15 days

Test hours: 15 to 45 hours

Coordination hours: 2 to 4 hours

**3.5 Test Required Information.** This comes from the requesting engineer or specification.

**3.5.1** The ambient light levels for the D/N and N/D transitions and the transition time delays. Suggested values are shown in Table 1, Transitions.

Table 1: Transitions

| Transition         | Light Level                                    | Delay (seconds) |
|--------------------|------------------------------------------------|-----------------|
| Night to Day (N/D) | 2700 lux $\pm$ 500 lux<br>(250 fc $\pm$ 50 fc) | 20              |
| Day to Night (D/N) | 1600 lux $\pm$ 300 lux<br>(150 fc $\pm$ 30 fc) | 20              |

**3.5.2** Determine any additional test data required. For validation, only photometer light measurements are required. If calibration changes are to be made, additional data (control module Analog to Digital (A/D) values, sensor voltage and current) may also be required.

**3.6 Personnel/Skills.** The tester must have the ability to use the laptop computer and serial data interface software (Vehicle Spy, VLT, CAT, etc.), if calibration data is required.

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## 4 Procedure

### 4.1 Preparation.

**4.1.1** Place the photometer light sensor on the roof of the vehicle as close to level with the ground surface as possible. Use Velcro to keep the sensor steady during testing. This is used to monitor exterior ambient light levels as the sun rises and sets. Route the sensor lead through passenger door to the photometer. Plug photometer into a 12 V power outlet if not battery powered.

**4.1.2** If required, connect the test harness to the ALS and set up multi-meters to monitor voltage and current.

**4.1.3** If required, connect the laptop computer to the Assembly Line Diagnostic Link (ALDL) connector with the appropriate interface and software to monitor the ALS calibration (DPID, DID, etc.)

**4.1.4** Place the vehicle in an open area for testing as described in 3.1. Face the vehicle directly towards the rising or setting sun.

**4.1.5** Complete the Test Information section of Data Sheets A2 and A3 in Appendix A. Cross out columns not needed.

### 4.2 Conditions.

**4.2.1 Environmental Conditions.** Do not perform this test if it is actively raining, snowing, or in dense fog. The photometer sensor is not waterproof and water on the sensor will affect the accuracy of the readings. This test can be performed in any other weather conditions that allow function of the monitoring equipment. Make sure the windshield is clear of mist, fog, and frost.

Start the test early enough in the morning and evening to capture the headlight transitions (approximately 30 minutes before sunrise and sunset). Actual times will vary depending on time of year.

The static test and calibration development should be performed at least once for each of the listed weather conditions. The dynamic test should be performed at least once for conditions 4.2.1.1, 4.2.1.2, 4.2.1.5, and 4.2.1.6.

**4.2.1.1** Sunrise, direct sunlight, 0% cloudy.

**4.2.1.2** Sunset, direct sunlight, 0% cloudy.

**4.2.1.3** Sunrise, 100% cloudy.

**4.2.1.4** Sunset, 100% cloudy.

**4.2.1.5** Sunrise, 25% to 75% cloudy.

**4.2.1.6** Sunset, 25% to 75% cloudy.

**4.2.2 Test Conditions.** Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

**4.2.2.1** Make sure the ALS is not covered or shadowed by other components. Report any shadowing by interior trim or windshield blackout to the requesting engineer.

**4.2.2.2** Test with the engine running at Park/Idle. Verify the vehicle is capable of idling for extended periods without overheating, etc.

**4.2.2.3** Do not set the parking brake when starting the vehicle at the test site. This can override the AHL feature.

**4.2.2.4** The headlamp switch should be in the AUTO position. Do not turn the headlamps on with the headlamp switch. Some switches have a momentary OFF position. Actuating the switch to this position can override the AHL feature.

**4.2.2.5** Do not turn the vehicle interior lights on during the test.

**4.2.2.6** Some vehicles do not turn on the DRL if the vehicle is in Park. AHL will still activate, so testing can still be done at Park/Idle.

### 4.3 Instructions.

#### 4.3.1 Static Validation Test.

**4.3.1.1** Record the date, start time, AM/PM, temperature, and weather conditions on Data Sheet A2 in Appendix A.

**4.3.1.2** Monitor the vehicle for the automatic headlamp transition.

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