

Intelligent AFS System

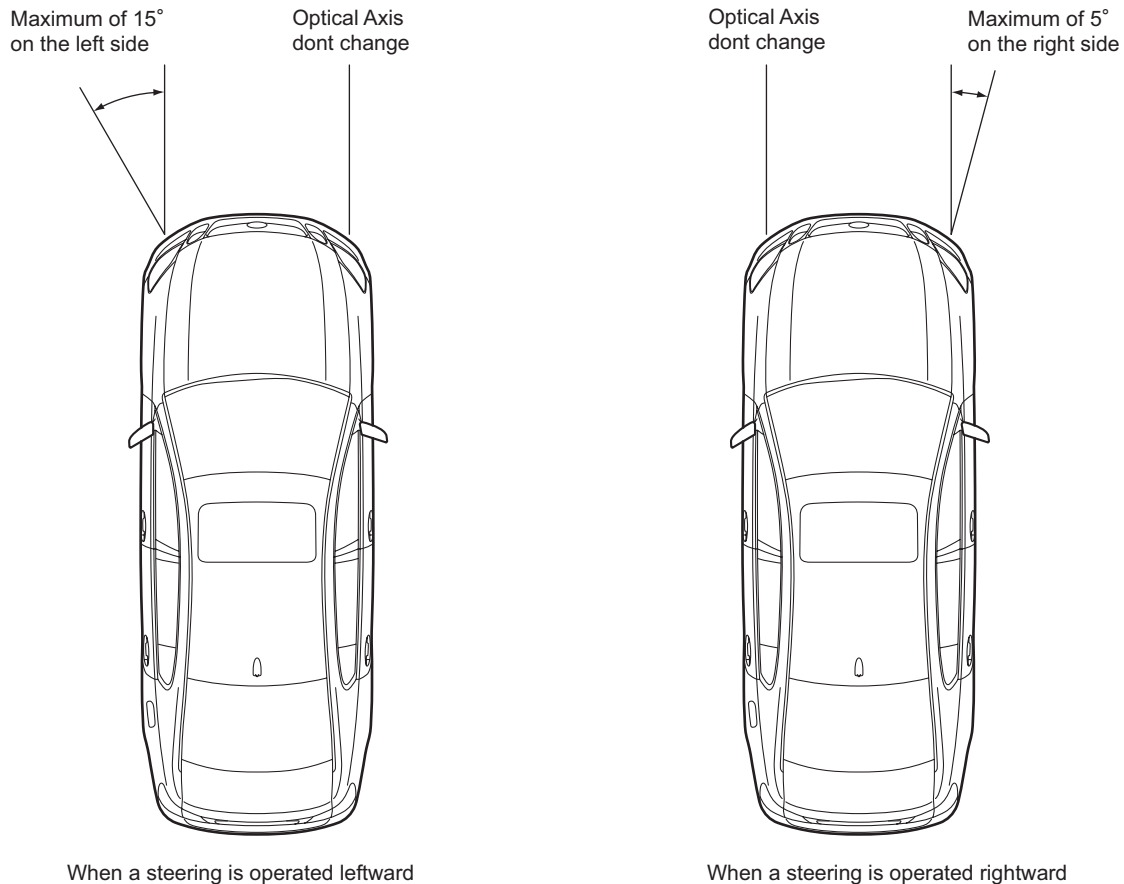
- The intelligent AFS combines the following: a swivel function that automatically changes the horizontal optical axes of the low-beam headlights in accordance with steering operation or vehicle speed; and an auto leveling function that automatically keeps the vertical optical axes constant. This system realizes optimal headlight distribution in all possible driving conditions.
- The unit that controls the intelligent AFS consists of an AFS ECU, swivel actuator, and a leveling actuator.

Intelligent AFS System Function

- If the vehicle speed is over* 10 km/h and the operating angle of the steering is over* 7.5°, the system can change the optical axes of the low-beam headlight on the inside of the turn a maximum of 15° on the left side, and a maximum of 5° on the right side for forward illumination during a turn.

❖REFERENCE❖

*These values change with the relationship between the vehicle speed and the operating angle of the steering.

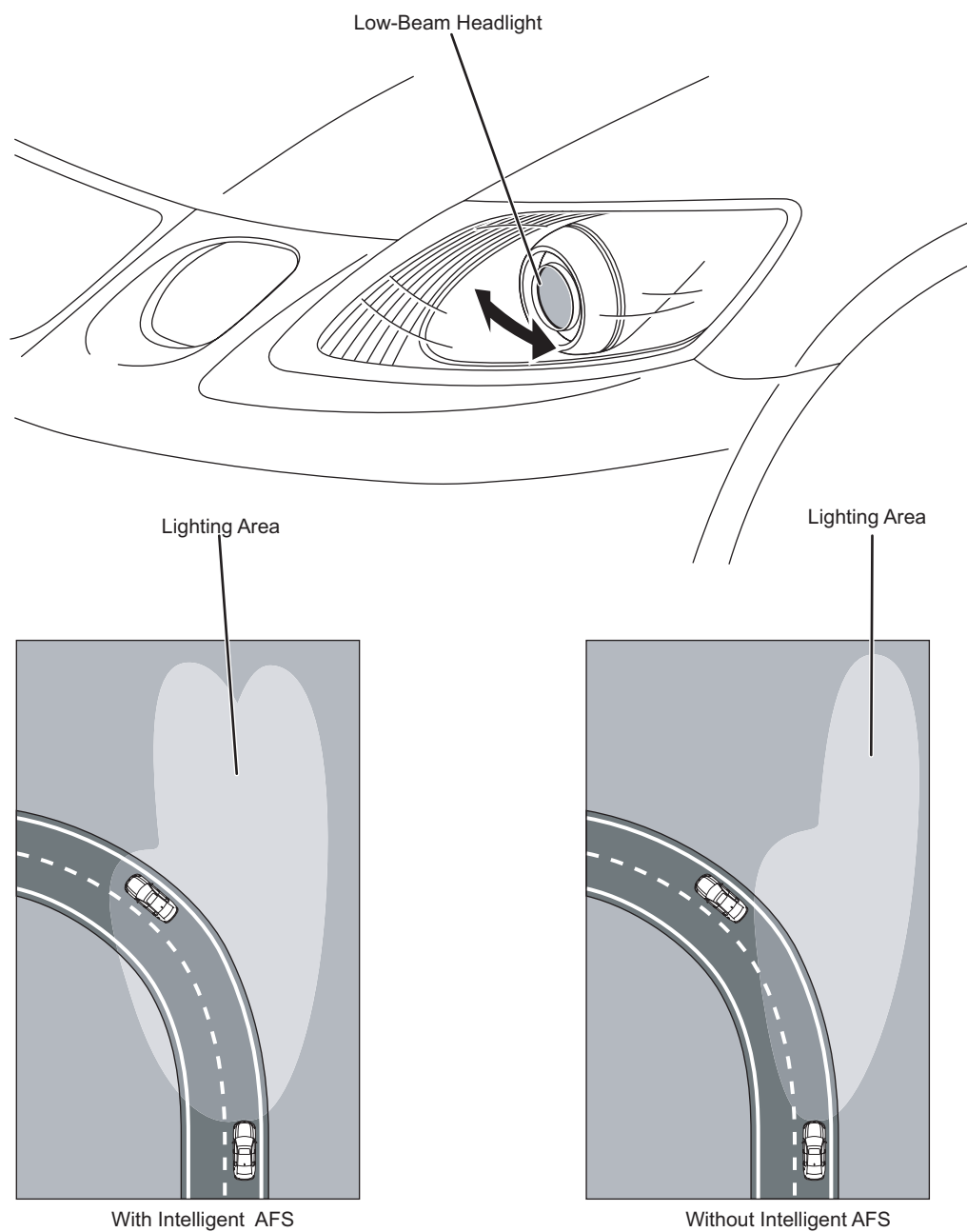


Optical Axis Variable Range by Intelligent AFS

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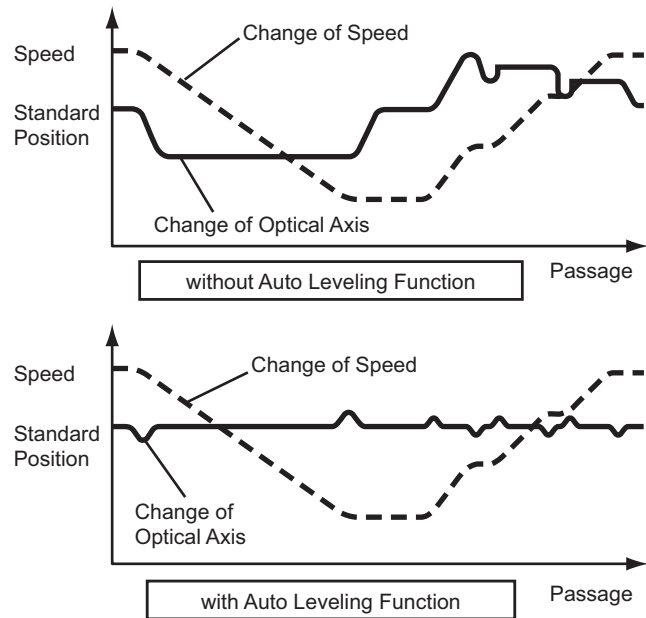
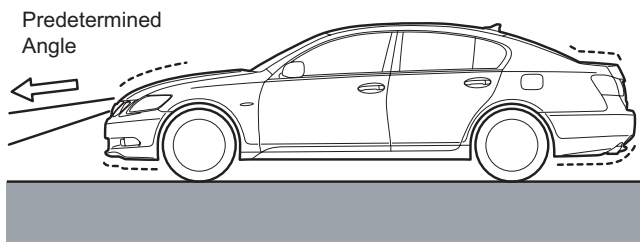
Conceptual Image of Intelligent AFS System Illumination

- In the intelligent AFS system, the AFS ECU calculates and estimates the curve based on the vehicle speed and the operating angle of the steering. Then, the system automatically changes the optical axes (operating angle of the swivel actuator) in accordance with the size of the curve, in order to illuminate the area in the direction of travel of the vehicle.



Auto Leveling Function

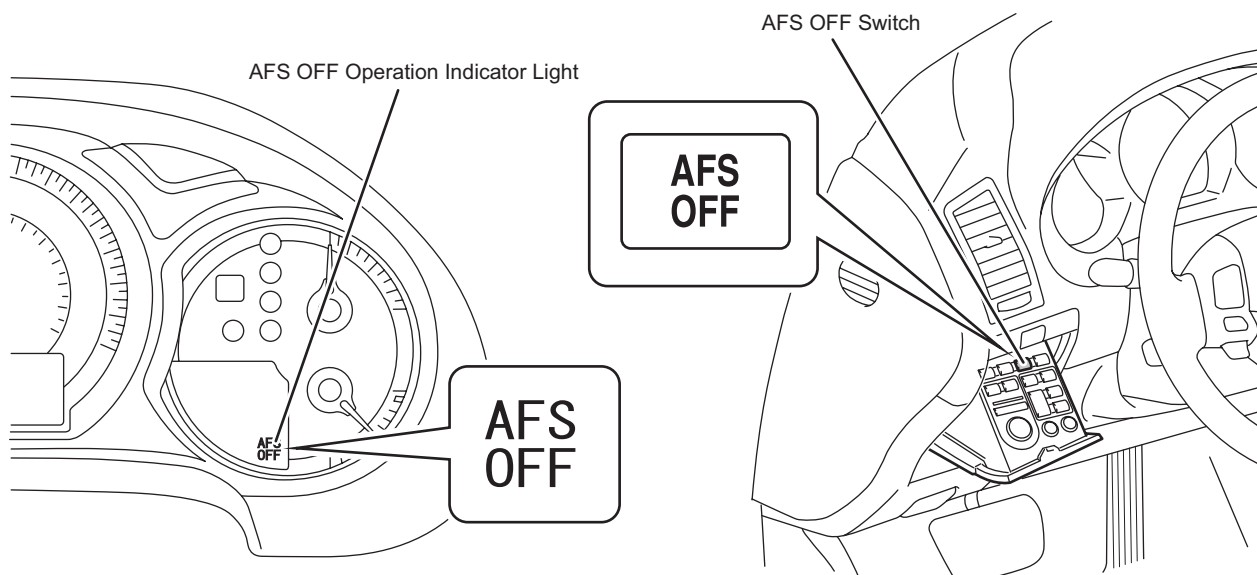
- The height control sensors, which are installed on the suspension for the front and rear axles on the left side of the vehicle, detect the changes in the vehicle posture that result from acceleration, deceleration, or the loading of cargo. Then, the sensors input the amount of change via the height control ECU. This causes the headlight leveling actuators, which are installed on the headlights, to actuate in accordance with the changes in the vehicle posture. As a result, the system automatically maintains the vertical movement of the optical axes of the headlights within a predetermined angle.



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Intelligent AFS System Cancel Function

- By pressing the AFS OFF switch, which is located below the lower instrument panel on the driver side, the driver will be able to cancel the swivel control of the intelligent AFS system. After the intelligent AFS system has been canceled, the AFS OFF operation indicator light will illuminate in the combination meter.
- After the intelligent AFS system has been canceled, the driver can press the AFS OFF switch again to resume the swivel control of the intelligent AFS system. At the same time, the AFS OFF operation indicator light will turn OFF in the combination meter.



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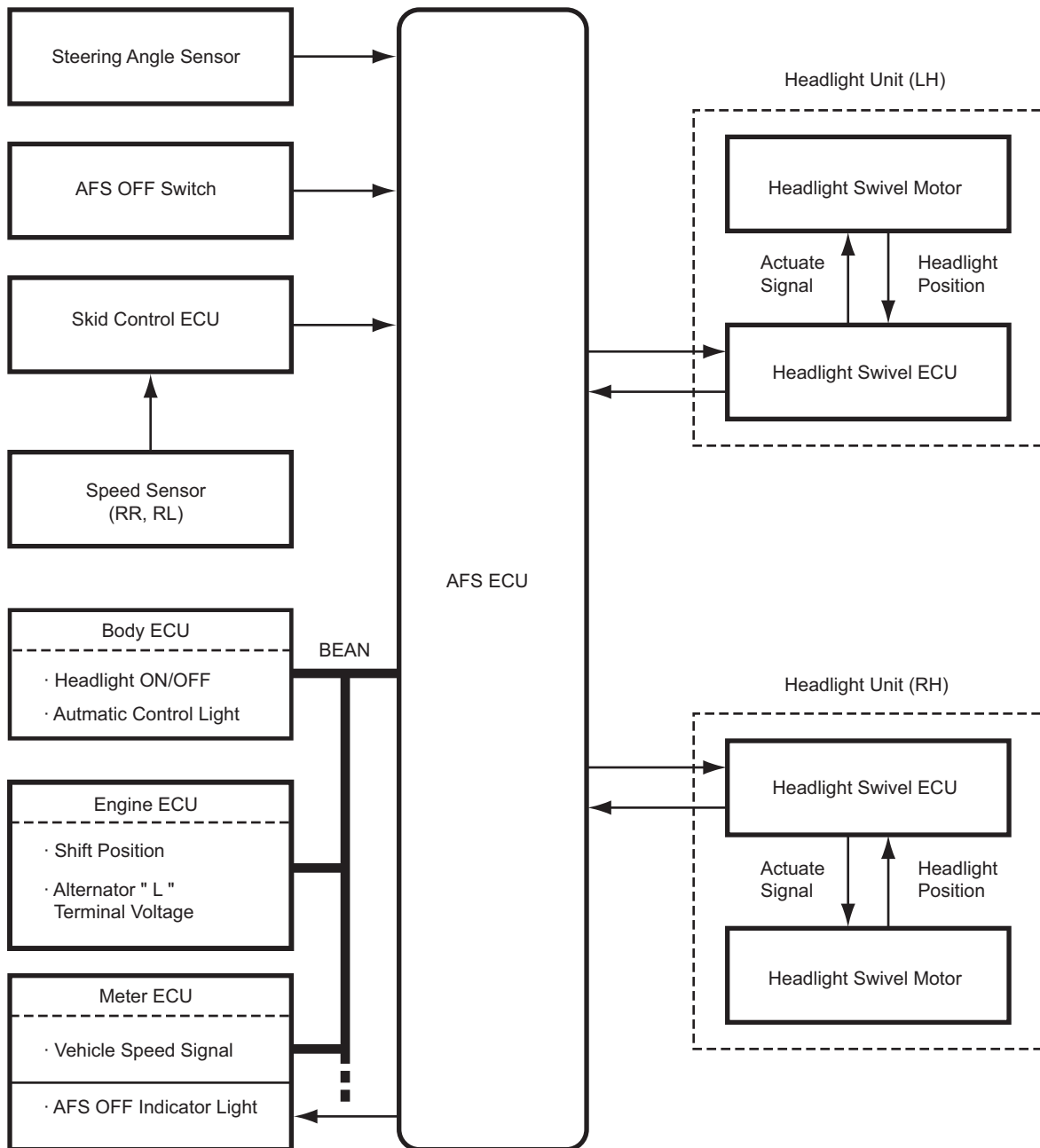
Intelligent AFS System Operation

Intelligent AFS System Operation

- The AFS ECU receives the input of the vehicle speed signal that is output by the front wheel speed sensor via the skid control ECU (which is built into the brake actuator), as well as the steering turning angle signal that is output by the steering angle sensor. In addition, the AFS ECU receives the input of headlight ON/OFF signals and the shift position signal by way of the BEAN (Body Electronics Area Network). Thus, the AFS ECU is able to control the swivel actuators.

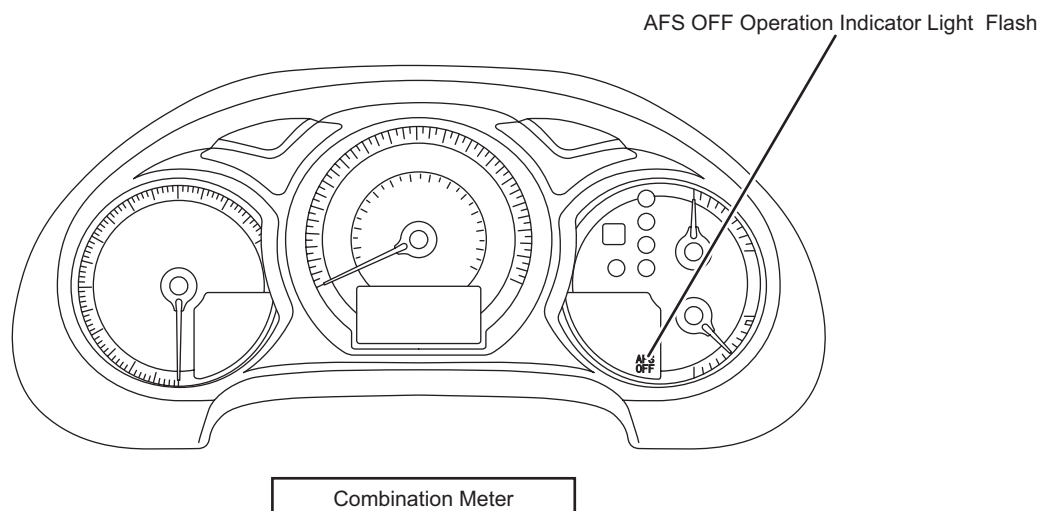
Auto Leveling Function Operation

- The AFS ECU receives the input of the vehicle speed signal that is output by the front wheel speed sensor via the skid control ECU (which is built into the brake actuator). In addition, the AFS ECU receives the input of the vehicle height signals, which are output by the height control sensors that are installed on the front and rear axles on the left side of the vehicle, via the height control ECU. The AFS ECU obtains the changes in the pitch angle of the vehicle posture through these signals. Then, in accordance with the amount of these changes, the AFS ECU controls the angle of the headlights by actuating the headlight leveling actuators to the same angle as the pitch angle, in the opposite direction.



Failsafe

- If the AFS ECU detects a failure indicated in the table (List of Main Failsafe Functions), it effects failsafe control, and outputs a request signal to the meter ECU (built into the combination meter) in order to flash the AFS OFF operation indicator light. Upon receiving this signal, the meter ECU flashes the AFS OFF operation indicator light in 1-second cycles (0.5 seconds ON, and 0.5 seconds OFF).
- Upon receiving the signal requesting the flashing of the AFS OFF operation indicator light, the meter ECU will transmit a warning indication request signal to the Electro Multivision. As a result, the warning icon will appear on the multi-display. The driver can touch the icon for a full-screen view of the details.



Note: The illustration gives a representative example, which may differ from the actual vehicle.

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List of Main Failsafe Functions

Item	Failure Detection Condition	Swivel Control	Auto Leveling Function Control	Light*
Swivel Actuator	Open, short, over-heating	Returns the headlights to a straight-ahead aim.(Only the side that is operating normally)	Continues to effect control by aiming the headlights 0.8°downward from the present position.	Flashing
	Gear malfunction			
	Faulty stop position			
	Faulty sensor input	Returns the headlights to a straight-ahead aim.	Continues to effect control.	
Steering Angle Sensor	Failure information	Stops the headlights at the present position, and returns them to a straight-ahead aim 10 seconds later.	Continues to effect control by aiming the headlights 0.8°downward from the present position. Reverts to the normal control after the headlights return to a straight-ahead aim.	Flashing
	Communication failure			
Vehicle Speed Signal	Failure at one side	Returns the headlights to a straight-ahead aim.	Effects control with the vehicle speed of the normal side.	Flashing
	Failure at both sides	Returns the headlights to a straight-ahead aim.	Continues to effect control of the stopped vehicle.	
Height Control Sensor	Open or short	Returns the headlights to a straight-ahead aim.	Returns the headlights to the default position if they are aimed higher than the default position. Keeps the headlights stopped at the present position if they are aimed lower than the default position.	Flashing
Headlight Leveling Actuator	Open, short, over-heating	Returns the headlights to a straight-ahead aim.	Returns the normal side to the default position if it is aimed higher than the default position. Keeps it stopped at the present position if it is aimed lower than the default position. (Keeps the abnormal side at the present position.)	Flashing
Communication	Headlight signal, gear position signal, etc.	Returns the headlights to a straight-ahead aim.	Continues to effect control.	Flashing
	Alternator signal, vehicle speed signal	Continues to effect control.		

❖REFERENCE❖

*AFS OFF operation indicator light.