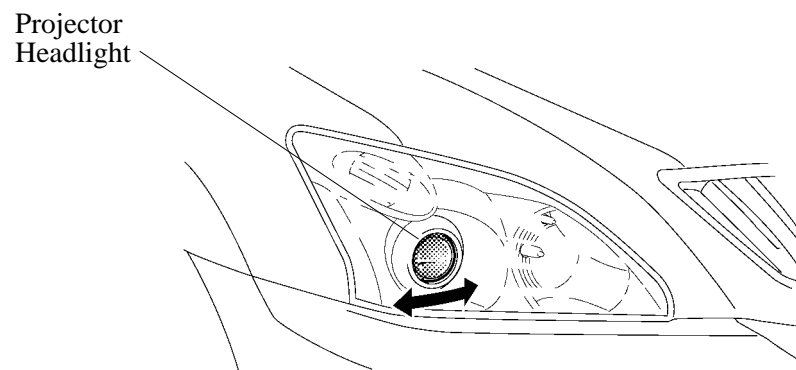


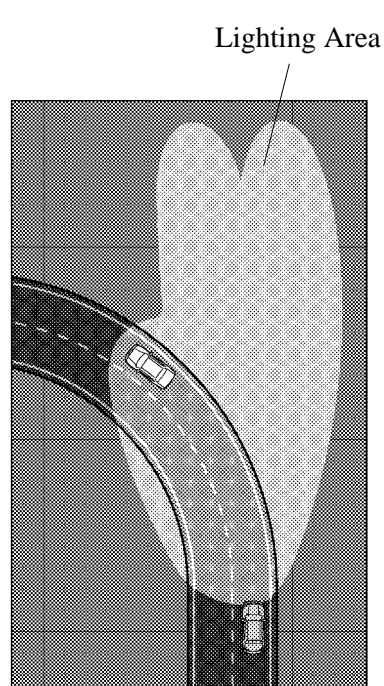
## ■ AFS (Adaptive Front-lighting System)

### 1. General

- An AFS (Adaptive Front-lighting System) has been adopted as optional equipment in order to ensure a wide range of the Lo beam lighted area and increase visibility during turning by swinging the projector headlight (for Lo beam) to the inner side of the cornering direction.
- This system is mainly comprised of 2 projector headlights (for Lo beam), the AFS ECU, 2 headlight swivel ECU, 2 headlight swivel actuators, steering angle sensor and rear speed sensors.
- This system is controlled by the AFS ECU. The AFS ECU also controls the automatic headlight beam level control system. For details of the automatic headlight beam level control system, see page BE-38.
- AFS ECU maintains communication with other ECUs through the BEAN (Body Electronics Area Network)

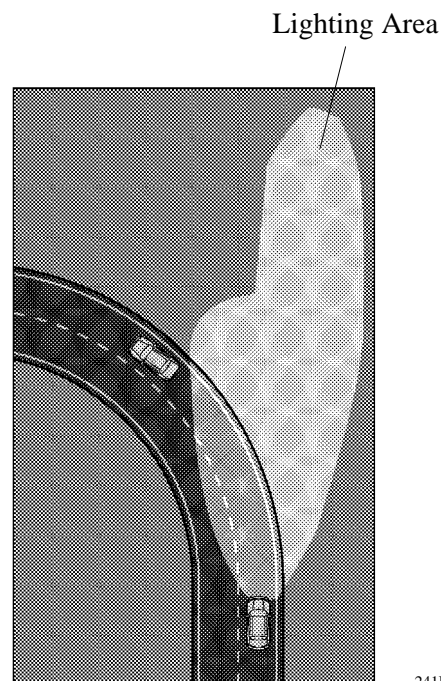


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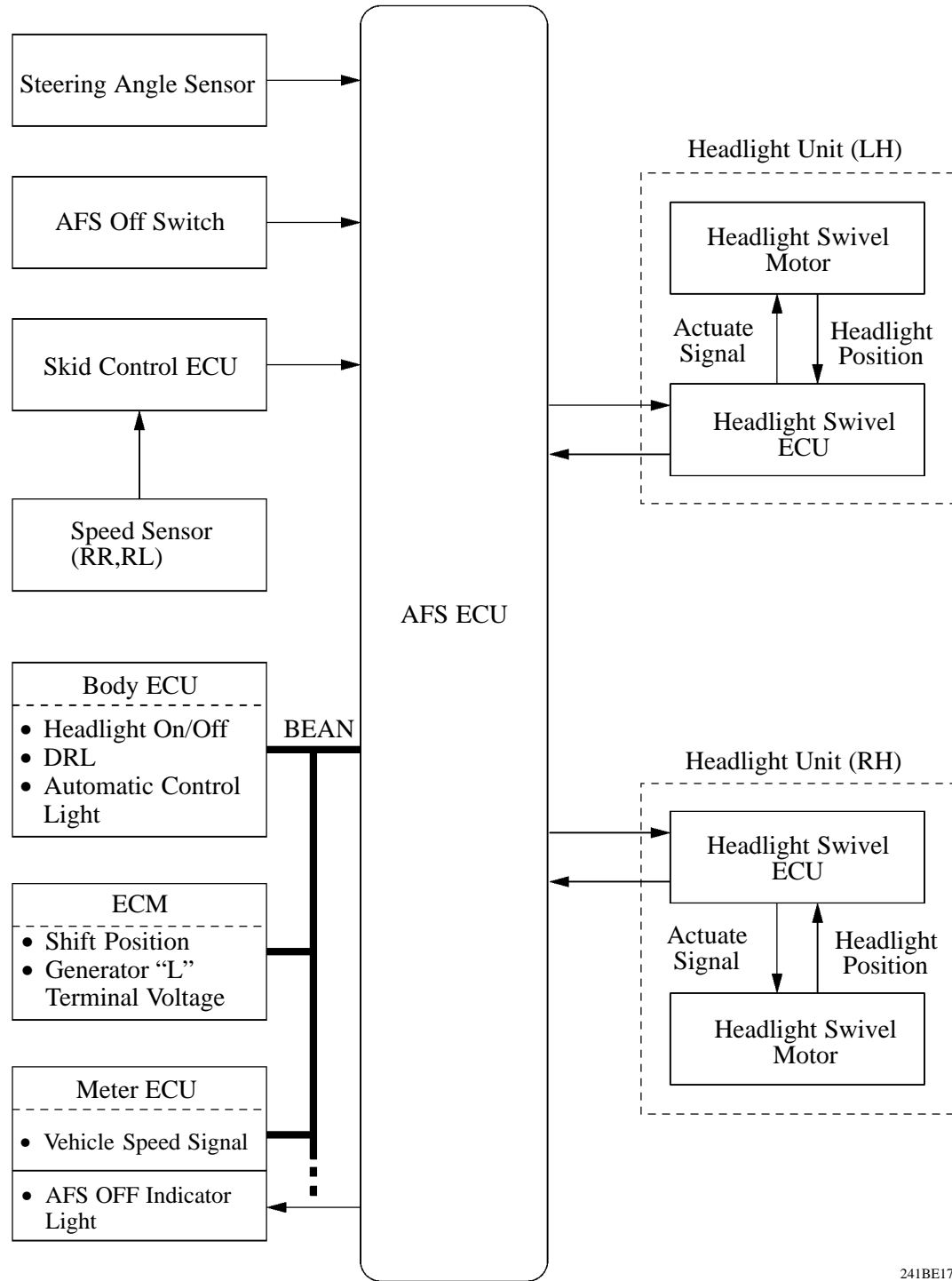
With AFS



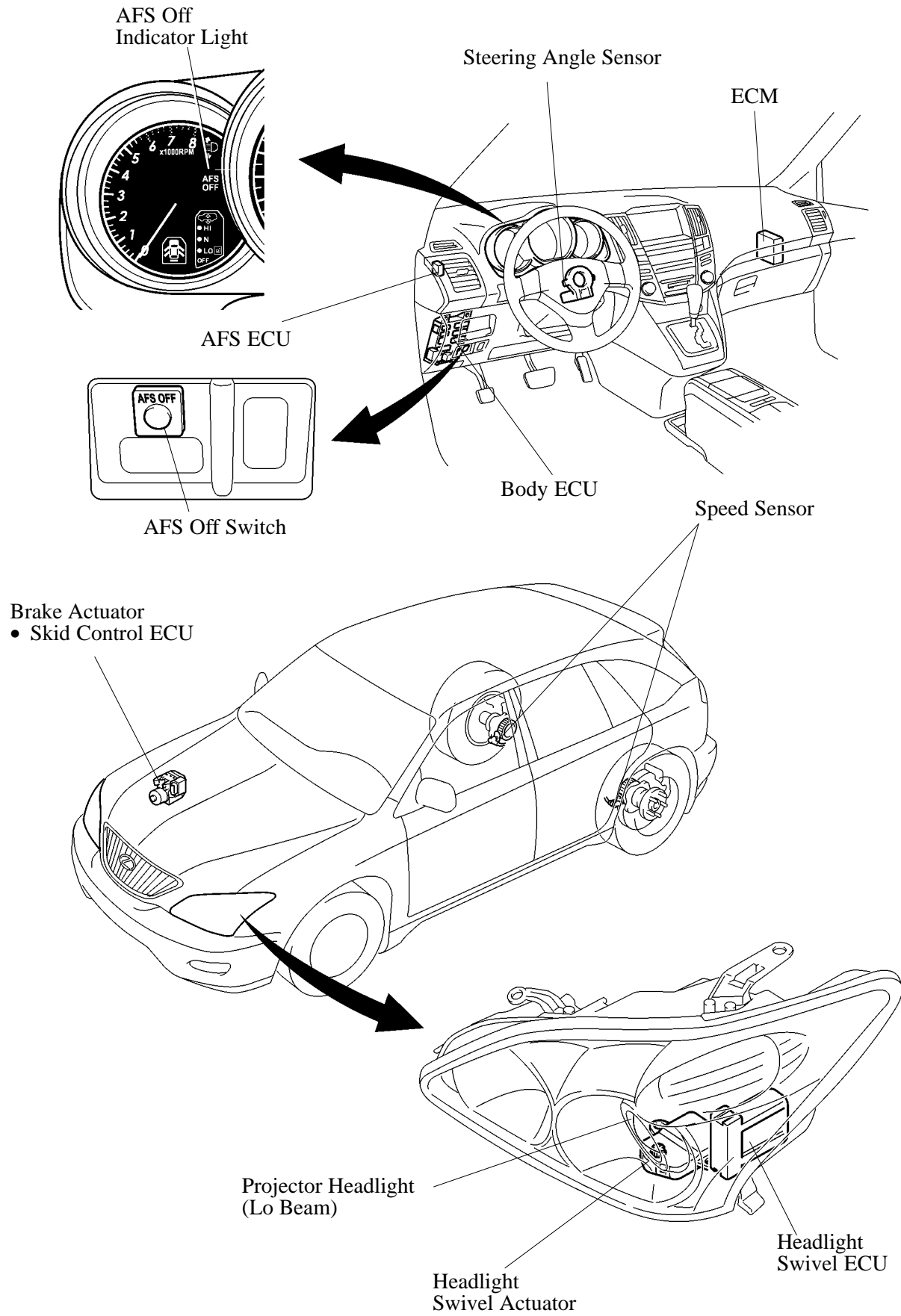
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Without AFS

2. System Diagram



### 3. Layout of Main Components



#### 4. Function of Main Components

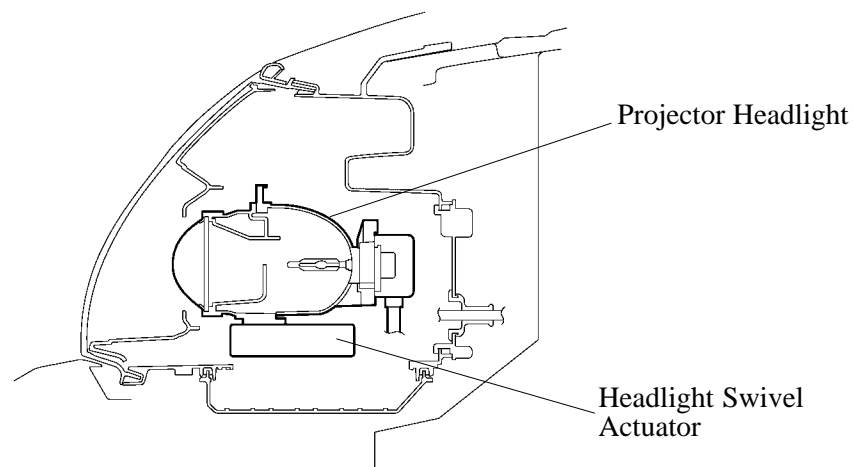
Item		Outline
Headlight Unit	Headlight Swivel Actuator	Driven by the headlight swivel ECU, the actuator moves the projector headlight (low beam) to the angle calculated by the AFS ECU.
	Headlight Swivel ECU	Drives the headlight swivel actuator according to control signals from the AFS ECU.
AFS ECU		The AFS ECU effects the control of the system.
Steering Angle Sensor		The AFS ECU receives the steering angle sensor signal and uses this information to calculate the headlight operation angle.
Speed Sensor		The AFS ECU receives the speed sensor signal from the skid control ECU and uses this information to calculate the headlight operation angle.
AFS OFF Switch		Pressing this switch, it enables to cut off the operation of the AFS.
AFS OFF Indicator Light		<ul style="list-style-type: none"> <li>• When AFS control is stopped by the AFS OFF Switch, it is indicated by the AFS OFF Indicator Light lighting up.</li> <li>• When the AFS ECU detects a malfunction, the AFS ECU flashes the AFS OFF Indicator Light.</li> </ul>

## 5. Construction and Operation

### Headlight Unit

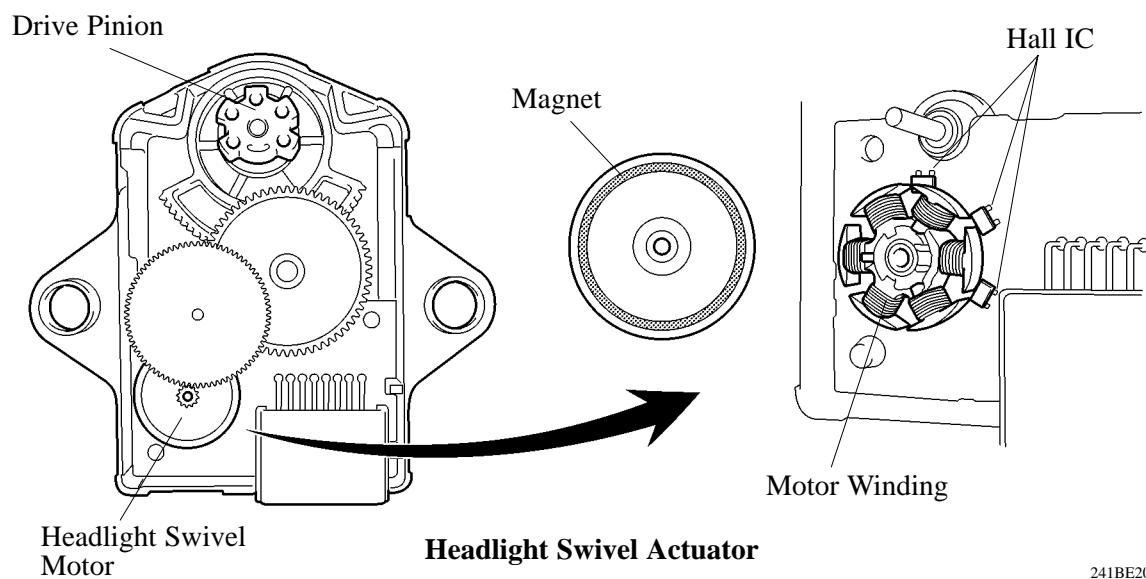
#### 1) Headlight Swivel Actuator

- The headlight swivel actuator is located under the projector headlight (for Lo beam) of the headlight unit, and it is comprised of the headlight swivel motor that moves the projector headlight (for Lo beam) to the left and right, and the 3 Hall ICs that detect the headlight swivel motor position. This actuator cannot be disassembled.
- The 3 Hall ICs detect changes in the magnetic flux density accompanying turning of the headlight swivel motor, and output to the headlight swivel ECU.



Headlight Unit Cross Section

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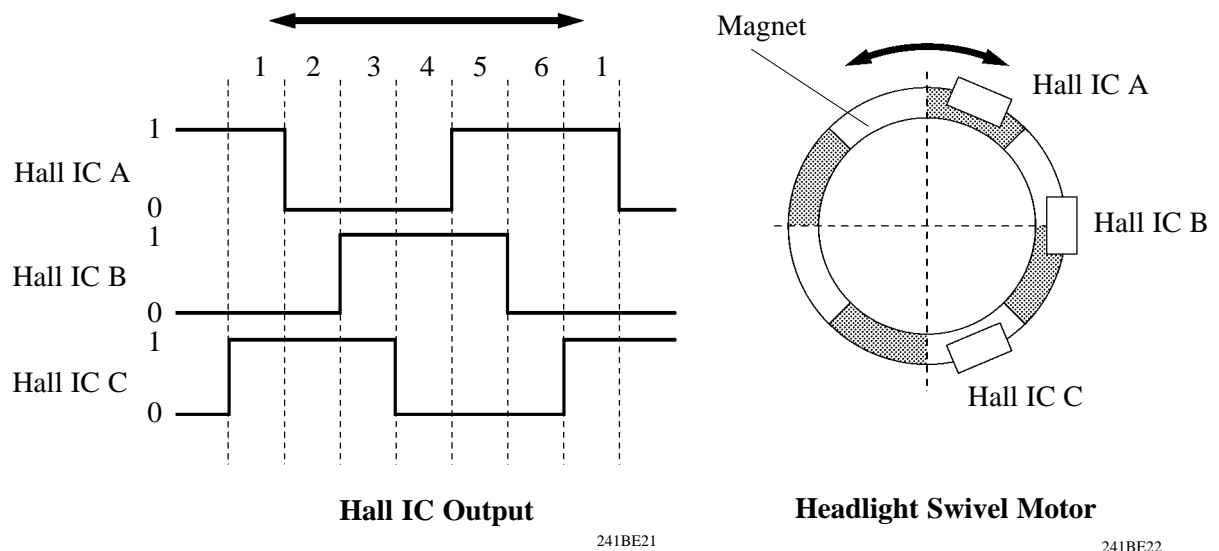


Headlight Swivel Actuator

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2) Headlight Swivel ECU

- The headlight swivel ECU performs drive control of the headlight swivel motor by control signals from the AFS ECU, and it judges the position and turning direction of the headlight swivel motor, then outputs to the AFS ECU.
- The headlight swivel ECU judges the position and turning direction of the headlight swivel motor from the combination of the 3 Hall IC signals from the headlight swivel actuator.

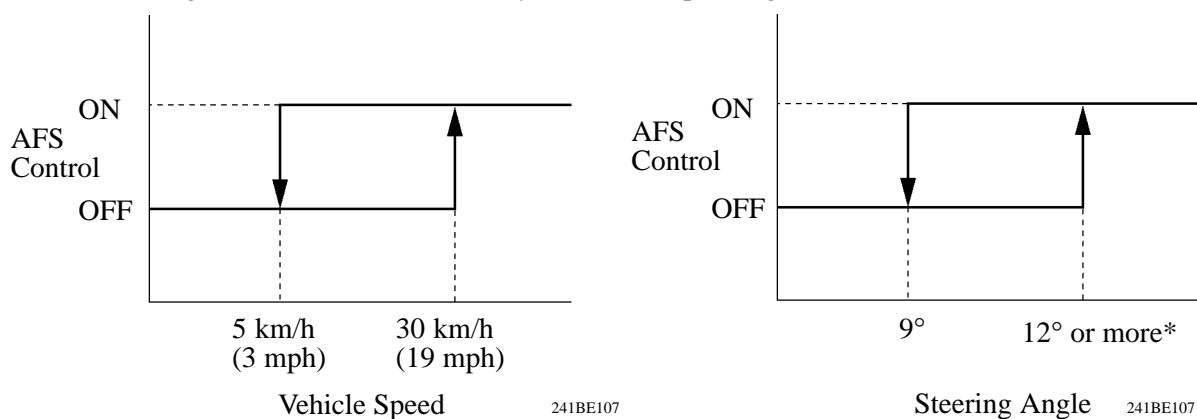


Direction	←————→																				
No.	1			2			3			4 (Neutral)			5			6			1		
Hall IC Output	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
	1	0	1	1	0	0	1	1	0	0	1	0	0	1	1	0	0	1	1	0	1

## AFS ECU

### 1) General

- The AFS ECU judges the steering angle and steering direction from the steering angle sensor signal, then calculates the lighting angle of the projector headlight (for Lo beam) from the steering angle information, and the vehicle speed and headlight swivel motor position signal from the headlight swivel ECU, then outputs a headlight swivel motor drive signal to each headlight swivel ECU.
- The AFS ECU performs AFS control when all the following conditions are fulfilled:
  - The vehicle speed is 30 km/h (18.6 mph) or more (excluding R range).
  - The steering angle is 12° or more.
  - The headlight Lo beam (but the DRL system is not operating)



\*: Changes with change of vehicle speed.

- The AFS ECU controls the cornering direction projector headlights (for Lo beam) to swing toward the cornering direction inner side as shown in the table below.

Condition	Item	Lighting Angle
Right Turn	Projector Headlight Unit (RH)	0° ~ 5° to Right
	Projector Headlight Unit (LH)	0° Fixed
Left Turn	Projector Headlight Unit (RH)	0° Fixed
	Projector Headlight Unit (LH)	0° ~ 15° to Left

### Service Tip

AFS ECU memorizes the steering position at the time of re-supplying electric power as an initial position. So, in case of performing any operations involving re-supplying of electric power to AFS ECU (such as removing and reinstalling of battery and AFS ECU), it is necessary to initialize the steering position at all times. At this time, AFS ECU flashes AFS OFF indicator light and informs the driver that the initialization of the steering position is necessary.

Perform the initialization of the steering position by following the procedure below.

1. With the ignition switch on, turn the steering wheel to the right or left at its most, and under this condition, press AFS OFF switch twice.
2. Turn the steering wheel to the opposite direction of the step 1 at its most, and under this condition, press AFS OFF switch twice.
3. Turn back the steering wheel to the straight-ahead direction, and under this condition, press AFS OFF switch twice.
4. After finishing the above operation, and if AFS OFF indicator light goes off, the initialization of the steering position will be completed.

For the details of steering position initialization, refer to 2004 LEXUS RX300 Repair Manual (Pub. No. RM1027U).

**2) Initial Set Control**

When the ignition switch is turned on, the AFS ECU drives the headlight swivel motor and moves the projector headlight to the left and right operation limit. Then it returns to the proper position. The AFS ECU thus assesses the position of the light beam that forms the reference for control.

**3) Fail-Safe**

If the AFS ECU detects a malfunction in the AFS and automatic headlight beam level control system, it will take the actions indicated in the table below.

Trouble Area	Headlight Leveling Actuator	Headlight Swivel Actuator	AFS OFF Indicator Light
Vehicle signal malfunction	Controlling continues	Stops operation after returning to initial position	Blinks
Vehicle height signal malfunction	Stops operation after returning to initial position (Fail at higher than initial position) Stops at current condition (Fail at lower than initial position)	Stops operation after returning to initial position	Blinks
Leveling actuator malfunction	Stops at current condition	Stops operation after returning to initial position	Blinks
Steering sensor malfunction	Lowers by 0.8° than current position and then re-starts controlling	Stops at current condition and then returning to initial position	Blinks
Communication signal malfunction	Controlling continues	Stops operation after returning to initial position	Blinks
Swivel actuator voltage malfunction	Controlling continues	Stops operation after returning to initial position	Goes off
Swivel actuator operation malfunction	Lowers by 0.8° than current position	Stops operation after returning to initial position (Stops at current condition when unable to operate)	Blinks
Swivel actuator communication signal malfunction	Lowers by 0.8° than current position	Stops operation after returning to initial position (Stops at current condition when unable to operate)	Blinks
AFS ECU malfunction	Stops at current condition	Stops at current condition and then returning to initial position	Goes off

**4) Diagnosis**

- If the AFS ECU detects a malfunction in the AFS and automatic headlight beam level control system, the AFS ECU blinks the AFS OFF indicator light (1 Hz) that is provided in the combination meter in order to alert the driver.

At the same time, the DTC (Diagnostic Trouble Code) are stored in memory.

The DTC can be accessed the use of the hand-held tester. For details, see the 2004 LEXUS RX330 Repair Manual (Pub. No. RM1027U).

- The table below indicates the DTCs that are associated with this system.

DTC No.	Detection Item	DTC No.	Detection Item
B2410	Headlight swivel ECU LH communication malfunction	B2416	Height Control Sensor malfunction
B2411	Headlight swivel ECU RH communication malfunction	B2417	Headlight beam level control motor LH malfunction
B2412	Headlight swivel motor LH malfunction	B2418	Headlight beam level control motor RH malfunction
B2413	Headlight swivel motor RH malfunction	B2419	BEAN communication malfunction
B2414	Steering position sensor malfunction	B2420	AFS ECU malfunction
B2415	Vehicle speed sensor malfunction	—	—