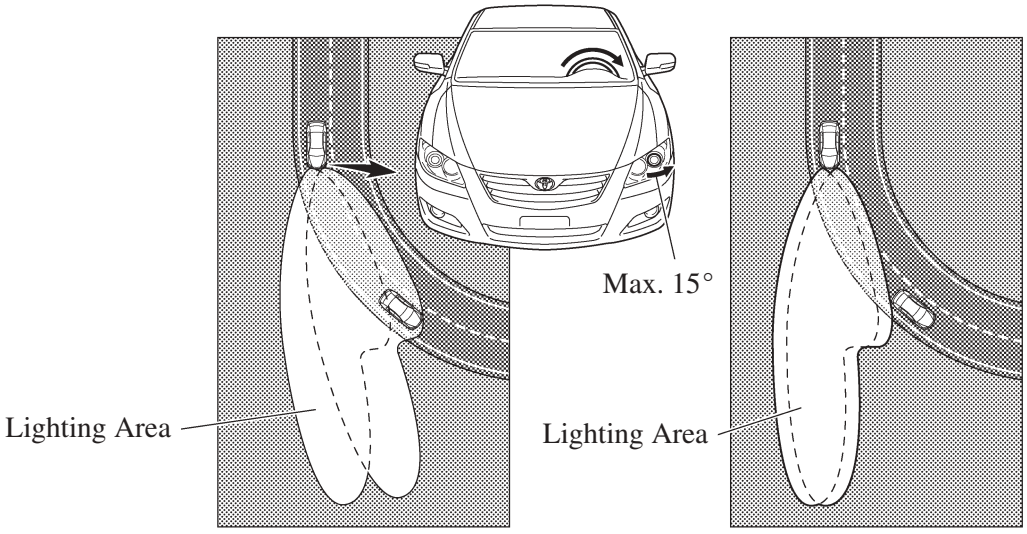
■INTELLIGENT AFS (Adaptive Front-lighting System)

1. General

- An intelligent AFS (Adaptive Front-lighting System) is used in order to ensure a wide Lo beam lighting area and realize excellent visibility during turns by moving the Lo beam.
- The intelligent AFS of the new Camry uses medium-to-high speed control and low speed control. In the medium-to-high speed control, the system calculates the target lighting angle based on the steering angle and vehicle speed and changes the swivel angle of the low-beam headlights individually. During the low speed control, the system calculates the target lighting angle based on the steering angle and changes the swivel angle of the low-beam headlight on the side facing into the turn.

▶ Medium-to-High Speed Control ◀

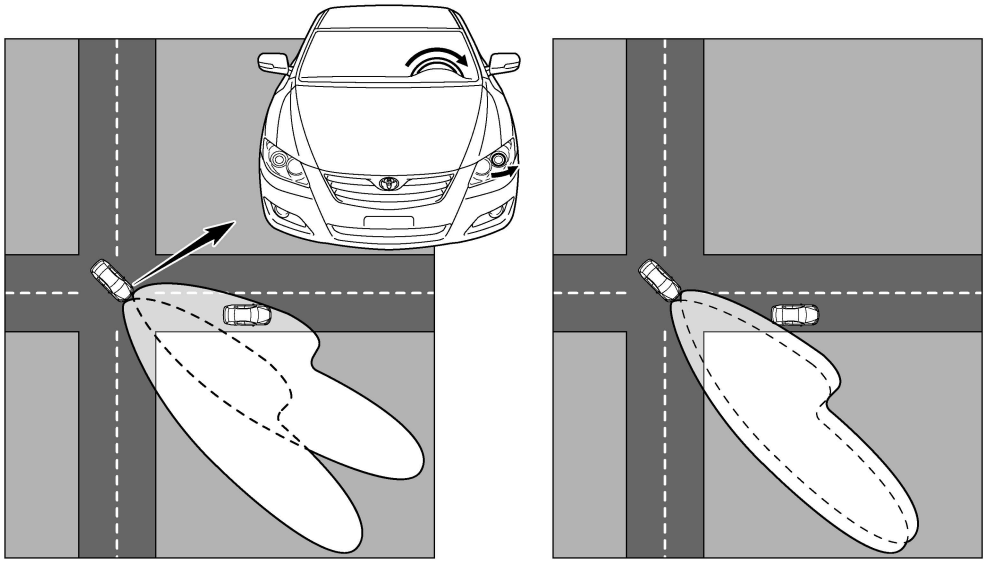


With intelligent AFS **Without intelligent AFS**

LHD Models

02KBE14Y

▶ Low Speed Control ◀



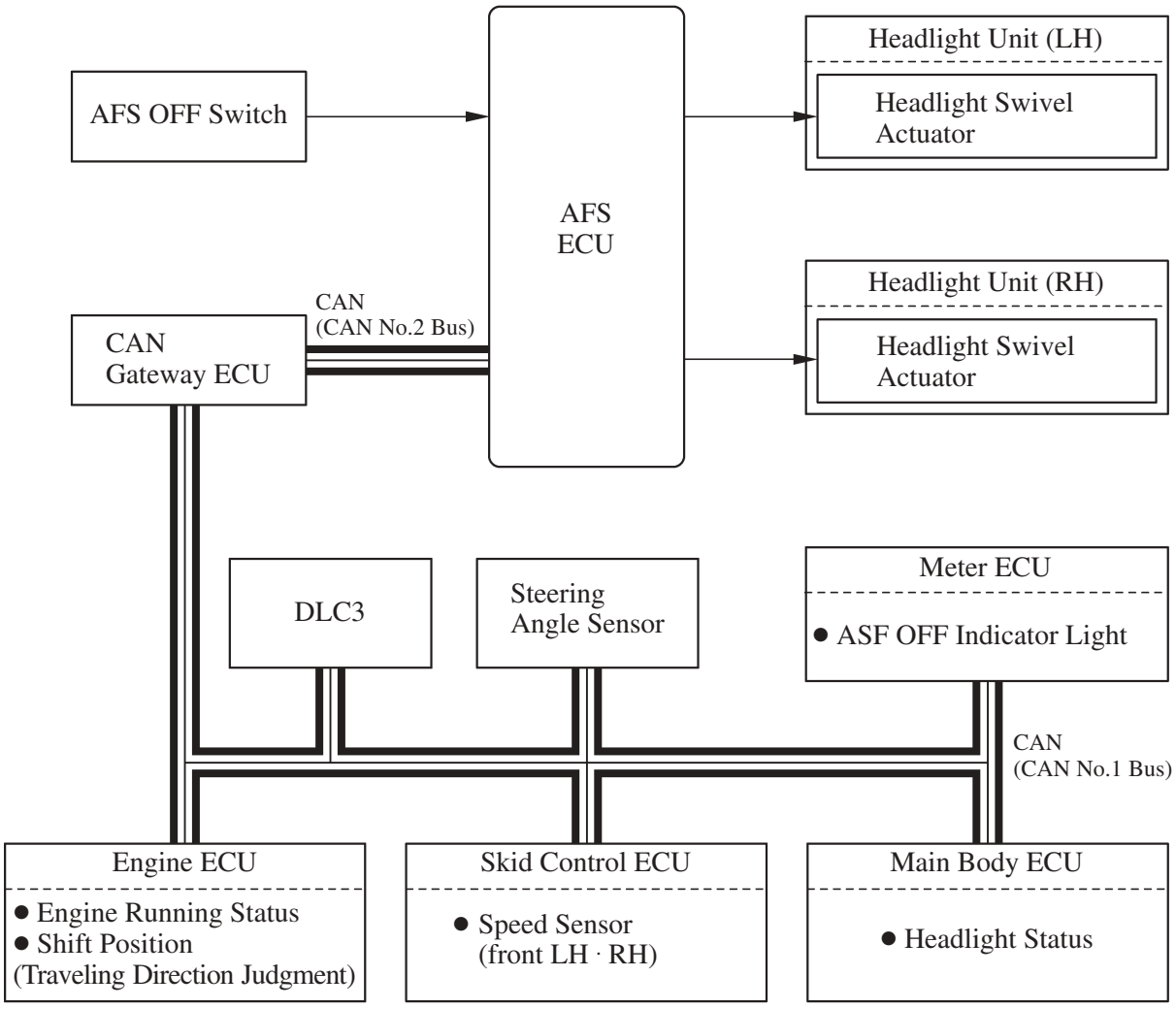
With intelligent AFS **Without intelligent AFS**

02KBE15Y

BE

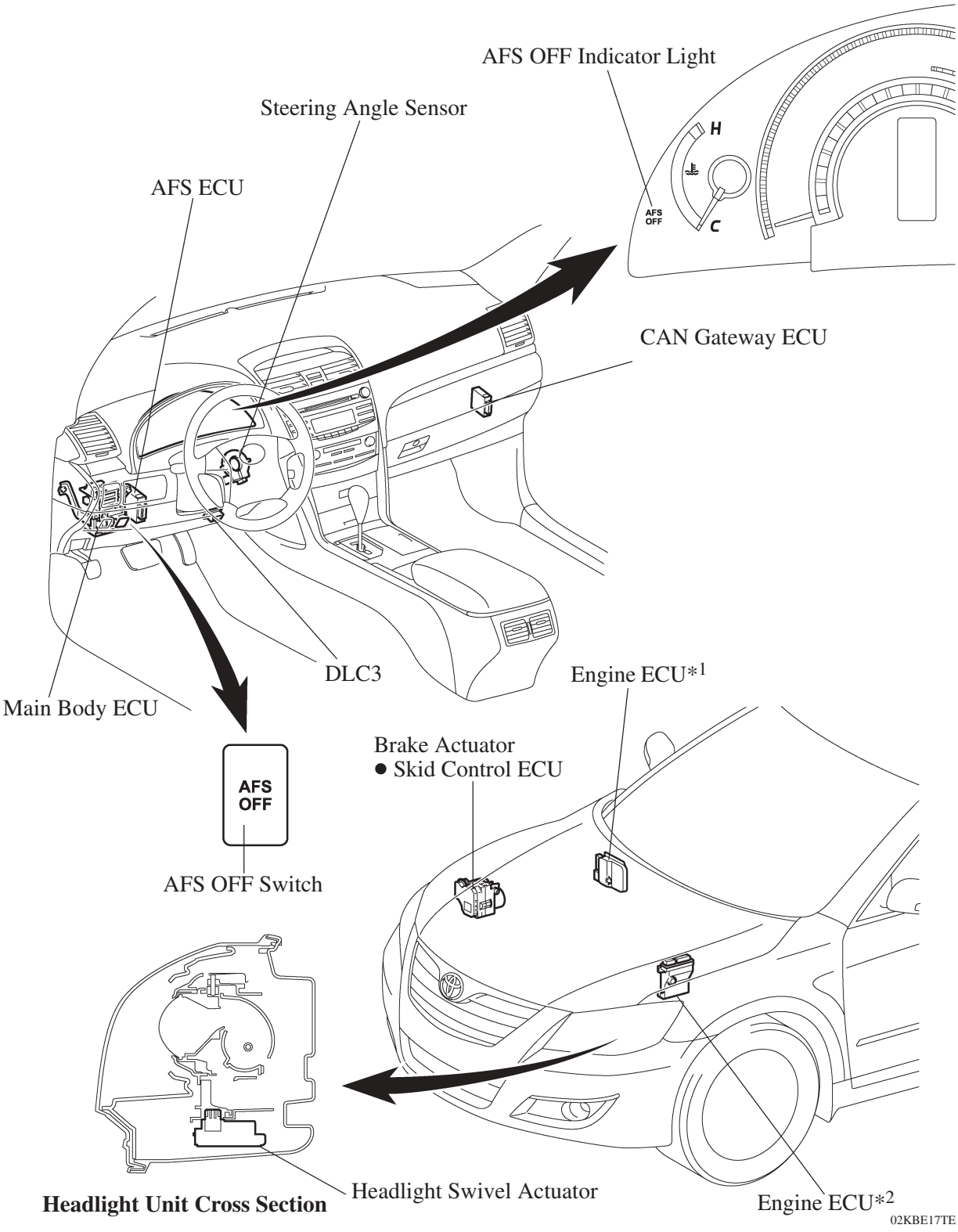
2. System Diagram

- This system consists of two headlight units (for Lo beam), the AFS ECU, two headlight swivel actuators, the steering angle sensor and the front speed sensors. The AFS ECU controls this system.
- The AFS ECU also controls the automatic headlight beam level control system. For details, see page BE-29.



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3. Layout of Main Components



Headlight Unit Cross Section

*1: Models with 2GR-FE engine
*2: Models with 1AZ-FE and 2AZ-FE engines

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4. Function of Main Components

Component		Outline
AFS ECU		The AFS ECU receives various signals, calculates the target lighting angle, and actuates the headlight swivel actuator.
Headlight Unit	Head Light Swivel Actuator	● Driven by the AFS ECU, the actuator moves the Lo beam left or right to the angle calculated by the AFS ECU. ● A step motor is used for the headlight swivel actuator. The AFS ECU determines the Lo beam angle based on the number of steps (position) of the step motor.
Steering Angle Sensor		Detects the steering angle and direction and outputs this signal to the AFS ECU.
AFS OFF Switch		Pressing this switch, disables the operation of the intelligent AFS.
Skid Control ECU		Transmits the speed sensor signal (Front LH and RH) to the AFS ECU.
Engine ECU		● Transmits the engine running status signal to the AFS ECU. ● Transmits the shift position signal to the AFS ECU. The AFS ECU determines whether the vehicle is moving forward or backward from this signal.
Main Body ECU		Transmits the headlight status signal.
Combination Meter (Meter ECU)	AFS OFF Indicator Light	● When the system malfunctions, the meter ECU flashes the AFS OFF indicator light based on the signal from the AFS ECU to alert the driver. ● When the AFS OFF switch is ON, the AFS ECU illuminates the AFS OFF indicator light to inform the driver that the system does not operational.

5. System Control

General

- The AFS ECU calculates the target lighting angle of the Lo beam by receiving the steering angle and the vehicle speed. Then, it actuates the headlight swivel actuator in order to attain the target lighting angle.
- The operation angle of the headlights is detected through the position (number of steps) of the step motor in the headlight swivel actuator.
- On the new Camry, the swivel angle control is switched between the medium-to-high speed and the low speed controls in accordance with the steering angle and vehicle speed.

Low Speed Control

- The AFS ECU performs the low speed control when all the following conditions are fulfilled.
  - Engine is running.
  - Vehicle is moving forward at a speed of 10 km/h (6 mph) or more.
  - Steering angle is 6° or more.
  - Headlight Lo beam is operating.
  - AFS ON/OFF condition is ON.
- The AFS ECU calculates the swivel angle from the steering angle and drives the headlight swivel actuator on the side facing into the turn to illuminate the road ahead during cornering.

▶ Swivel Angle Range ◀

Driving Condition	Headlight Unit	
	Left	Right
Right Turn	0° Fixed	0° to 10° to Right
Left Turn	0° to 15° to Left	0° Fixed

Medium-to-High Speed Control

- The AFS ECU performs the medium-to-high speed control when all the following conditions are fulfilled.
  - Engine is running.
  - Vehicle is moving forward at a speed of 30 km/h (19 mph) or more.
  - Steering angle is 7.5° or more.
  - Headlight Lo beam is operating.
  - AFS ON/OFF condition is ON.
- Based on the steering angle and vehicle speed, the AFS ECU calculates the swivel angle of the Lo beam headlights so that the headlights can illuminate the position which the vehicle will reach after 3 seconds, and drives both headlight swivel actuators to illuminate the road ahead during cornering.

▶ Swivel Angle Range ◀

Driving Condition	Headlight Unit	
	Left	Right
Right Turn	0° Fixed	0° to 10° to Right
Left Turn	0° to 15° to Left	0° Fixed

Initial Set Control

When the engine is started, the AFS ECU drives the headlight swivel actuator, moves the projector headlight to the operation limit in the direction toward the vehicle center and returns it to the proper position. The AFS ECU thus assesses the position of the headlight for reference control.

Fail-Safe

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

Trouble Area	Condition (Fail-Safe Control for Intelligent AFS)	AFS OFF Indicator Light
Headlight Swivel Actuator Malfunction	Normal Side Headlight Swivel Actuator: ● Stops operating after returning to the initial position.	Flash
	Abnormal Side Headlight Swivel Actuator: ● Stops in its current position.	
Steering Angle Sensor Signal Malfunction	Stops operating after returning to the initial position.	Flash
Speed Sensor Signal Malfunction	Stops operating after returning to the initial position.	Flash
Height Control Sensor Signal Malfunction	Stops operating after returning to the initial position.	Flash
Headlight Level Actuator Malfunction	Stops operating after returning to the initial position.	Flash
Communication Signal Malfunction	Main Body ECU: ● Stops operating after returning to the initial position.	Flash
	Engine ECU: ● Stops operating after returning to the initial position.	Flash
	Skid Control ECU: ● Stops operating after returning to the initial position.	Flash
	Steering Angle Sensor: ● Stops operating after returning to the initial position.	Flash

Diagnosis

If the AFS ECU detects a malfunction in the intelligent AFS, the AFS ECU flashes the AFS OFF indicator light in order to alert the driver. At the same time, the DTC (Diagnostic Trouble Codes) are stored in the memory. The DTC can be read by using the intelligent tester II. For details, see the Camry Repair Manual.