

SYSTEM DESCRIPTION

1. LUGGAGE COMPARTMENT DOOR OPENER AND CLOSER SYSTEM DESCRIPTION

When the luggage door opener switch ON signal is input the driver side J/B ECU, the trunk opener activation signal is sent to the theft deterrent (warning) ECU through the multiplex communication line. A large amount of data are input to the theft deterrent ECU. Based on these data, the theft deterrent ECU judges if the luggage compartment door can be opened or not. When the ECU determines that the luggage compartment door can be opened, the driver side J/B ECU: 1) sends a luggage open output signal, 2) activates the door closer motor, and 3) opens the luggage door.

The luggage compartment door closer assy includes the position detection switch, the courtesy switch and the open detection switch (on the striker side). These switches send signals to the driver side J/B ECU. Based on these signals, the driver side J/B ECU controls the luggage door closer system.

2. FUNCTION OF MAIN COMPONENTS

The luggage door opener and closer system mainly consists of a luggage door lock and the luggage room J/B ECU. The luggage door lock contains switches and a motor. The constituent parts provide the functions listed below.

Components	Function
Luggage Door Lock	<ul style="list-style-type: none"> Provides both opener and closer functions. In accordance with signal received from switches, luggage door lock automatically closes luggage door that is ajar to fully closed state. This is accomplished by actuating closer motor to push and turn latch in order to pull striker in. Upon receiving open signals from switches, system actuates motor to disengage latch from link mechanism in order to free latch. Result is that striker disengages from latch, enabling luggage door to open.
Courtesy Switch	<ul style="list-style-type: none"> Changing courtesy switch signal from ON to OFF causes closer function to start. Furthermore, while system operates in closer mode, if courtesy switch detects that luggage door has been mechanically opened through operation of luggage door key cylinder, it transmits signal to luggage room J/B ECU. Upon receiving this signal, ECU initializes system to open completion state. Luggage room lamp illuminates while this switch outputs ON signal (with luggage door open).
<ul style="list-style-type: none"> Position Detection Switch (Open) Position Detection Switch (Close) 	Rotating position of closer motor is detected through ON/OFF patterns of 2 switches and their signals are transmitted to luggage room J/B ECU.
Closer Motor	Actuated by signals from luggage room J/B ECU, closer motor performs both closer and opener functions.
Luggage Door Striker	Luggage door striker assembly is mounted on body. Engagement of pole portion of striker with latch causes luggage door to lock.
Luggage Room Junction Block ECU	Controls luggage opener and closer system in accordance with signals received from switches.
Luggage Door Open Switch	Mounted on luggage door striker assembly, this switch is used for detecting whether luggage door is open or closed and for transmitting applicable signal to luggage room J/B ECU.
Smart Trunk Open Switch*	Detects that smart trunk open switch of smart key system has been pressed and transmits applicable signal to luggage room J/B ECU.
Theft Deterrent ECU	In wireless door lock remote control function, if trunk lid opener switch on transmitter is pressed, theft deterrent ECU transmits signal to luggage room J/B ECU via BEAN.
Driver Side J/B ECU	When luggage door opener switch is pressed, driver side J/B ECU transmits signal to luggage room J/B ECU via theft deterrent ECU.

*: with Smart key system

3. GENERAL

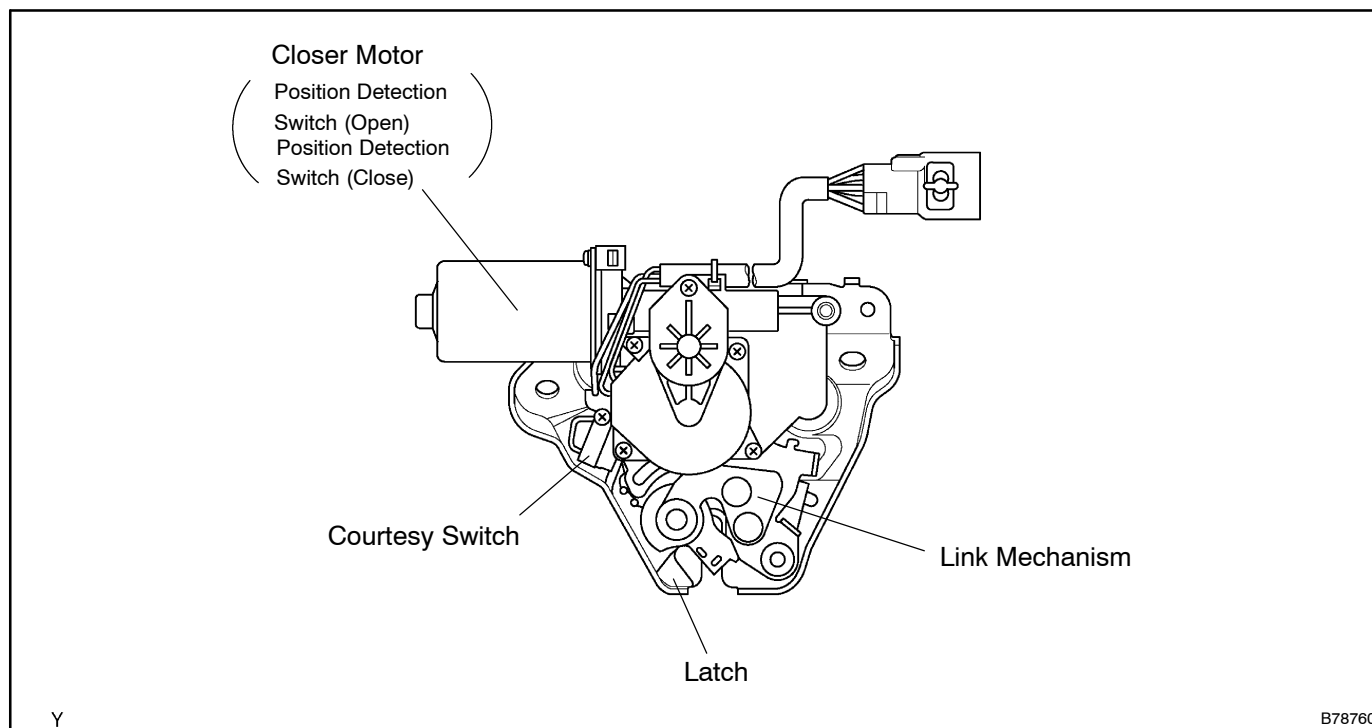
- A single actuator performs both the opener and closer functions. It is located in the luggage door lock assembly. The closer function automatically closes the luggage door entirely even if only a light pressure is applied to close the luggage door.
- A jam protection function is used so that if the presence of a foreign object is detected between the luggage door and the body while the system is in closer mode, the system stops this mode and changes to opener mode.
- While this system is in closer mode, if the trunk lid opener switch of the transmitter or the luggage door opener switch is pressed, or if the luggage door key cylinder is turned, the system cancels its operation and opens the luggage door.
- This system is controlled by the luggage room J/B ECU. In accordance with the signals received from the switches, the ECU controls the opener or closer function by actuating the closer motor to push and turn the latch.

The luggage room junction block ECU transmits its signals via the BEAN (Body Electronics Area Network) and belongs to the steering column bus.

4. CONSTRUCTION AND OPERATION

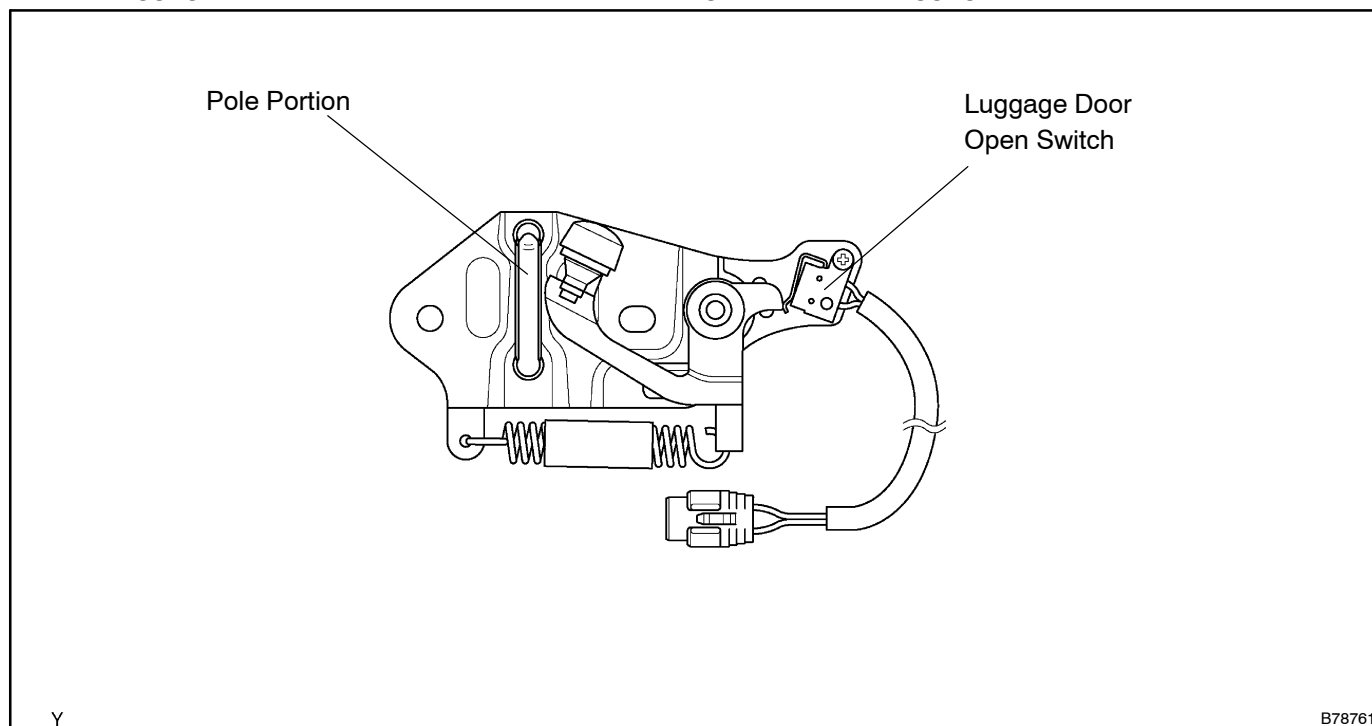
Luggage Door Lock Assembly

- The luggage door lock assembly is mounted on the luggage door and consists mainly of a link mechanism and a closer motor. It provides 2 functions: the closer function to automatically close the luggage door and the opener function to disengage the striker from the luggage door latch.
- The luggage door lock assembly contains 1 courtesy lamp switch and 2 position (open and closed) detection switches in the closer motor.



Luggage Door Striker Assembly

- The luggage door striker assembly is mounted on the body. The engagement of the pole portion of the striker with the latch of the luggage door lock assembly causes the luggage door to lock.
- A luggage door open switch is used for detecting whether the luggage door is open or closed.



Luggage Room J/B ECU**(a) General**

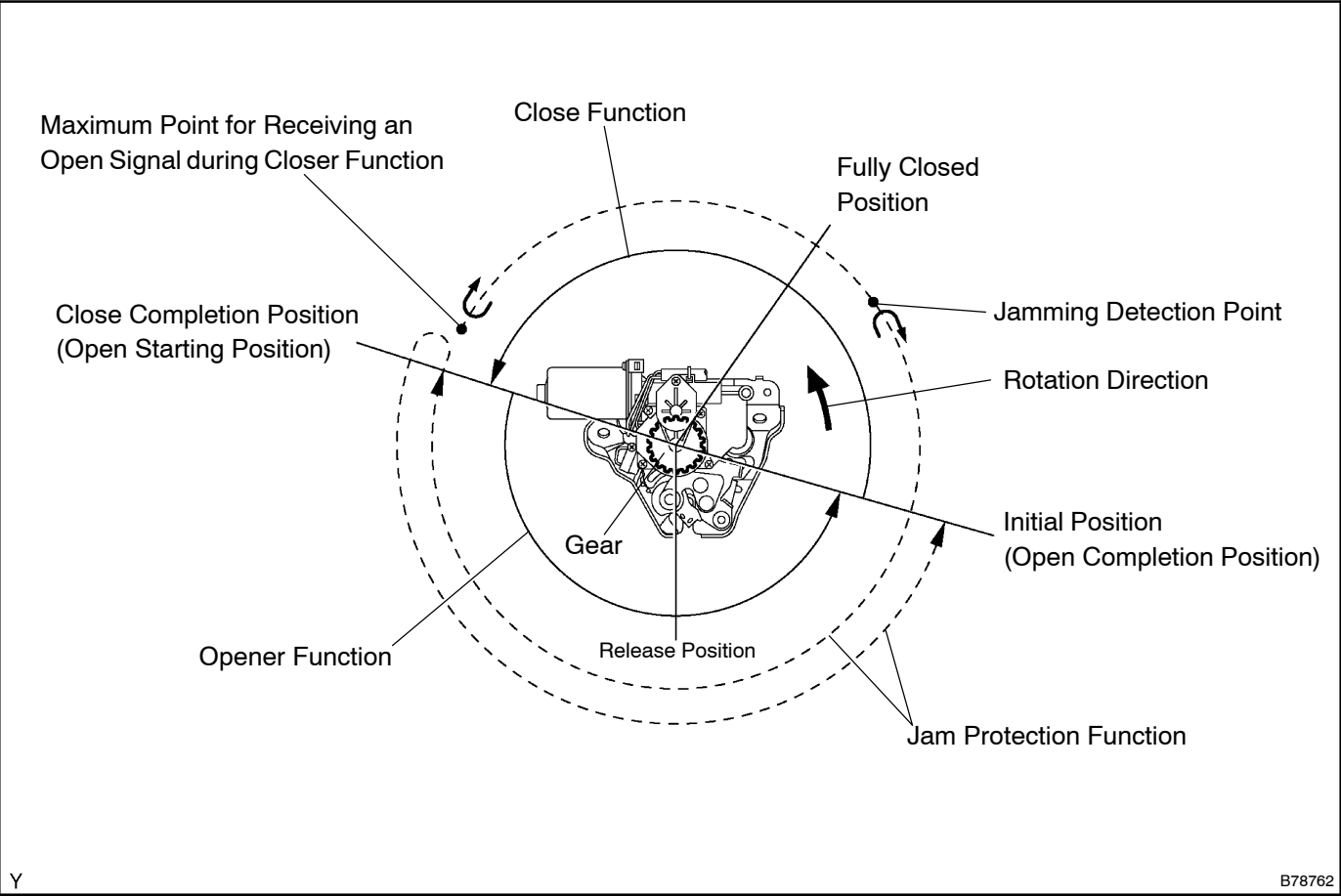
- When this system is in opener mode, it actuates the closer motor in order to free the latch by disengaging the latch from the link mechanism under one of the following conditions: 1) an open request signal from the wireless door lock remote control system or luggage door opener switch is received by the ECU, or 2) a change in the courtesy switch signals from OFF to ON, which is caused by the operation of the luggage door key cylinder, is received by the ECU.

At this time, because the hinges of the luggage door apply tension to the door in the open direction, the pole portion of the striker disengages from the latch.

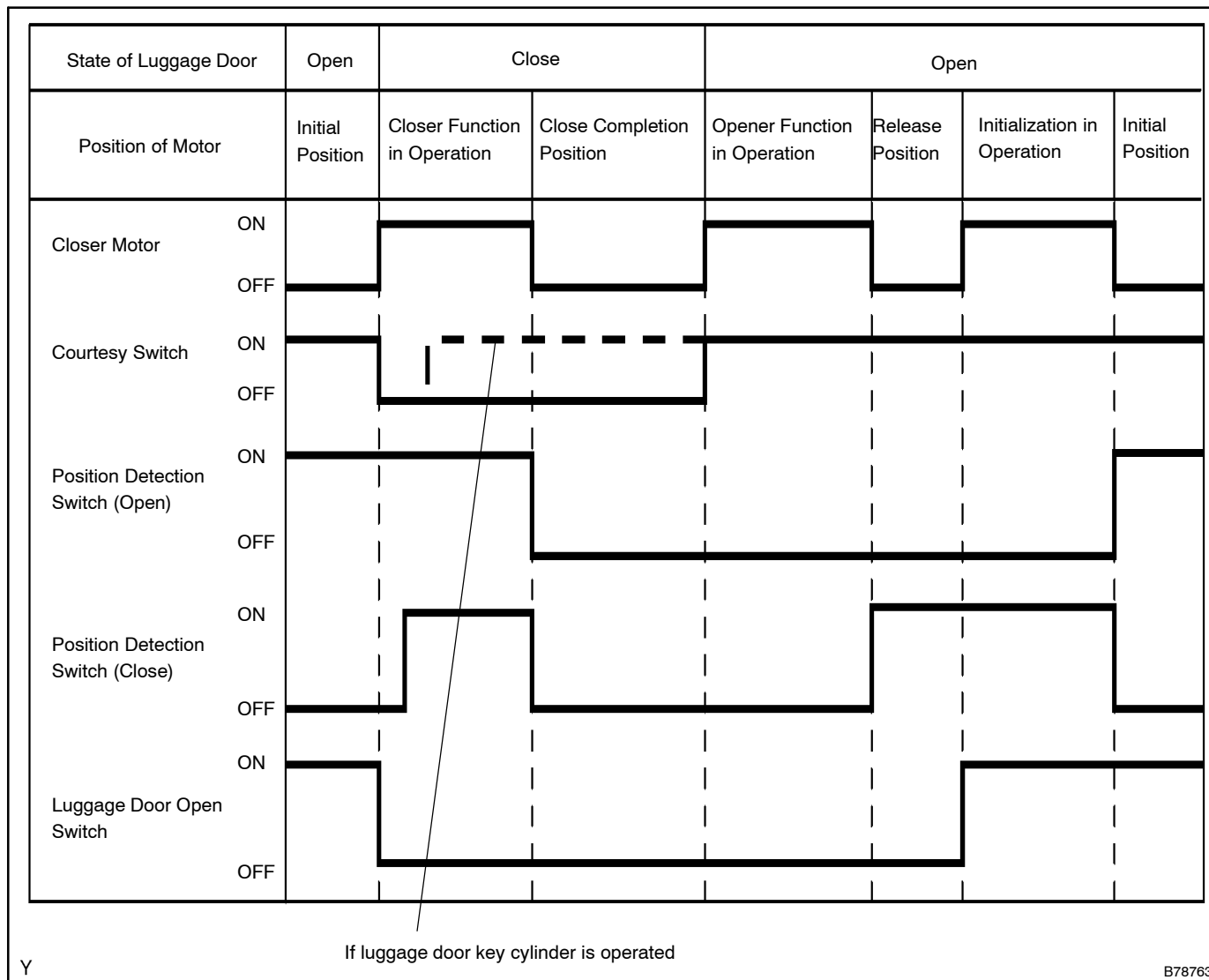
- In closer mode, this system operates as follows: when the state of the luggage door changes from open to ajar, the signal from the courtesy light switch changes from ON to OFF. Upon receiving this signal, the ECU actuates the motor in order to push and turn the latch via the link mechanism. As a result, the latch engages with the pole portion of the striker in order to fully close the luggage door.
- A jam protection function is used so that if the position detection switches cannot detect a close completion position after the system has started its closer function, the system determines that an abnormal condition has occurred (such as the detection of a jammed object) in the closer function. Then, the system stops the operation of the closer function and transfers to the opener function.

(b) Operation

- In the luggage door opener and closer system, after the motor rotates the gears approximately 180 degrees from its initial position (open completion position) to change the state of the luggage door from ajar to fully closed, the motor stops.
Then, the motor rotates the gears from the close completion position (open starting position) to the release position in order to free the latch (by disengaging the latch) from the link mechanism. After disengaging the pole portion of the striker from the latch, the motor stops in this position. In this manner, the motor stops before reaching the initial position (open completion position) for the time being. Because the switches are thus not in their initial state, the system is prevented from executing the closer function, such as when prompted by the sluggishness of the luggage door. Thereafter, when the system detects that the state of the luggage door open switch has changed from OFF to ON (because the door has opened), it actuates the motor to rotate the gears to the initial position (open completion position) and stops the motor. The switches will then return to their initial state.
- In the jam protection function, if the system detects the jamming of an object, it reverses the motor just before it reaches the full lock position and actuates the motor until the close completion position (open starting position) has been reached.
At this time, the latch becomes free by disengaging from the link mechanism. As a result, the pole portion of the striker disengages from the latch. Thereafter, the system actuates the motor in the forward direction to return to its initial position (open completion position).
- While the system is operating in the closer mode, if a signal that indicates that the luggage door has been opened (such as from the trunk lid opener switch, luggage door opener switch, or the courtesy switch through the operation of the luggage door key cylinder), the system stops the closer function.
Then, it reverses the motor, just as in the jam protection function. In this manner, the system cancels its operation and opens the luggage door regardless of its condition.



- The timing chart below shows the basic operation of the luggage door opener and closer system.



(c) Fail-safe

If a system malfunction is detected by the luggage room junction block ECU, the ECU stops the system. However, even if the system is deactivated, the luggage door can be opened and closed manually.

5. STANDARD LUGGAGE DOOR OPERATION

- (a) During standard luggage door operation, the closer motor rotates counterclockwise and changes between positions in the following order: 1) open completion position, 2) close completion position, and 3) open standby position. The closer motor then returns to the open completion position. When luggage door operation is abnormal, the closer rotates clockwise.

The position detection switches and the closer motor positions are described in the table below.

Closer Position	1. Open Completion Position	2. Close Completion Position (when the rotation is counterclockwise)	2. Close Completion Position (when the rotation is clockwise)	3. Open Standby Position
LOPN terminal	ON	OFF	ON	OFF
LCLS terminal	OFF	OFF	ON	ON
Luggage Door Condition	Luggage door is open.	Luggage door is closed.	–	LOCK does not function due to its structure when the latch is free.

Closer Operation

- (a) Normal Motor Operation

When the closer motor is at the open completion position (position detection switches: LOPN ON, LCLS OFF) and the luggage door lock switch (BDCY) is OFF, if the luggage door courtesy switch (LCTY) is turned from ON to OFF, the closer motor rotates counterclockwise and stops at the close completion position (position detection switches: LOPN OFF, LCLS OFF).

- (b) Motor Operation Under Abnormal Condition (Jammed object is present)

If the close completion position (position detection switches: LOPN OFF, LCLS OFF) cannot be detected within 3 seconds after closer operation was activated, an error occurs and a jammed object is assumed to be present. As a result, the closer operation is cancelled and, once motor stoppage of 100 ± 20 msec is confirmed, the closer motor rotates clockwise to the open completion position (position detection switches: LOPN ON, LCLS OFF).

- (c) Opener Operation Demand During Closer Operation

If any of the following conditions are found during the closer operation, the opener operation is conducted.

- The transmitter luggage door UNLOCK switch or the luggage door opener switch has been pressed.
- The luggage room J/B ECU receives a luggage door OPEN signal from the theft deterrent ECU.
- The luggage door courtesy switch (LCTY) is ON.

HINT:

The luggage door key cylinder switch and the luggage door courtesy switch (LCTY) are mechanically connected. When the key cylinder switch signal indicates that the luggage door has been opened, the luggage door courtesy switch is turned ON.

Opener Operation**(a) Normal Motor Operation**

When the closer motor is at the close completion position (position detection switches: LOPN OFF, LCLS OFF), if a luggage door OPEN signal is received, the closer motor rotates counterclockwise and the opener operation is conducted.

The motor will stop at the open standby position (position detection switches: LOPN OFF, LCLS ON). If the luggage door lock switch signal changes from OFF to ON (luggage door has opened), the closer motor rotates counterclockwise, stopping at the open completion position (position detection switches: LOPN ON, LCLS OFF).

(b) Motor Operation Under Abnormal Condition

Even through the closer motor is not in the close completion position (position detection switches: LOPN OFF, LCLS OFF) the luggage door courtesy switch (LCTY) sends an ON signal (through operation of the luggage door key cylinder) or a luggage door OPEN signal is received. This is determined as an error and the closer motor rotates clockwise to the open completion position (position detection switches: LOPN ON, LCLS OFF).