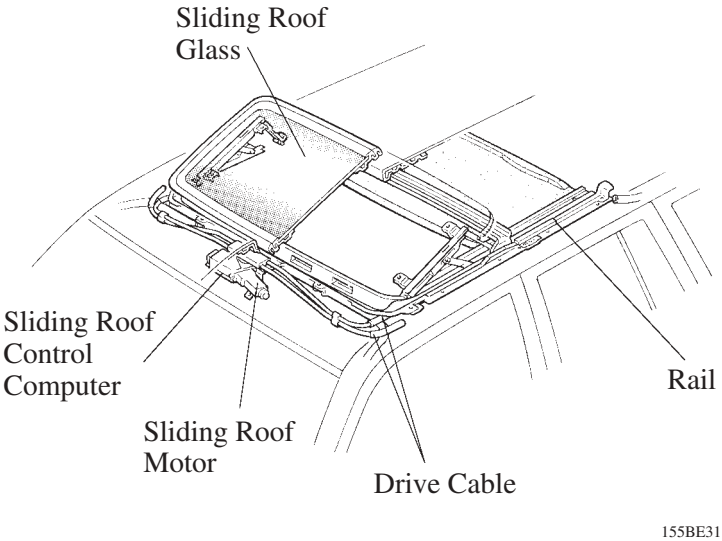
■ MOON ROOF

1. General

The moon roof in the Land Cruiser has the following features:

- A tilt-and-slide type power moon roof with "one-touch operation (except models for Australia)" and "jam protection" functions has been adopted.
  The "one-touch operation" function enables the moon roof to effect a fully open or a fully closed tilt-and-slide operation.
  The "jam protection" function detects if a foreign object gets caught while the moon roof is closing (in the slide-close mode).
- The sliding roof microcomputer and the sliding roof motor have been integrated to reduce the number of components.

2. Layout of Components



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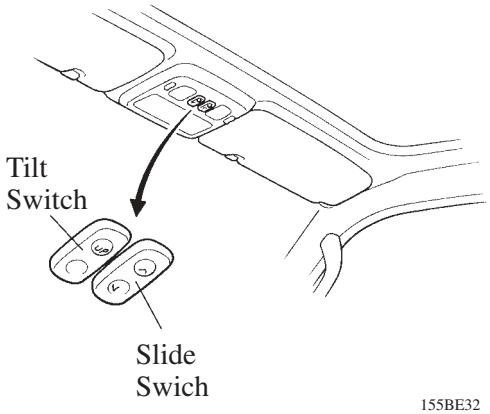

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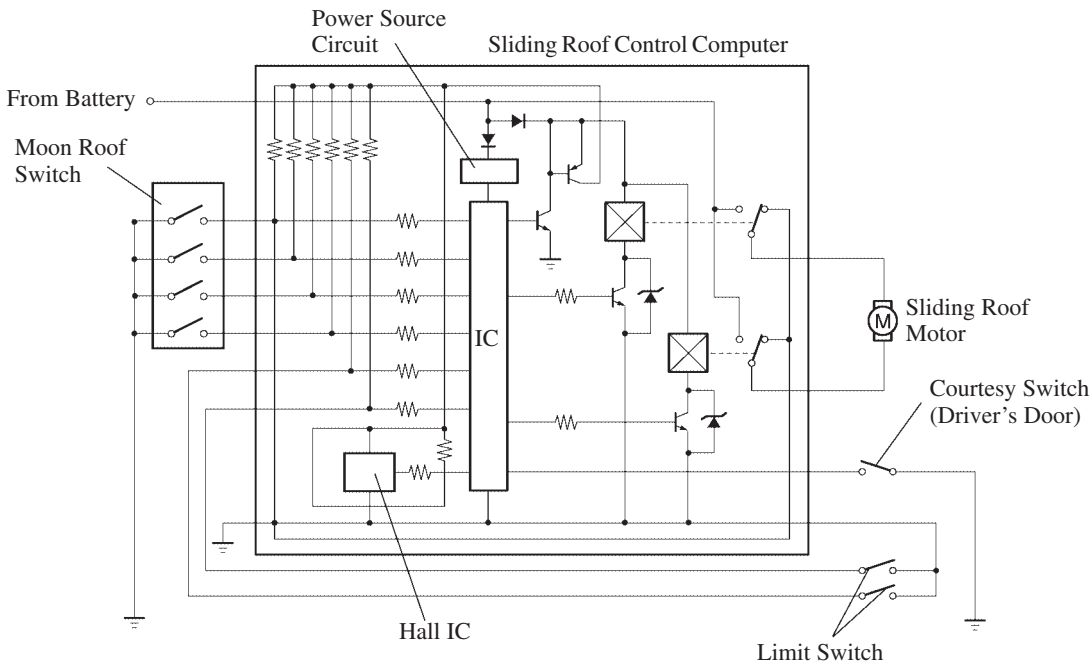
3. Wiring Diagram



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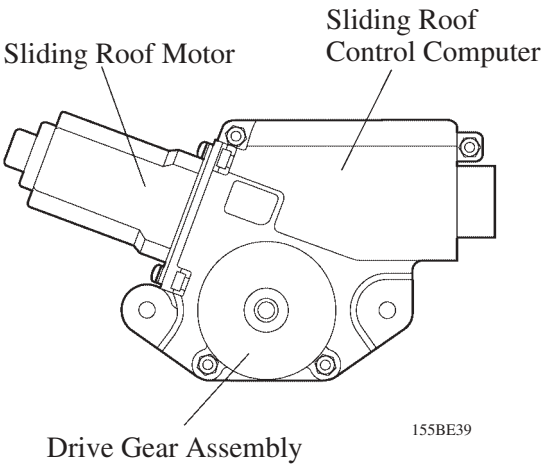
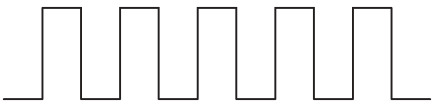
4. Construction

Sliding Roof Drive Gear Assembly

- The sliding roof drive gear assembly consists of a microcomputer that contains a Hall IC and a drive unit that contains a sliding roof motor and a drive gear.
- The sliding roof drive gear assembly contains a pulse sensor to detect if any foreign object gets caught in the sliding roof.
  The pulse sensor consists of a magnet and a hall IC. The magnet rotates with the sliding roof motor. The hall IC detects a polarity change which is caused by the rotation of the magnet, and converts it into a pulse signal. The pulse sensor (hall IC) outputs a pulse signal to the microcomputer.





5. Operation

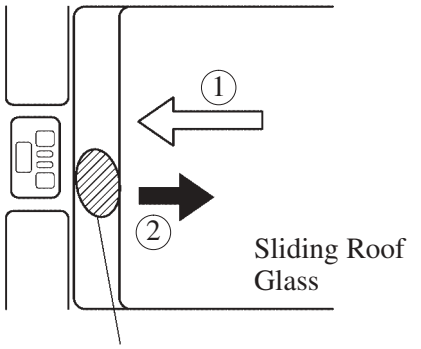
One-Touch Operation

When one of the moon roof switches (the slide switch or the tilt switch) is pressed longer than 0.3 seconds, the microcomputer causes the sliding moon roof motor to rotate in accordance with the switch operation. At the same time, the timer function in the microcomputer activates, allowing the current to be applied to the motor even if the finger is released from the switch. Thus, the moon roof will carry out the slide-open, slide-close, tilt-up, and tilt-down operations even if the switch is no longer pressed.
The one-touch operation stops its operation when one of the conditions given below is met.

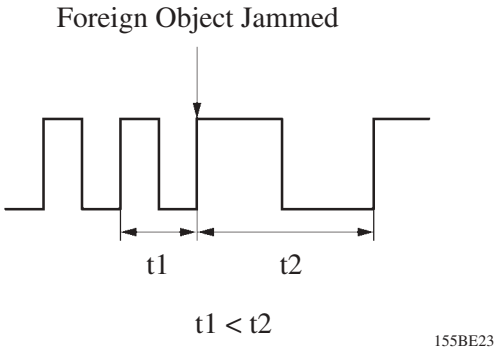
- The microcomputer determines that the motor has seized (by the activation of the “jam protection” function), according to the signals from the Hall IC.
- The moon roof fully opens or fully closes during a tilt-up or down operation or a slide-open or close operation.
- One of the moon roof switches (the slide switch or the tilt switch) is pressed during the moon roof operation.
- The slide switch and the tilt switch are turned ON simultaneously.

Jam Protection Operation

If an object becomes jammed between the moon roof and the body during slide close operation, the sliding roof motor's speed decrease (①). Accordingly, the amplitude of the pulse signals that are output by the pulse sensor to microcomputer increases.
When the motor's deceleration rate exceeds a predetermined value or the seizure of the motor is detected, the microcomputer determines that jamming has occurred.
Then, the microcomputer stops the close movements of the moon roof, and automatically moves the moon roof open.
If jamming occurs during a slide-close operation, the moon roof slide opens until the roof opening is 200 mm (7.9 in.) or more (②).



Slide Operation



Output Pulse Signal