RAIN SENSING WIPER

OVERVIEW AND OPERATION PROCESS
The rain sensing wiper unit in this vehicle doesn’t control the wiper directly. The rain sensing unit detects the amount of rain drops and sends the operating signal to STICS, and STICS drives the wiper directly.

1. COMPONENTS OF RAIN SENSOR

<table>
<thead>
<tr>
<th>Rain sensing unit</th>
<th>Multifunction wiper switch: AUTO and sensitivity control</th>
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</thead>
</table>
| A sensor that emits infrared rays through LED and then detects the amount of rain drops by receiving reflected rays against sensing section (rain sensor mounting section on the windshield) with photodiode. | AUTO : Wiper operates automatically by rain sensor
FAST <--------> SLOW : Auto delay/Auto speed control. A position that can control sensitivity against rains on the windshield and transmits wiping demand signal accordingly |

The rain sensing unit detects the amount of rain drops and sends the operating signal to STICS, and STICS drives the wiper directly. At this moment, STICS determines the wiper operation mode (washer, MIST, AUTO), then sends the information to the rain sensor.

STICS

Relay5 (Wiper INT-Low)

ICM box
The wiper related relays are installed in ICM box.

Relay6 (Wiper High)
2. RAIN SENSOR OPERATION
The rain sensor is installed on the specific heat treated windshield that has minimum 13% of transmittance rate with specified intensity of radiation. It is installed on the glass with a adhesive of Sorepa.
It communicates with STICS and makes the wipers to operate automatically under the rain sensing mode (multifunction switch wiper: AUTO mode).
The emitting section of the rain sensor unit emits infrared rays against the windshield and then detects the amount of rain drops by receiving reflected rays with photodiode.
The sensing section on the windshield is located just above the center point between LED and photodiode.

Components and functions of the rain sensor unit

<table>
<thead>
<tr>
<th>Rain sensor unit (including cover)</th>
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</thead>
<tbody>
<tr>
<td>Rear</td>
</tr>
<tr>
<td>Front</td>
</tr>
<tr>
<td>Rain sensor unit</td>
</tr>
<tr>
<td>Unit latch</td>
</tr>
<tr>
<td>PCB assembly and emitter lens</td>
</tr>
<tr>
<td>Emitter lens</td>
</tr>
</tbody>
</table>
The LED emits the infrared rays is located at bottom and the lens guides the infrared rays to target point.
| Housing and receiver lens        |
| Receiver lens                    |
The receiver lens guides the reflected infrared rays from windshield to photodiode.
| Housing and PCB                  |
### 3. OPERATION MODE OF RAIN SENSING WIPER SYSTEM

<table>
<thead>
<tr>
<th>Switch positions</th>
<th>Operation mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIST (Transmits the manual operation mode signal to sensor)</td>
<td>As long as the switch is in MIST position, the wiper motor operates in low speed. The wiper blade returns to parking position if the switch returns to the original position. The rain sensor ignores inputs during parking signal periods.</td>
</tr>
<tr>
<td>OFF (Transmits the manual operation mode signal to sensor)</td>
<td>The wiper motor rotates in low speed until it returns to parking position. When the system is in manual mode, the sensitivity of sensor will be set to 2 (AUTO 2) internally. By doing so, immediate wiping with proper intervals is possible when a driver sets the system from OFF to AUTO.</td>
</tr>
<tr>
<td>AUTO 1 (Low sensitivity)</td>
<td>SLOW</td>
</tr>
<tr>
<td>AUTO 2 (Low/medium sensitivity)</td>
<td>Auto delay/auto speed control. Low sensitivity against rains on windshield. When the switch is in AUTO position, the sensor transmits the wiping request signal to STICS.</td>
</tr>
<tr>
<td>AUTO 3 (Medium sensitivity)</td>
<td>Auto delay/auto speed control. Low/medium sensitivity against rains on windshield.</td>
</tr>
<tr>
<td>AUTO 4 (Medium/High sensitivity)</td>
<td>Auto delay/auto speed control. Medium sensitivity against rains on windshield.</td>
</tr>
<tr>
<td>AUTO 5 (High sensitivity)</td>
<td>Auto delay/auto speed control. High sensitivity against rains on windshield.</td>
</tr>
<tr>
<td>LOW SPEED (transmits the manual operation mode signal to sensor)</td>
<td>The wiper motor rotates continuously in low speed of approx. 45 rev./minute at B+13.5V. The rain sensor operations are same as in MIST.</td>
</tr>
<tr>
<td>HI SPEED (transmits the manual operation mode signal to sensor)</td>
<td>The wiper motor rotates continuously in high speed of approx. 70 rev./minute at B+13.5V. The rain sensor operations are same as in MIST.</td>
</tr>
<tr>
<td>Washer switch</td>
<td>The washer can be operated as long as the washer switch is pressed. And, the wiper operates several times as specified. When releasing the washer switch, the wiper returns back to the parking position. The STICS transmits the washer signal during its whole washing period (including dry wiping operation). The rain sensor ignores the rain detection during the washing period.</td>
</tr>
</tbody>
</table>
4. FUNCTIONS OF RAIN SENSOR

1) Windshield Glass and Coupler Attachment

Check the outer windshield surface of sensing area for wear, damage and scratch.
The sensor is able to compensate the wear up to a specific level.
Check the coupler attached surface of windshield for porosity.
If the porosity exists, the sensor cannot function properly.

**CAUTION**

If the installed wiper brushes are out of specification (size and length), the rain sensing area cannot be fully wiped.
In this case, the rain sensor’s sensitivity could be decreased and the wipers are not properly operated.

2) Recognition of AUTO Mode

1) When the engine is started with the wiper switch “AUTO” position, the wiper operates one cycle to remind a driver that the wiper switch is in “AUTO” position.
2) When the wiper switch is turned to “AUTO” from OFF, the wiper operates one cycle.
   It always operates one cycle for the initial operation, however, the wiper does not operate afterwards to prevent the wiper blade wear if not raining when turning the wiper switch to “AUTO” from “OFF”. However, the wiper operates up to 5 minutes after rain stops.
3) If this function does not occur, check No. 2 terminal on the rain sensor.
   If any defective cannot be found, check the wiper relay (LOW) for defective.

**CAUTION**

As described, the STICS recognizes the wiper switch “AUTO” position. If there are not a problem, go to diagnosis mode in STICS and check the terminal that receives signal from wiper and communication lines between rain sensor unit and STICS.

3) Instant Wipe Function

When the variable resistance knob on the multifunction wiper switch is turned by each 1 stage from low sensitivity (Smark) to high sensitivity (F mark), the wiper operates one cycle.
And, the wiper also operates during raining up to 5 minutes after rain stops.
4) Washer Coupled Wiper Function
Check the washer coupled wiper operation by pressing the washer switch.

5) Irregular Operations (Abrupt Operations)
- Check the sensor for coming off.
- Check the rain sensor cover installation.
- Check that the customer is familiar to how to control the wiper sensitivity.
  Check that the customer can select the sensitivity by selecting the variable resistance value
  (stage 1 to stage 5), that is, the wiper sensitivity control value. And, also check whether the
  sensitivity is selected to the highest value of FAST (stage 5).
- Check the wiper blade for wear.
  If the wiper blade cannot wipe the glass uniformly and clearly, the irregular operations could
  be occurred.
  And, the wiper blade should be replaced with new one with same specifications.

6) Self Diagnosis
▶ Poor sensing
Position the wiper switch to “AUTO” position and rotate the variable resistance knob from
“FAST” toward “SLOW” by one step.
At this moment, check if the wiper operates one cycle.

The wiper operates when the windshield glass is excessively worn or scratched, the windshield
glass is not cleared wiped due to using worn wiper blade or different wiper blade, or the rain
sensor is not improperly installed.

▶ Poor sensor
Rotate the variable resistance knob toward “SLOW” by 2 more steps. At this moment,
check if the wiper operates one cycle.

The wiper operates when the sensor is defective.
5. DIAGNOSIS PROCEDURES

1. Check the glass and coupler for proper installation.

2. Check the power up function.

3. Check the instant wipe function.

4. Check the washer coupled wiper function.

5. Check the high speed.

6. Find the causes for irregular operations (abrupt operations).

7. Check the system with self-diagnosis function.
6. RAIN SENSOR RELATED CIRCUIT

The rain sensor has one connector with 4 pins and each pin has following function as shown in the circuit diagram.

However, in this vehicle, the terminal No. 1 and No. 2 are for communications between STICS and the rain sensor; the

No. 1 terminal sends the detected value from the rain sensor to STICS then the STICS drives wiper motor.

No. 2 terminal sends the wiper and washer operation information such as
- washer operation mode
- MIST mode, or
- AUTO wiper position

to the rain sensor to recognize whether it is actual rain or it is in rain sensing wiper operation mode.