1. WIPER CONTROL

- MIST & Washer coupled wiper
- Auto washer coupled wiper
- Rain sensing wiper (LIN)
- Speed sensitive intermittent wiper
- Wiper LO/HI control

2. CAUTIONS ON RAIN SENSOR

- When the wiper switch is in the "AUTO" position, the wiper will operate once if the initial engine start is made. This may wear the wiper blades prematurely. Therefore, other than rainy days, set the switch to the "OFF" position. Especially during winter time, check if wiper blades are frozen to the windshield. Wiper operation with the blades frozen can damage the wiper motor.
- The wiper operation on the dry windshield can scratch the glass and wear the blade prematurely. Do not operate the wiper when the windshield is dry.
- When it does not rain, turn the wiper switch into the "OFF" position.
- Turn the wiper switch to the "OFF" position before any car wash to avoid unwanted operation of the wipers.

**WARNING**

When cleaning the windshield over the sensor with damp clothes, the wiper may operate suddenly. It could cause serious injury. Make sure to place the wiper switch to the "OFF" position and ignition switch "OFF" when not in use.

- **Irregular operation (abrupt operation)**
  - Check if the sensor is off the position.
  - Check if the rain sensor cover is securely installed.
  - Check if the customer is familiar to how to control the wiper sensitivity.
    That is, check if the customer has set the wiper sensitivity to the 5th level.
  - Check if the wiper blades are worn.
  - If the wiper blade cannot wipe the glass uniformly and cleanly, the irregular operations could be occurred. Therefore, the wiper blade should be replaced with a new one with the same specifications.
1. OVERVIEW

1) Auto Washer Coupled Wiper

When turning ON the auto washer switch with IGN1 ON & wiper switch OFF, the washer fluid is sprayed onto the windshield glass for 2 seconds and the wipers operate 4 times. After then, additionally, the washer fluid is sprayed for 1.5 seconds and the wipers operate 3 times again.

2) Rear Washer Fluid Supply System

The rear washer system uses the washer fluid from front washer fluid reservoir.
3) Fluidic Washer Nozzle

The inside of fluidic washer nozzle is designed to utilize the fluidic power during spraying.

* To prevent the water from incoming into engine compartment, thoroughly clean the glass surface before installing the washer nozzle.

The spraying shape of washer fluid is continuously changed as shown in the picture below according to the operating time.

The spraying direction is changed by swirl and counterflow in washer nozzle.
The rain sensing unit sends only the rain drop data to BCM. The wiper and washer operation should be done by user with switches.

The emitting section of the rain sensing unit emits infrared rays against the windshield and then detects the amount of rain drops by receiving reflected rays with photodiode.

AUTO: automatic wiping by rain sensor
FAST <--------> SLOW:
The rain sensor controls the wiping speed by detecting the amount of rain drops.

Emitter lens
Light receiving area of auto light sensor
BCM

The rain sensing unit sends only the rain drop data to BCM. BCM controls the wiper operation. BCM also sends the data for wiper and washer operation to the rain sensor.

| BCM                  | Fuse box for engine compartment |
|----------------------|---------------------------------

BCM Fuse box for engine compartment
3. SYSTEM LAYOUT (INCLUDING RAIN SENSOR)

**Wiper & washer switch**

**Rain sensor unit**

**Wiper**

- Front wiper
- Rear wiper

**Rear washer hose and nozzle**

- For vehicle with rear spoiler
- For vehicle without rear spoiler
4. WIPER & WASHER OPERATION

1) Front Wiper Control

- **MIST**
  The front wipers can be operated only when you hold the switch to the “MIST” position. The lever will return to the “OFF” position when released.

- **OFF**
  Stop the operation.

- **AUTO**
  Operates automatically according to the vehicle speed or amount of rain.

- **LO**
  Continuous wipe, slow operation

- **HI**
  Continuous wipe, fast operation

**Wiper and Washer coupled operation**
Pull the lever briefly (for less than 0.6 seconds):
One wiping cycle with washer spray
Pull and hold the lever for more than 0.6 seconds:
Three wiping cycles with washer spray
(1) Wiper MIST

1. When turning ON the front washer switch with IGN1 ON, the front wipers operate after T1. When releasing the switch, the wipers will stop at parking positions.

![Diagram of wiper MIST logic](image-url)
(2) Wiper low/high control

1. The wiper low relay is turned ON/OFF by the ON/OFF signal from wiper low switch.
2. The wiper high relay is turned ON/OFF by the ON/OFF signal from wiper high switch.
   The wiper low relay operates all the time when the wiping system is in high speed mode (high relay + low relay).
3. The wiper motor should operate with P-POS signal even when turning off the ignition switch during wiper operation.
4. The wiper relay should stay ON during wiper operation in low/high mode even though the system does not receive P-POS signal. (In "AUTO" mode, the wiper relay should be turned OFF after 5 seconds if there is no P-POS signal for 3 seconds. - inform to car owner)
5. In high/low mode, the front washer motor should operate when turning ON the front washer switch.
6. In high/low mode, the rear washer motor should operate when turning ON the rear washer switch.
7. The auto washer function is not available during high/low mode.
8. The wipers should go back to low parking position when turning off the ignition during high mode.
2) Front Washer Control

(1) Washer coupled wiper

Washer coupled wiper operation

Pull the lever briefly (for less than 0.6 seconds):
One wiping cycle with washer spray
Pull and hold the lever for more than 0.6 seconds:
Three wiping cycles with washer spray

1. When holding the front washer switch at ON position for more than T2 with IGN1 ON, the washer fluid is sprayed onto the windshield glass and the wipers operate three times.

| KEY IN & IGN1 SW (B17, B19) | ON | OFF |
| Front Washer SW (B38) | OFF | ON |
| FRT Washer Motor Output (A9) | ON | OFF |
| Wiper P-POS | Turn | Stop |
| Wiper Low Relay (A8) | OFF | ON |

T1 : 0.5s  T2 : MIN 0.6s  T3 : WIPER 1Turn
2. When holding the front washer switch at ON position for more than 0.6 seconds with the wiper switch AUTO, the washer fluid is sprayed onto the windshield glass and the wipers operate three times. When holding it between 0.1 and 0.59 seconds, the wiper will operate only once.

<table>
<thead>
<tr>
<th>Component</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY IN &amp; IGN1 SW (B17,B19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT AUTO SW (B33,B34)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Front Washer SW (B38)</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>FRT Washer Motor Output (A9)</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Wiper P-POS (B36)</td>
<td>Turn</td>
<td>Stop</td>
</tr>
<tr>
<td>Wiper Low Relay (A8)</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

T1 : 0.5s  T2 : 0.1 ~ 0.59s  T3 : MIN 0.6s  T4 : 3 Turn TIME  T5 : Pause time
(2) Auto washer coupled wiper

Auto washer switch
When the front wiper switch is off and this switch is pressed, washer fluid will be sprayed and the wiper will automatically operate 4 times. Then, the fluid will be sprayed again and the wiper will automatically operate 3 times.

1. When turning ON the auto washer switch with IGN1 ON & wiper switch OFF, the washer fluid is sprayed onto the windshield glass for 2 seconds and the wipers operate 4 times. After then, additionally, the washer fluid is sprayed for 1.5 seconds and the wipers operate 3 times again.

2. The auto washer function is not available during the operation of auto washer coupled wiper.

3. While the wiper system is in intermittent wiping mode.

4. When turning the wiper switch to AUTO position during the operation of auto washer, the auto washer stops its operation and the intermittent wiping mode will be started.

5. The front & rear washer function are not available during the operation of auto washer.

<table>
<thead>
<tr>
<th>KEY IN &amp; IGN1 SW (B17,B19)</th>
<th>OFF</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT AUTO SW (B33,B34)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>AUTO Washer SW (B37)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>FRT Washer Motor Output (A9)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Wiper P-POS (B36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wiper Low Relay (A6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T1 : 100 ms or longer  
T2 : 2.0sec  
T3 : 1.5sec  
T4 : 0.5sec  
T5 : 4Turn  
T6 : 3Turn
3) Rear Wiper Control

Rear wiper switch

When the switch is fully turned, washer fluid will be sprayed onto the rear window glass and the wiper will also operate. When the switch is released, it will stop in the Rear Wiper Operation mode and only the wiper will keep operating.

Rear wiper operation

OFF

Rear wiper stops

When the switch is fully turned, washer fluid will be sprayed onto the rear window glass and the wiper will also operate. When the switch is released, it will return to the “OFF” position and turn off the wiper and washer.
4) Rear Washer Control

When the switch is fully turned, washer fluid will be sprayed onto the rear window glass and the wiper will also operate. When the switch is released, it will return to the “OFF” position and turn off the wiper and washer.

▶ Rear washer motor control

1. When turning ON the rear washer switch with key IN & IGN1 ON, the washer fluid is sprayed onto the tailgate glass.

<table>
<thead>
<tr>
<th>KEY IN &amp; IGN1 SW (B17,B19)</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear Washer SW (B39)</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>RR Washer Motor Output (A16)</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>
5) Rain Sensor Coupled Wiper Control

"AUTO" switch and speed control switch

AUTO: Automatic wiping by rain sensor
FAST <----> SLOW:
Operates automatically according to the vehicle speed or amount of rain.
(1) Rain sensor coupled wiper (LIN)

Block diagram

- Multi-Function Switch
- BCM
- Int, Auto SW
- Auto Washer SW
- Washer SW
- Volume
- IGN 1
- LIN
- Rain Sensor
- N.C 2
- 3
- Parking
- LO Speed
- HI Speed
- Wiper Motor
- 4 3 2 1
(2) Power-up reminder wiper

1. If the wiper switch is in "AUTO" position, the wiper motor does not operate even when turning the ignition switch to "ON" position.

2. When moving the wiper switch to "AUTO" from "OFF" position with IGN2 ON, the wipers operate one cycle through wiper low relay regardless of the communication with the rain sensor. Afterward, the wipers operate only when receiving S_RAIN (raining) signal from the rain sensor.

![Diagram of wiper system](image_url)
(3) **Washer coupled wiper in rain sensing mode**

1. When turning the washer switch ON with IGN2 ON and wiper switch AUTO in rain sensing mode, the wiper operate in washer coupled mode regardless of the communication with rain sensor.

2. Even though the wiping system is in washer coupled wiper mode, the operating data are sent to rain sensor.
(4) Sensitivity adjustment (Instant wiping)

1. When increasing the wiping speed (ex: sensitivity 0 ⇒ 1) with volume dial with IGN2 ON, wiper switch AUTO and wiper motor stop (parking), the wipers operate one cycle through the low relay. (only when the signal from rain sensor is "raining")

* If the volume sensitivity is changed within 2 seconds, the wipers operate only one cycle.
(5) Fault strategy for wiper parking signal

1. The wiper system continuously sends the wiper parking signal when the wiper parking terminal is grounded with IGN2 ON and wiper switch AUTO.
   * The wiper motor runs only when the rain sensor requires the wiper operation.

2. When the parking terminal is fixed at IGN (HIGH) with IGN2 ON and wiper switch AUTO, the wiper system sends the wiper operating signal for 2 seconds, then continuously sends the wiper parking signal.
   * The wiper motor runs only when the rain sensor requires the wiper operation.
(6) Fault strategy for rain sensor

1. When changing the volume sensitivity to "2" from "3" with IGN2 ON and wiper switch AUTO while receiving S_RSFAULT (defective rain sensor) signal from rain sensor, the wipers operate one cycle through the low relay.

   ![Diagram 1]

2. When changing the volume sensitivity to "3" from "4" with IGN2 ON and wiper switch AUTO while receiving S_COMMFAULT (communication error) signal from rain sensor, the wipers operate one cycle through the low relay.

   ![Diagram 2]
(7) Speed sensitive intermittent wiper

Operation for the wiping system without rain sensor:

1. When turning the ignition switch to ON from OFF position with wiper switch AUTO, the wipers do not operate.
2. When moving the wiper switch to AUTO from OFF position after turning the ignition switch to ON position, the wipers operate one cycle.
   - Vehicle speed and volume sensitivity controls the intermittent wiping operation.
   - The system calculates and changes the intermittent interval by using vehicle speed and volume sensitivity with IGN2 ON and wiper switch AUTO.
   - Intermittent interval (at 0 km/h): 3±0.5 to 19±2 seconds

![Diagram of wiper operation](image)

- T1: 3.0 sec  T2: 7.0 sec  T3: 11.0 sec  T4: 15.0 sec  T5: 19.0 sec
- T6: 1 Turn  T7: Vehicle speed coupled time  T8: Within 0.3 sec

![Graph of pause time against vehicle speed](image)
1. Motor assy - FRT wiper
2. Linkage assy - windshield wiper
3. Bolt
4. Arm assy - windshield WPR
5. Nut
6. Cap - wiper arm
7. Blade assy - windshield wiper
1. Tank assy - washer reservoir  
2. Motor assy - washer pump  
3. Packing-pump  
4. Hose assy - washer reservoir  
5. Screw  
6. Nut  
10. Guide assy - washer reservoir  
11. Cap - washer reservoir  
20. Hose assy - washer  
21. Hose assy - windshield washer  
22. Nozzle assy - windshield washer  
30. Hose assy - T/gate washer FRT  
31. Hose assy - T/gate washer  
32. Hose assy - T/gate washer  
33. Nozzle assy - washer T/gate  
35. Nozzle - washer T/gate
1. Blade assy - RR wiper
2. Arm assy - T/gate wiper
3. Motor assy - RR wiper
4. Spacer assy - T/gate wiper
5. Splash ring - T/gate wiper
6. Nut
7. Cap-wiper arm
1) Front Wiper Switch

▶ Mounting location

► Front wiper switch function

- **MIST**: The windshield wipers can be operated only when you hold the switch to the “MIST” position. The lever will return to the “OFF” position when released.

- **OFF**: Stop the operation.

- **AUTO**: Operates automatically according to the vehicle speed or amount of rain.

- **LO**: Continuous wipe, slow operation

- **HI**: Continuous wipe, fast operation

**Front automatic wiping speed control switch**

The interval of wiper swings can be adjusted by twisting the control knob upward or downward when the windshield wiper switch is in the AUTO position.

- Fast: Fast interval
- Slow: Slow interval
2) Front Wiper Switch

(1) Washer wiper

Wiper and washer coupled operation
Pull the lever briefly (for less than 0.6 seconds): One wiping cycle with washer spray
Pull and hold the lever for more than 0.6 seconds: Three wiping cycles with washer spray
While being held down, the wiper and washer will keep working.

Front auto washer switch
When the front wiper switch is off and this switch is pressed, washer fluid will be sprayed and the wiper will automatically operate 4 times. Then, the fluid will be sprayed again and the wiper will automatically operate 3 times.
3) Rear Wiper Switch

- Mounting location

Rear wiper switch function

When the switch is fully turned, washer fluid will be sprayed onto the rear window glass and the wiper will also operate. When the switch is released, it will stop in the Rear Wiper Operation mode and only the wiper will keep operating.

Rear wiper operation

OFF
Rear wiper stops
4) Rear Wiper Switch

When the switch is fully turned, washer fluid will be sprayed onto the rear window glass and the wiper will also operate. When the switch is released, it will return to the “OFF” position and turn off the wiper and washer.
1) Specification

Wiper motor

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>12 V</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>10 V to 15 V</td>
</tr>
<tr>
<td>Minimum operating voltage</td>
<td>Max. 8 V</td>
</tr>
</tbody>
</table>

2) Mounting Locations

Front wiper motor

Rear wiper motor
3) Connector

▶ Front wiper

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Wiper parking</td>
</tr>
<tr>
<td>3</td>
<td>B+</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>Wiper LOW</td>
</tr>
<tr>
<td>6</td>
<td>Wiper HIGH</td>
</tr>
</tbody>
</table>

▶ Rear wiper

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B+</td>
</tr>
<tr>
<td>2</td>
<td>Wiper switch</td>
</tr>
<tr>
<td>3</td>
<td>Wiper parking</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
</tr>
</tbody>
</table>
1) Mounting Locations

Front wiper

Rear wiper
2) Wiper Blade Size

(1) Front wiper blade

- Driver side: 600 mm (24 in)
- Passenger side: 400 mm (16 in)

(2) Rear wiper blade

- Rear wiper blade: 350 mm (14 in)
WASHER FLUID RESERVOIR

1) Mounting Locations

- Reservoir
- Washer motor
The rain sensor is located in the center on the top of the windshield. The emitting section of the rain sensing unit emits infrared rays against the windshield and then detects the amount of rain drops by receiving reflected rays with photodiode. Then, the unit operates the wipers at high or low speed according to this data for the driver's convenience.
The receiver lens guides the reflected infrared rays from the windshield to the photodiode.

The LED, which emits the infrared rays, is located at bottom and the lens guides the infrared rays to target point.
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 BCM and the rain sensor; the No. 1 terminal sends the detected value from the rain sensor to BCM then the STICS drives wiper motor. No. 2 terminal sends the wiper and washer operation information such as

**wiper operation mode,**

**wiper relay,** or

**multifunction wiper switch is in AUTO wiper position**

to the rain sensor to recognize whether it is actual rain or it is in rain sensing wiper operation mode.
2) Functions and Checks for Rain Sensor

(1) Front 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.

⚠️ NOTE
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 multifunction wiper switch in "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.

⚠️ NOTE
As described, the STICS recognizes if the wiper switch is in "AUTO" position. If there is no problem, go to diagnosis mode in STICS and check the terminal that receives signal from wiper and communication lines between rain sensor unit and BCM.

(3) Instant Wipe Function

When the variable resistance knob on the multifunction wiper switch is turned by each 1 stage from low sensitivity (S mark) to high sensitivity (F mark), the wiper operates one cycle.

⚠️ NOTE
When the variable resistance knob is rotated by 4 stage from 0 stage without stopping, the wiper operates one cycle. The wiper operates one cycle when changing the wiping stage (0 → 1, 1 → 2, 2 → 3).
(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's installation status.
- 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
If the system receives S_RSFAULT signal from rain sensor and the volume sensitivity is changed to "2" from "3" with IGN2 ON and wiper switch AUTO, the wipers operate one cycle with LOW relay.

▶ Poor sensor
If the system receives S_COMMFAULT signal from rain sensor and the volume sensitivity is changed to "3" from "4" with IGN2 ON and wiper switch AUTO, the wipers operate one cycle with LOW relay.
3) Diagnosis Procedures

1. Check the glass and coupler for proper installation
2. Check the Power-up function.
3. Check the instant wiping function.
4. Check the washer coupled wiper operation.
5. Check the high speed operation.
6. Find the causes for irregular operations (abrupt operations).
7. Check the system with self diagnosis function

Troubleshooting

Symptom 1. The wiper does not operate one cycle when turning the multifunction wiper switch to the "AUTO" from the "OFF" position or starting the engine while the wiper switch is in the "AUTO" position.

1. When starting the engine with the multifunction wiper switch in the "AUTO" position, the wiper operates one cycle to remind a driver that the wiper switch is in the "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. If this function does not occur, check No. 8 pin. If the pin is normal, check the wiper relay related terminals.
Symptom 2. It rains but the system does not work in "AUTO" position.

1. Check whether the multifunction wiper switch is in the "AUTO" position.
2. Check the power to the sensor. Check the conditions of the pin 3 (Ground) and the pin 4 (IGN).
3. Check the wiper relay for defective.

Symptom 3. The wiper operates 3 or 4 times at high speed abruptly.

Check whether the variable resistance knob on the multifunction wiper switch is set in "FAST". The "FAST" is the highest stage of the sensitivity and very sensitive to small amount of rain drops. Therefore, change the knob to the low sensitivity.

Symptom 4. The wiper operates continuously even on the dry glass.

1. Check the wiper blade for wear. If the wiper blade cannot wipe the glass uniformly and clearly, this problem could be occurred. In this case, replace the wiper blade with a new one.
2. Check whether the variable resistance knob on the multifunction wiper switch is set in "FAST". The "FAST" is the highest stage of the sensitivity and very sensitive to small amount of rain drops. Therefore, change the knob to the low sensitivity.

Symptom 5. The wiper does not operate at high speed even in heavy rain.

Check if the wiper operates at high speed when grounding pin 1 and pin 2.

Symptom 6. The wiper responses are too fast or too slow.

Check whether the variable resistance knob on the wiper switch is set in "FAST" or "SLOW". Notify that the customer can select the sensitivity by selecting the variable resistance value. And, select a proper stage.