WIPER AND WASHER SYSTEM

GENERAL INFORMATION

1. WIPER CONTROL
   ▶ Wiper mist & washer coupled wiper
   ▶ Auto washer coupled wiper
   ▶ Rain sensor coupled wiper operation (LIN)
   ▶ Speed sensitive intermittent wiper
   ▶ Wiper low/high control

2. CAUTIONS ON RAIN SENSOR
   - When the wiper switch is in the AUTO position, the wiper will operate for 1 cycle if the initial engine start is made. This may cause the wiper blades to wear prematurely. Therefore, other than rainy days, set the switch to the OFF position. Especially during the winter time, check if the wiper blades are not frozen to the windshield.
     Operating the wiper with the blades frozen can damage the wiper motor.
   - If you operate the wipers when the windshield is dry without spraying washer fluid, the windshield can be scratched and the wiper blades can wear prematurely. Use the wiper with the washer fluid when the windshield is dry.
   - When it does not rain, turn the wiper switch to 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.
     Check if the wiper sensitivity control is set to the FAST side (step 5).
   - Check the wiper blade for wear.
   - If the wiper blade cannot wipe the glass uniformly and clearly, it may cause the rain sensor to work irregularly. Therefore, in this case, replace the wiper blade with a new one.
1. WIPER AND WASHER SYSTEM

1) AUTO Washer Coupled Wiper Function

If you press the AUTO washer switch briefly with the ignition key ON and INT-AUTO switch "OFF", the washer motor is operated for about 2 seconds to spray washer fluid once after the switch is turned ON and the wiper relay is turned ON for 4 cycles. After that, the washer motor is operated for about 2 seconds to spray the washer fluid again and the relay is turned ON for 3 cycles and then the relay is turned OFF.

2) Rear Washer Fluid Supply System

The front washer fluid reservoir supplies the rear washer fluid without additional washer fluid reservoir.
3) Fluidic Washer Nozzle

This vehicle has the fluidic washer nozzle, which is designed to use fluid movement occurring in the washer fluid spraying process.

* When installing the washer nozzle, make sure that the mounting surface is clean and free of dirt or debris, since the water may come into the engine compartment in accordance with a seamless contact condition between the mounting surface of the nozzle and the curved surface of the engine hood.

The inside of the nozzle is designed in a fan shape to change the spray direction continuously based on the time the fluid is sprayed. Refer to the figure below.

The spray direction is changed by means of the whirlwind and back flow generated while the washer fluid is passing through the nozzle.
2. RAIN SENSING SYSTEM

In the rain sensing wiper operation system, the rain sensing unit only sends the information about the amount of rain drops to the BCM, and it does not operate the wiper directly. The wiper and washer are controlled by the BCM according to the driver’s choice.

This sensor emits infrared rays through LED and then detects the amount of rain drops by receiving the rays reflected off the 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 the sensitivity for the amount of rains on the windshield and transmit the wiping request signal accordingly.
BCM

The rain sensor detects the amount of rain drops and sends the operating request signal to the BCM, which drives the wiper directly. At this moment, the BCM also sends the information on whether the wiper is in operation mode or whether the multifunction wiper switch is in AUTO position to the rain sensor.
3. SYSTEM LAYOUT (INCLUDING RAIN SENSOR)

Wiper and washer switch

Rain sensor unit

Wiper

Front wiper

Rear wiper

Rear washer hose and nozzle

For vehicles with rear spoiler

For vehicles without rear spoiler

WIPER AND WASHER SYSTEM
KORANDO 2013.08
BCM

Front nozzle assembly

Washer fluid reservoir assembly

Reservoir tank

Washer motor

Wiper motor

Modification basis
Application basis
Affected VIN

WIPER AND WASHER SYSTEM
KORANDO 2013.08
4. WIPER AND WASHER OPERATION

1) Windshield Wiper Control Function

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIST</td>
<td>If you move the wiper switch to “MIST” position and release it, the windshield wipers operate one wiping cycle. The wipers will operate continuously if the switch is held in this position.</td>
</tr>
<tr>
<td>OFF</td>
<td>Wipers are not in operation.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Operates automatically according to the vehicle speed and amount of rainfall.</td>
</tr>
<tr>
<td>LO</td>
<td>Continuous wipe, slow operation</td>
</tr>
<tr>
<td>HI</td>
<td>Continuous wipe, fast operation</td>
</tr>
</tbody>
</table>

**Front auto washer switch**
When you press this switch with the front wiper switch in “OFF” position, 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.

**Front automatic wiping speed control switch**
Turning the control knob upward or downward when the windshield wiper switch is in AUTO position.
Fast: Fast interval
Slow: Slow interval
(1) Wiper mist

1. When the multifunction switch is pushed to the MIST position for 0.1 sec. or more with the IGN1 ON, the wiper relay is turned on after 0.1 sec. has passed. When the wiper returns to the park position, the wiper relay is turned off.

2. When the MIST switch signal is input, the wiper is operated at high speed. When the switch is released from the MIST position, the wiper is operated at low speed.
(2) Wiper LO/Hi Control

1. The wiper LOW relay is turned on when the multifunction wiper switch is at the LO position. The wiper HIGH relay is turned on when the wiper switch is at the HI position. When the wiper switch is at the HI position, both the LOW relay (constant operation) and HIGH relay are operated.

   The wiper motor returns to parking position and stops, even when turning off the ignition switch during wiper operation.

2. The wiper relay should stay ON in low/high wiper operation mode even if the parking signal for the wiper motor is not received. In INT/AUTO wiper operation mode, the wiper relay should be turned OFF after 5 seconds if there is no parking signal for the wiper for 3 seconds and informs the driver of parking position signal abnormality.

   While the wiper operates at low/high speed, the front/rear washer switch can be operated but the auto washer switch cannot.

3. The wiper motor returns to parking position and stops when turning off the ignition switch during wiper operation in high mode.
2) Windshield Washer Control Function

(1) Windshield washer coupled wiper

Wiper and Washer Coupled Operation
Pull the switch briefly (for less than 0.6 sec.)
- One wiping cycle
Pull and hold the switch for more than 0.6 sec.
- Three wiping cycles with washer fluid spray

1. When holding the front washer switch at ON position for more than 0.6 seconds with IGN ON, the wiper relay is activated 0.5 seconds after. The wiper stops after three more wipes since that the washer switch is turned to "OFF" position.

<table>
<thead>
<tr>
<th>KEY IN &amp; IGN1 SW</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Washer SW</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>FRT Washer Motor Output</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Wiper P-POS</td>
<td>Turn</td>
<td>Stop</td>
</tr>
<tr>
<td>Wiper Low Relay</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

T1 : 0.5s  T2 : Min 0.6s  T3 : Wiper 1 turn
2. When holding the front washer switch at ON position for 0.1 to 0.59 seconds during the wiper operation by the intermittent/automatic wiper switch, the wiper will operate only once. When holding the washer switch for more than 0.6 seconds, the wiper relay is activated 0.5 seconds after. The wiper stops after three more wipes since that the washer switch is turned to "OFF" position.
(2) AUTO washer coupled wiper

Auto washer switch
If pressing the switch when the wiper switch turns to the "OFF" position, washer fluid is sprayed once and wiper operates 4 times. After a while, washer fluid is sprayed once more and the wiper operates 3 times.

1. When the AUTO washer switch is operated with IGN ON and the INT/AUTO switch OFF, the washer motor is operated for 2 sec. and the wiper continues to cycle 4 times. And then the washer motor is operated for 2 sec. and the wiper continues to cycle 3 times before returning to park position.
2. The auto washer switch signal is overridden during speed sensitive intermittent wiper, washer coupled wiper or auto washer coupled wiper operation.
3. When turning the wiper switch to AUTO position during the operation of auto washer, the auto washer stops its operation and the intermittent/automatic wiping mode will be started.
4. The front and rear washer switch signal are overridden during the operation of auto washer.
5. The input from the switch during the AUTO washer coupled wiper operation also is ignored.

<table>
<thead>
<tr>
<th>KEY IN &amp; IGN1 SW</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT AUTO SW</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>AUTO Washer SW</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>FRT Washer Motor Output</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Wiper P-POS</td>
<td>Turn</td>
<td>Stop</td>
</tr>
<tr>
<td>Wiper Low Relay</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

T1: over 0.1sec  T2: 2sec  T3: 1.5sec  T4: 0.5sec  T5: 4 turn  T6: 3 turn

1. When the AUTO washer switch is operated with IGN ON and the INT/AUTO switch OFF, the washer motor is operated for 2 sec. and the wiper continues to cycle 4 times. And then the washer motor is operated for 2 sec. and the wiper continues to cycle 3 times before returning to park position.
2. The auto washer switch signal is overridden during speed sensitive intermittent wiper, washer coupled wiper or auto washer coupled wiper operation.
3. When turning the wiper switch to AUTO position during the operation of auto washer, the auto washer stops its operation and the intermittent/automatic wiping mode will be started.
4. The front and rear washer switch signal are overridden during the operation of auto washer.
5. The input from the switch during the AUTO washer coupled wiper operation also is ignored.
3) Rear Wiper Control Function

Windshield Washer Operation
In the “OFF” position, pull the lever toward you to spray washer fluid on the windshield and to operate the wipers 1~3 cycles. 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 The spray and wiper operation will continue until you release the lever.

Rear wiper switch

**TYPE A**
- **ON**: Rear wiper operation (Normal Speed)
- **INT**: Rear wiper operation (Intermittent)

**TYPE B**
- 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 Rear Wiper Operation mode and only the wiper will keep operating.
- **OFF**: Rear wiper is not in operation.

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 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 return to the “OFF” position and turn off the wiper and washer.

**Rear washer motor control**

1. The rear washer motor is operated only when the rear washer switch is activated with the ignition key ON.
2. If the front washer or automatic washer switch signal is received during the rear washer switch operation, the washer motor stops and the front washer or automatic washer motor begins to operate.

![Diagram of washer switch operation]

<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 Function

<table>
<thead>
<tr>
<th>AUTO operation and sensitivity control</th>
</tr>
</thead>
</table>

AUTO: Wiper operates automatically by rain sensor
FAST <----> Auto delay/auto speed control
A position that can control sensitivity against rains on the windshield and transmits wiping demand signal accordingly.
(1) Rain sensor coupled wiper operation (LIN)

▶ System layout

- Multi-Function Switch
  - Int, Auto SW
  - Auto Washer SW
  - Washer SW
  - Volume
  - LIN
  - IGN 1
  - N.C 2
  - Rain Sensor
  - Parking
  - LO Speed
  - HI Speed
  - Wiper Motor

Modification basis
Application basis
Affected VIN

WIPER AND WASHER SYSTEM
KORANDO 2013.08
(2) Power-up reminder wiper

1. If the intermittent/automatic wiper switch is in "ON" position, the wiper motor does not operate even when turning the ignition switch to ON from OFF position.

2. When the INT/AUTO wiper switch is turned on from off with the ignition switch ON, the wiper is operated at low speed for the 1st cycle regardless of the rain sensor signals. After that, if the INT/AUTO wiper switch is turned on from off, the wiper cycles one time at low speed only when the rain sensor detects the presence of rain.

![Diagram showing the operation of wiper system](image-url)
(3) Washer coupled wiper operation during rain sensor coupled operation

1. When the washer switch signal is received during intermittent operation coupled with rain sensor with IGN ON and intermittent/automatic washer switch operation, the wipers operate in washer coupled mode regardless of the communication with the rain sensor. However, if the washer switch signal is received the washer relay is activated and wiper relay remains activated, when the data coupled with rain sensor indicates continuous wiper operation.

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

1. When the wiping speed control switch is turned to "FAST" with IGN2 ON, intermittent/automatic wiper switch in "ON" position and wiper motor stop (parking position), the wiper motor operates one cycle at low speed.
   (only when the rain sensor detects raindrops)
   * If the wiping speed control switch is changed more than 2 stages within 2 seconds, the wiper motor operates only one cycle.

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>SEN.0</th>
<th>SEN.1</th>
<th>SEN.2</th>
<th>SEN.3</th>
<th>SEN.4</th>
<th>SEN.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Sensor To BCM</td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rain Sensing</td>
<td></td>
<td>T1</td>
<td>T1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wiper Low Relay</td>
<td>OFF</td>
<td>T1</td>
<td>T1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For abnormal wiper parking signal

1. The wiper system sends continuously the signal for current status when the wiper parking terminal is shorted to ground with IGN2 ON and intermittent wiper switch in "ON" position.
   * The wiper motor is operated only when there is a request from the rain sensor.

2. When the parking terminal is shorted to power with IGN2 ON and intermittent wiper switch in "ON" position, the wiper system sends the signal for current wiping status for 2 seconds. After that, it sends the current signal for parking status continuously.
   * The wiper motor is operated only when there is a request from the rain sensor.
(6) For faulty rain sensor

1. When the wiper speed control switch is turned to step 2 from step 3 the wiper motor cycles one time at low speed, provided that the BCM receives a faulty sensor signal from the rain sensor unit with IGN ON and the INT/AUTO switch ON.

2. When the wiper speed control switch is turned to step 3 from step 4 the wiper motor cycles one time at low speed, provided that the BCM receives a communication error signal from the rain sensor unit with IGN ON and the INT/AUTO switch ON.
(7) **Speed sensitive intermittent wiper**

For the vehicles without rain sensor, the BCM operates the wiper as follows:

1. When turning the ignition switch to ON from OFF position with the intermittent wiper switch in "ON" position, the wipers do not operate.
2. When turning the wiper switch to ON from OFF position after turning the ignition switch to ON position, the wipers operate one cycle.
3. The wiper's operation cycle depends on the vehicle speed (CAN communication with instrument cluster) and wiping speed the side fascia panel.
   - Wiping cycle: 3 ± 0.5 sec. (FAST) to 19 ± 2 sec. (SLOW)
### Speed sensitive intermittent wiper interval

<table>
<thead>
<tr>
<th>SPEED VIR</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
<th>140</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>19.00</td>
<td>17.90</td>
<td>16.80</td>
<td>15.70</td>
<td>14.60</td>
<td>13.50</td>
<td>12.40</td>
<td>11.30</td>
<td>10.20</td>
<td>9.10</td>
<td>8.00</td>
<td>6.90</td>
<td>5.80</td>
<td>4.70</td>
<td>3.60</td>
<td>2.50</td>
</tr>
<tr>
<td>75%</td>
<td>15.00</td>
<td>14.03</td>
<td>13.06</td>
<td>12.09</td>
<td>11.13</td>
<td>10.16</td>
<td>9.19</td>
<td>8.22</td>
<td>7.26</td>
<td>6.29</td>
<td>5.32</td>
<td>4.35</td>
<td>3.39</td>
<td>2.42</td>
<td>1.45</td>
<td>0.45</td>
</tr>
<tr>
<td>50%</td>
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<td>10.16</td>
<td>9.33</td>
<td>8.49</td>
<td>7.66</td>
<td>6.82</td>
<td>5.99</td>
<td>5.15</td>
<td>4.32</td>
<td>3.48</td>
<td>2.65</td>
<td>1.81</td>
<td>0.98</td>
<td>0.14</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>25%</td>
<td>7.00</td>
<td>6.29</td>
<td>5.59</td>
<td>4.89</td>
<td>4.19</td>
<td>3.48</td>
<td>2.78</td>
<td>2.08</td>
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<td>0.00</td>
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<tr>
<td>0%</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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</tbody>
</table>