SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 104
WINDSHIELD WIPING AND WASHING SYSTEMS

GENERAL MOTORS CORP.
2009 CADILLAC CTS, PASSENGER CAR
NHTSA NO. C90101

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

JUNE 30, 2009
FINAL REPORT
PREPARED FOR
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Approval Date: 06/30/09

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**Title and Subtitle**
Final Report of FMVSS 104 Compliance Testing of 2009 CADILLAC CTS PASSENGER CAR
NHTSA No. C90101

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Washington, DC  20590

**Abstract**
Compliance tests were conducted on the subject 2009 Cadillac CTS Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-104-08 for the determination of FMVSS 104 compliance. Test failures identified were as follows:
NONE

**Key Words**
Compliance Testing
Safety Engineering
FMVSS 104

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Purpose of Compliance Test</td>
<td>1</td>
</tr>
<tr>
<td>2 Compliance Test Procedure and Summary of Results</td>
<td>2</td>
</tr>
<tr>
<td>3 Compliance Test Data</td>
<td>3</td>
</tr>
<tr>
<td>4 Test Equipment List</td>
<td>8</td>
</tr>
<tr>
<td>5 Photographs</td>
<td>9</td>
</tr>
<tr>
<td>5.1 Left Side View of Vehicle</td>
<td></td>
</tr>
<tr>
<td>5.2 Right Side View of Vehicle</td>
<td></td>
</tr>
<tr>
<td>5.3 ¾ Frontal View From Left Side of Vehicle</td>
<td></td>
</tr>
<tr>
<td>5.4 ¾ Rear View From Right Side of Vehicle</td>
<td></td>
</tr>
<tr>
<td>5.5 Vehicle Certification Label</td>
<td></td>
</tr>
<tr>
<td>5.6 Vehicle Tire Information Label</td>
<td></td>
</tr>
<tr>
<td>5.7 Instrumentation and Equipment Set-up</td>
<td></td>
</tr>
<tr>
<td>5.8 Wiped Area Test in Process</td>
<td></td>
</tr>
<tr>
<td>5.9 Wiped Area Test Pattern</td>
<td></td>
</tr>
<tr>
<td>5.10 Capability Test #1 Pre-Coated Windshield</td>
<td></td>
</tr>
<tr>
<td>5.11 Capability Test #1 in Progress</td>
<td></td>
</tr>
<tr>
<td>5.12 Capability Test #2 Pre-Coated Windshield</td>
<td></td>
</tr>
<tr>
<td>5.13 Capability Test #2 in Progress</td>
<td></td>
</tr>
<tr>
<td>5.14 Capability Test #1 &amp; #2 Vellum Pattern</td>
<td></td>
</tr>
<tr>
<td>6 Vehicle Owner’s Manual Information</td>
<td>24</td>
</tr>
</tbody>
</table>
SECTION 1
PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2009 Cadillac CTS Passenger Car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 104 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-104-08 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-104-08A dated 4 April 1997.

1.1 The test vehicle was a 2009 Cadillac CTS. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: 1G6DG577790130497

B. NHTSA No.: C90101

C. Manufacturer: GENERAL MOTORS CORP.

D. Manufacture Date: 08/08

E. Color: Gold Mist

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 104 testing on May 21, 2009.
SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2009 Cadillac CTS passenger car, NHTSA No. C90101 was subjected to FMVSS No. 104 tests on May 21, 2009. The selected portions of FMVSS No. 104 tests used were as amplified in the following subparagraphs. The test vehicle was positioned in the test system with three water spray nozzles suspended in line with the center of the longitudinal axis of the windshield and horizontal left/right center of the windshield to provide an even distribution of spray to the entire windshield. The height of the nozzles was approximately 22 inches above the glazing surface.

2.1 WIPER FREQUENCY TEST

The wiper frequency test was performed with the engine operating and with a minimum of 50 cubic inches per minute of water from the spray nozzles. The wiper frequency was measured at the low and high wiper speed settings with the engine operating at idle RPM and 2,000 RPM.

2.2 WIPED AREA TEST

The test was conducted with the windshield wiper system operating at the high speed setting, engine at idle RPM and the spray nozzles spraying water at a minimum of 50 cubic inches per minute. The wiper blade wipe pattern was outlined on the glazing surface and then transferred to a windshield pattern. The wiped area was determined for areas A, B and C from the windshield pattern.

2.3 CAPABILITY TEST

The windshield glazing surface was coated with a mixture of water and fine grade test dust. Within 15 seconds following application of the water-dust mixture, the windshield wiper and washing system was activated in the high speed mode for ten complete cycles. The vehicle’s engine was operating at idle RPM. The cleared areas of the windshield were marked on the inside windshield surface. After ten complete cycles the system was deactivated and the wiped area transferred to a windshield pattern.

The glazing surface was cleaned and dried. The water dust mixture was re-applied and the test repeated.

The windshield patterns were used subsequently to determine the cleared area percentages.

2.4 SUMMARY OF RESULTS

Based on the test performed, the test vehicle’s windshield wiping and washing system appears to meet the requirements of FMVSS 104.
SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2009 Cadillac CTS.
SUMMARY OF DATA
FMVSS 104, WINDSHIELD WIPING AND WASHING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CADILLAC CTS PASSENGER CAR
VEH. NHTSA NO: C90101; VIN: 1G6DG577790130497
VEH. BUILD DATE: 08/08 TEST DATE: MAY 21, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WIPER TYPE: 2 SPEED ELECTRIC WITH DELAY

WASHER TYPE: HIGH PRESSURE ELECTRIC

WINDSHIELD AREAS: A = 1115 in²  B = 785 in²  C = 259 in²

MANUFACTURER’S WINDSHIELD PATTERN USED: Yes X No _____

ACCESSIBILITY:
(1) Washer Control Accessible: Yes X No____
(2) Wiper Control Accessible: Yes X No____
(3) Washer Reservoir Filler Accessible: Yes X No____

DESCRIBE UNUSUAL FEATURES OF WIPING AND WASHING SYSTEMS:

PERFORMANCE:

<table>
<thead>
<tr>
<th>TEST</th>
<th>PASS</th>
<th>FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIPER FREQUENCY</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WIPED AREA</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WASHER CAPABILITY</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

RECORDED BY: G. FARRAND ___________ DATE: 05/21/09
APPROVED BY: D. MESSICK ___________
FREQUENCY TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CADILLAC CTS PASSENGER CAR
VEH. NHTSA NO: C90101; VIN: 1G6DG577790130497
VEH. BUILD DATE: 08/08 TEST DATE: MAY 21, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBERVERS: GRANT FARRAND, JIMMY LATANE

Water Hardness: 7.0 grains/gallon (12 max.); Date Certified: 05/09
Water Spray Flow Rate: 75 in³/min. (specified range = 50 to 100 in³/min.)
Ambient Air Temp.: 75 °F (50-100°F); Water Temp.: 73 °F (100°F max.)
Manufacturer’s Recommended Engine Idle Speed: 550 rpm

RUN 1, MAXIMUM WIPER FREQUENCY TEST:

<table>
<thead>
<tr>
<th>TIME</th>
<th>ENGINE SPEED</th>
<th>TOTAL CYCLES</th>
<th>AVG. CYCLES/MIN. (45 MINIMUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ST 3 minutes</td>
<td>550 (idle ± 50 rpm)</td>
<td>209</td>
<td>69.7</td>
</tr>
<tr>
<td>2ND 3 minutes</td>
<td>2000 (2000 rpm ± 50 rpm)</td>
<td>229</td>
<td>76.3</td>
</tr>
</tbody>
</table>

Frequency at least 45 cycles/minute regardless of engine speed: Yes X No __

RUN 2, LOWER WIPER FREQUENCY TEST:

<table>
<thead>
<tr>
<th>TIME</th>
<th>ENGINE SPEED</th>
<th>TOTAL CYCLES</th>
<th>AVG. CYCLES/MIN. (20 MINIMUM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ST 3 minutes</td>
<td>550 (idle ± 50 rpm)</td>
<td>142</td>
<td>47.3</td>
</tr>
<tr>
<td>2ND 3 minutes</td>
<td>2000 (2000 rpm ± 50 rpm)</td>
<td>153</td>
<td>51</td>
</tr>
</tbody>
</table>

Highest and lower frequency differ by at least 15 cycles/minute, and lower frequency is at least 20 cycles/minute regardless of engine speed: Yes X No __

REMARKS:

RECORDED BY: G. FARRAND DATE: 05/21/09
APPROVED BY: D. MESSICK
WIPED AREA TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CADILLAC CTS PASSENGER CAR
VEH. NHTSA NO: C90101; VIN: 1G6DG577790130497
VEH. BUILD DATE: 08/08; TEST DATE: MAY 21, 2009
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 80°F (specified range of 50 to 100°F)

Air Velocity at windshield = 0.1 mph (specified range of 0 to 1 mph)

Engine speed = 550 rpm (manufacturer’s recommended idle ± 50 rpm)

Temperature of water spray = 73°F (100°F maximum)

Water spray flow rate = 75 in³/min. (specified range of 50 to 100 in³/min.)

Windshield wiper frequency = 48 cycles/min. (45 cpm minimum)

TEST RESULTS:

<table>
<thead>
<tr>
<th>WINDSHIELD AREA</th>
<th>ACTUAL</th>
<th>REQUIRED</th>
<th>PASS</th>
<th>FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>91.9%</td>
<td>80%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>97.7%</td>
<td>94%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>100%</td>
<td>99%</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS:

RECORDED BY: G. FARRAND DATE: 05/21/09
APPROVED BY: D. MESSICK
**CAPABILITY TEST DATA**  
FMVSS 104 – WINDSHIELD WASHER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CADILLAC CTS PASSENGER CAR  
VEH. NHTSA NO: C90101;  
VIN: 1G6DG577790130497  
VEH. BUILD DATE:08/08;  
TEST DATE: MAY 21, 2009  
TEST LABORATORY:GENERAL TESTING LABORATORIES  
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 83 °F (specified range of 70 to 80°F)  
Washer reservoir fluid temperature = 76 °F (specified range of 70 to 80°F)  
Air Velocity at windshield = .1 mph (specified range of 0 to 1 mph)  
Engine speed = 550 rpm (manufacturer’s recommended idle ± 50 rpm)  
Number of windshield washer nozzles on the vehicle = 2

Windshield washer system activation coordinated with components of the wiper system:  
Yes X  
No

**TEST RESULTS:**

<table>
<thead>
<tr>
<th>WINDSHIELD AREA</th>
<th>TEST 1</th>
<th>TEST 2</th>
<th>AVG</th>
<th>REQ'D*</th>
<th>PASS</th>
<th>FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>94.7</td>
<td>94.7</td>
<td>94.7</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>75%</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*NOTE FOR REFERENCE ONLY: SAE 942b, revised Jul72, recommends capability to clear 80% of the total wash area and 90% of the wash area included in AREA C.

REMARKS:

RECORDED BY: G. FARRAND  
DATE: 05/21/09  
APPROVED BY: D MESSICK
## TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>MODEL/ SERIAL NO.</th>
<th>CAL. DATE</th>
<th>NEXT CAL. DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMER</td>
<td>ACCU-SPLIT ACT1</td>
<td>05/09</td>
<td>05/10</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE READOUT</td>
<td>FLUKE 7471026</td>
<td>08/08</td>
<td>10/09</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE RECORDER</td>
<td>FLUKE 7471026</td>
<td>08/08</td>
<td>10/09</td>
<td></td>
</tr>
<tr>
<td>SPRAY SYSTEM</td>
<td>GTL N/A</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
<td></td>
</tr>
<tr>
<td>ANEMOMETER</td>
<td>OMEGA 19353-56</td>
<td>06/08</td>
<td>06/09</td>
<td></td>
</tr>
<tr>
<td>CYCLE COUNTER</td>
<td>GTL GTL</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
<td></td>
</tr>
<tr>
<td>SOFT WATER</td>
<td>N/A N/A</td>
<td>05/09</td>
<td>05/10</td>
<td></td>
</tr>
<tr>
<td>TACHOMETER</td>
<td>MONARCH ACT-3</td>
<td>05/09</td>
<td>05/10</td>
<td></td>
</tr>
<tr>
<td>TEST DUST</td>
<td>AC GM FINE</td>
<td>CALIBRATED DUST</td>
<td>CALIBRATED BY VENDOR*</td>
<td></td>
</tr>
</tbody>
</table>

*AC Inspection #503, Batch #1943, Measured with particle size roller analyzer.
SECTION 5
PHOTOGRAPHS
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE VIEW OF VEHICLE
<table>
<thead>
<tr>
<th>Date</th>
<th>GVWR</th>
<th>GAWR FRT</th>
<th>GAWR RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/08</td>
<td>2340 KG</td>
<td>1115 KG</td>
<td>1225 KG</td>
</tr>
<tr>
<td></td>
<td>5159 LB</td>
<td>2459 LB</td>
<td>2700 LB</td>
</tr>
</tbody>
</table>

**THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.**

**1G6DG577790130497**

**TYPE: PASS CAR**

**FIGURE 5.5**

**VEHICLE CERTIFICATION LABEL**
The combined weight of occupants and cargo should never exceed 404 kg or 891 lbs.

<table>
<thead>
<tr>
<th>TIRE</th>
<th>ORIGINAL SIZE</th>
<th>COLD TIRE PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRONT</td>
<td>P235/50R18 V</td>
<td>240 kPa, 35 PSI</td>
</tr>
<tr>
<td>REAR</td>
<td>P235/50R18 V</td>
<td>240 kPa, 35 PSI</td>
</tr>
<tr>
<td>SPARE</td>
<td>T135/70R18 M</td>
<td>420 kPa, 60 PSI</td>
</tr>
</tbody>
</table>

See owner's manual for additional information.
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.7
INSTRUMENTATION AND EQUIPMENT SET-UP
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.9
WIPE AREA TEST PATTERN
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.10
CAPABILITY TEST #1 PRE-COATED WINDSHIELD
FIGURE 5.13
CAPABILITY TEST #2 IN PROGRESS
2009 CADILLAC CTS
NHTSA NO. C90101
FMVSS NO. 104

FIGURE 5.14
CAPABILITY TEST #1 AND #2 PATTERN
SECTION 6

OWNER’S MANUAL INFORMATION
Windshield Wipers

The lever on the right side of the steering column operates the windshield wipers.
Move the lever to one of the following positions:

획획 (Mist): Pull the lever down and release it for a single wiping cycle. The lever will return to its original position. Hold the lever in this position for continuous wiping cycles.

획 vids (Delay): For a delayed wiping cycle. Turn the delay adjustment knob to set the length of the delay.

획 vids (Delay Adjustment): Use this knob to set the length of the delay between wipes when using the delay feature. The closer the knob is moved towards 횃획 횃획 , the longer the delay. The windshield wiper lever must be in delay for this feature to work.
1 (Low Speed): For slow, steady wiping cycles.

2 (High Speed): For rapid wiping cycles.

If the windshield wipers are in use for about six seconds while you are driving, the exterior lamps come on automatically if the exterior lamp control is in AUTO. See Wiper Activated Headlamps on page 3-17 for more information.

Clear snow and ice from the wiper blades before using them. If the blades are frozen to the windshield, gently loosen or thaw them. If they become damaged, install new blades. For more information, see Windshield Wiper Blade Replacement on page 5-59.

Heavy snow or ice can overload the wiper motor. A circuit breaker will stop the motor until it cools down.

---

Rainsense™ Wipers

Vehicles with Rainsense windshield wipers, have a moisture sensor for this feature mounted on the interior side of the windshield behind the rearview mirror. This sensor automatically operates the wipers by monitoring the amount of moisture build-up on the windshield. Wipes occur as needed to clear the windshield depending on driving conditions and the sensitivity setting. In light rain or snow, fewer wipes will occur. In heavy rain or snow, wipes occur more frequently. If the system is left on for long periods of time, occasional wipes may occur without any moisture on the windshield. This is normal and indicates that the Rainsense system is activated.

The wiper control should be left in the off position, unless the wiper is needed.

The Rainsense system is sensitive to vibration and can activate if something hits the windshield or if the vehicle hits a bump.
Rainsense windshield wipers operate in a delay mode, as well as a continuous low or high speed as needed. Move the wiper lever up to the delay position and turn the band to one of five settings.

The level one or lowest setting is at the bottom of the band. This setting lets more rain or snow collect on the windshield between wipes. Turn the delay band forward to a higher setting to let less rain or snow collect on the windshield between wipes.

The top position is the highest setting. A single wipe occurs each time the delay band is turned to a higher setting to indicate that the Rainsense level has been increased.

**Notice**: Going through an automatic car wash with the wipers on can damage them. Turn the wipers off when going through an automatic car wash.

The mist and wash cycles operate as normal and are not affected by the Rainsense function. The Rainsense system can be overridden at any time by manually changing the wiper control to low or high speed. The system will default to normal time delay operation if the Rainsensor detects something that would affect Rainsense operation.

When Rainsense is active, the headlamps turn on automatically. If it is dark, they remain on. See "Wiper Activated Headlamps" under *Wiper Activated Headlamps on page 3-17* for more information.

**Notice**: Do not place stickers or other items on the exterior glass surface directly in front of the moisture sensor. Doing this could cause the moisture sensor to malfunction.
Windshield Washer

⚠️ CAUTION:

In freezing weather, do not use your washer until the windshield is warmed. Otherwise the washer fluid can form ice on the windshield, blocking your vision.

(Washer Fluid): Press the button with this symbol, located at the end of the windshield washer lever, to wash the windshield. The washer fluid sprays onto the windshield and the wipers run for a few cycles to clear the windshield. Press and hold " for more wash cycles.

Washer Fluid Low Add Fluid displays on the Driver Information Center (DIC) when the washer fluid is low. See DIC Warnings and Messages on page 3-58.

If the headlamps are on while the windshield is being washed, the headlamp washers, if the vehicle has them, will also turn on. See "Headlamp Washer" following for more information.

Heated Windshield Washer

For vehicles with the heated windshield washer fluid system it can be used to help clear ice, snow, tree sap, or bugs from the windshield.

The button is located on the climate control system panel.

Push \( \text{\texttrademark} \) to begin four heated wipe cycles. Heating Washer Fluid Wash Wipes Pending displays on the DIC. See DIC Warnings and Messages on page 3-58. The first heated wipe cycle can take up to 40 seconds to occur, depending on the outside temperature.
After the first wipe cycle, it can take up to 20 seconds for each of the remaining cycles. The system will automatically turn off after four wipe cycles have been completed or press \( \frac{3}{4} \) again to turn it off. Heated Washer Fluid System Off displays on the DIC. See DIC Warnings and Messages on page 3-58.

When the heated windshield washer fluid system is activated under certain outside temperature conditions, steam might flow out of the washer nozzles for a short period of time before washer fluid is sprayed. This is a normal condition.

Washer Fluid Low Add Fluid displays on the DIC when the washer fluid is low. See DIC Warnings and Messages on page 3-58.

**Headlamp Washer**

Your vehicle may have headlamp washers. The headlamp washers clear debris from the headlamp lenses.

The headlamp washers are located beneath the headlamps.

Press the washer button located at the end of the windshield wiper lever to wash the headlamps. Both the headlamps and the windshield will be washed. After the first wash, the headlamps will not be washed until the fifth press of the windshield washer button.

The headlamps must be on to be washed. If the headlamps are off, only the windshield will be washed when the washer button is pressed. If the washer fluid is low, the headlamp washers will not work.

See Windshield Washer on page 3-12 for more information.