SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 103
WINDSHIELD DEFROSTING AND
DEFOGGING SYSTEMS

FORD MOTOR CO.
2006 FORD FUSION, PASSENGER CAR
NHTSA NO. C60202

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

JUNE 16, 2006
FINAL REPORT
PREPARED FOR
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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ROOM 6111 (NVS-220)
WASHINGTON, D.C. 20590
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<tr>
<td>Grant Farrand, Project Engineer Debbie Messick, Project Manager</td>
<td>GTL-DOT-06-103-003</td>
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15. Supplementary Notes

16. Abstract
Compliance tests were conducted on the subject, 2006 Ford Fusion Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-103-13 for the determination of FMVSS 103 compliance. Test failures identified were as follows: None

17. Key Words
Compliance Testing Safety Engineering FMVSS 103

18. Distribution Statement
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<td>5.8 Instrumentation Set-up</td>
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<td>5.9 Windshield, Pre-Test Frosted State Test #1</td>
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<td>5.10 Defrosted Area at 20 minutes Test #1</td>
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<td>5.11 Windshield Vellum Pattern, Test #1</td>
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<td>5.12 Windshield Pre-Test Frosted State Test #2</td>
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<td>Copy of Owner’s Manual Defroster Instructions</td>
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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2006 Ford Fusion Passenger Car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 103 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-103-13 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, “Windshield Defrosting and Defogging Systems – Passenger Vehicles, Multipurpose Vehicles, Trucks and Buses”.

1.1 TEST VEHICLE

The test vehicle was a 2006 Ford Fusion Passenger Car. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: 3FAFP06Z56R135176

B. NHTSA No.: C60202

C. Manufacturer: FORD MOTOR COMPANY

D. Manufacture Date: 12/05

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 103 testing on May 22-23, 2006.
SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2006 Ford Fusion 4-door passenger car, NHTSA No. C60202 was subjected to FMVSS No. 103 tests on May 22-23, 2006. Photographs of the test vehicle are shown in Figures 5.1 through 5.4. The manufacturer’s certification and tire information labels are shown in Figures 5.5 and 5.6. The test instrumentation and instrument panel setups are depicted in Figures 5.7 and 5.8. Figures 5.9 through 5.15 depict the windshield pre and post test defrost conditions.

2.1 TEST PROCEDURE

Prior to test the test vehicle was inspected for completeness, systems operability, and appropriate fuel and liquid levels, i.e., oil and coolant to include antifreeze protection. The vehicle was then photographically documented as required by the DOT/NHTSA test procedure. The windshield patterns for areas A, B and C had been furnished prior to testing and these areas were outlined on the windshield with a marker. The vehicle was then installed in the cold chamber and pre-conditioned for a 14-hour minimum, 0º ±5º F temperature soak for the first test run. After the pre-condition, the hood was raised to assure engine coolant and lubricant were stabilized within the test temperature range for a minimum of 2 hours.

At the end of the 2-hour minimum stabilization period, the entire windshield was sprayed evenly with 0.010 ounces of water per square inch of glass area. Refer to Section 3, Compliance Test Data, for test specifics such as total amount of water sprayed, spray gun identification, and air pressure regulation. The vehicle soak continued for an additional 30 minutes minimum but no more than 40 minutes after the windshield was sprayed.

At the conclusion of the additional soak time the vehicle’s engine was started and operated at a target speed of 1500-1600 rpm or at the manufacturer’s specification if different as noted on data sheets. The defroster blower was turned on to the high speed setting with the heater selector in the de-ice (defrost) position, and the temperature control in the maximum temperature position. All doors and windows were closed. The heater air intake was fully open and the vehicle’s hood closed. At no time during the test were the windshield wipers used.
At start of testing and during test, at each 5-minute interval after engine start, cold chamber, engine coolant, heater coolant in and defroster air left/defroster air right temperatures were recorded. Likewise at each 5-minute interval the boundary of the defrosted area was marked on the inside surface of the windshield. The test was run for a maximum of 40 minutes from engine start, or until such time as 100 percent windshield clearance was achieved. Photographs were made of the windshield at the pre-test frosted state and 20-minute and 25-minute intervals. Post test actions included placing a vellum pattern on the windshield and tracing the windshield’s 5-minute interval defrosted area boundary lines onto the vellum pattern.

After the traces were obtained, the windshield was again thoroughly cleaned and the vehicle engine coolant and lubricant stabilization period at 0º ±5º F temperature commenced for a repeat of the procedure discussed. The windshield patterns for both tests were used subsequently to determine the cleared area percentages.

2.2 SUMMARY OF RESULTS

Based on the test performed, the test vehicle appears to be in compliance with the requirements of FMVSS 103.
SECTION 3
COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2006 Ford Fusion.
SUMMARY DATA SHEET
FMVSS 103, WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2006 FORD FUSION PASSENGER CAR
VEH. NHTSA NO: C60202; VIN: 3FAFP06Z56R135176
VEH. BUILD DATE: 12/05; TEST DATE: MAY 22-23, 2006
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WINDSHIELD AREA: 1968 in²  AREA C = 262.2 in²  AREA D = 262.2 in²  AREA A = 1128.9 in²
MANUFACTURER’S WINDSHIELD PATTERN USED: Yes X  No
ENGINE THERMOSTAT NOMINAL REGULATING TEMPERATURE: 180 °F
HEATER-DEFROSTER SYSTEM INCLUDES AIR CONDITIONER: YES ___ NO ___
DESCRIBE UNUSUAL FEATURES OF DEFROSTING SYSTEM: ___ NONE ___
DESCRIBE UNUSUAL FEATURES OF TEST CAR: ___ NONE ___

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<th>DESIGNATION</th>
<th>AREA PERCENT DEFROSTED</th>
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<tr>
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<td>TEST 1</td>
</tr>
<tr>
<td>CRITICAL AREA C AT 20 MINUTES</td>
<td>100%</td>
</tr>
<tr>
<td>PASSENGER AREA D AT 25 MINUTES</td>
<td>100%</td>
</tr>
<tr>
<td>TOTAL AREA A AT 40 MINUTES</td>
<td>100%</td>
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REMARKS:

RECORDED BY: G. FARRAND DATE: 05/23/06
APPROVED BY: D. MESSICK
VEH. MOD YR/MAKE/MODEL/BODY: 2006 FORD FUSION PASSENGER CAR

VEH. NHTSA NO: C60202; VIN: 3FAFP06Z56R135176

VEH. BUILD DATE: 12/05; TEST DATE: MAY 22-23, 2006

TEST LABORATORY: GENERAL TESTING LABORATORIES

OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned __72__ hours @ 0º ±5º F (14 hrs. min.)

Cold Soak Period: ______________ 72 HOURS ______________

Time engine coolant and lubricant remained stabilized at 0º F: __60__ hrs. __0__ minutes

Water Spray Gun and Nozzle Type: __________ BINKS #66 __________

Spray Gun Pressure: ______________ 50 __________ psi (50 psi ± 3 psi)

Water used: __19.7__ fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: __35__ minutes (30 to 40 minutes)

Engine Speed: * (Target engine speed 1500 to 1600 rpm)
* 1600 RPM FOR FIRST 5 MINUTES THEN 1500 RPM

Wind at specified location in front of windshield: __.4__ mph (0 to 2 mph)

Number of Vehicle Occupants: ___1__ (2 maximum)

Describe window openings, if any: __NONE__

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<th>MOTOR VOLTAGE (volts)</th>
<th>TEMPERATURE, ºF</th>
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<td>ENGINE WATER</td>
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<td>14.7</td>
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REMARKS:

RECORDED BY: G. FARRAND DATE: _____05/23/06_____

APPROVED BY: D. MESSICK
FMVSS 103 TEST DATA RECORD – TEST RUN NO. ______ 2 ______

VEH. MOD YR/MAKE/MODEL/BODY: 2006 FORD FUSION PASSENGER CAR
VEH. NHTSA NO: C60202; VIN: 3FAFP06ZS56R135176
VEH. BUILD DATE: 12/05; TEST DATE: MAY 22-23, 2006
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned N/A hours @ 0º ±5º F (14 hrs. min.)

Cold Soak Period: 18 HOURS

Time engine coolant and lubricant remained stabilized at 0º F: 12 hrs. 30 minutes

Water Spray Gun and Nozzle Type: BINKS #66

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 19.7 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 35 minutes (30 to 40 minutes)

Engine Speed: *1600 RPM FOR FIRST 5 MINUTES THEN 1500 RPM

Wind at specified location in front of windshield: .6 mph (0 to 2 mph)

Number of Vehicle Occupants: 1 (2 maximum)

Describe window openings, if any: NONE

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REMARKS:

RECORDED BY: G. FARRAND DATE: 05/23/06

APPROVED BY: D. MESSICK
## SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

### TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

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SECTION 5

PHOTOGRAPHS
2006 FORD FUSION
NHTSA NO. C60202
FMVSS NO. 103

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE
MFD. BY FORD MOTOR CO.

DATE: 12/05
FRONT GAWR: 1030KG/2270LB
REAR GAWR: 916KG/2020LB

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

VIN: 3FAFP06Z56R135176 TYPE: Passenger Car
MAXIMUM LOAD = OCCUPANTS + LUGGAGE = 385KG/850LB
OCCUPANTS = 5 TOTAL; 2 FRONT, 3 REAR

TIRE (FR): P205/60R16
( RR): P205/60R16
PRESSURE (FR): 235 kPa/34 PSI COLD
( RR): 235 kPa/34 PSI COLD

RIMS (FR): 16X6.5J
( RR): 16X6.5J

TRAILER TOWING - SEE OWNER GUIDE
EXT PNT: T8
INT TR TP/PS R AXLE TR SPR AL
F 38 C AA11 40A

FIGURE 5.5
VEHICLE CERTIFICATION LABEL
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<tr>
<td>SPARE</td>
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The combined weight of occupants and cargo should never exceed: 385 kg or 850 lbs.
2006 FORD FUSION
NHTSA NO. C60202
FMVSS NO. 103

FIGURE 5.7
CLOSE-UP VIEW OF DEFROSTER CONTROL SETTING ON DASH
2006 FORD FUSION
NHTSA NO. C60202
FMVSS NO. 103

FIGURE 5.9
WINDSHIELD, PRE-TEST FROSTED STATE
TEST #1
2006 FORD FUSION
NHTSA NO. C60202
FMVSS NO. 103

FIGURE 5.10
DEFROSTED AREA AT 20 MINUTES TEST #1
2006 FORD FUSION
NHTSA NO. C60202
FMVSS NO. 103

FIGURE 5.11
WINDSHIELD VELLUM PATTERN, POST TEST #1
Figure 5.13
Defrosted area at 20 minutes Test #2
MANUAL HEATING AND AIR CONDITIONING SYSTEM (IF EQUIPPED)

1. **Temperature selection:**
Controls the temperature of the airflow in the vehicle.

2. **Air flow selections:**
Controls the direction of the airflow in the vehicle. See the following for a brief description on each control setting:

**MAX A/C:** Distributes recirculated air through the instrument panel vents only to cool the vehicle. This re-cooling of the interior air is more economical and efficient. Recirculated air may also help reduce undesirable odors from entering the vehicle.

- \(\text{\textbullet}\) : Distributes air through the instrument panel vents.
- \(\text{\textbullet}\) : Distributes air through the instrument panel vents and floor vents.

**O (OFF):** Outside air is shut out and the climate system is turned off.

- \(\text{\textbullet}\) : Distributes air through the floor vents. **Note:** You may notice a small amount of air flowing from the demister and defroster vents.

- \(\text{\textbullet}\) : Distributes air through the windshield defroster vents, demisters and floor vents.

- \(\text{\textbullet}\) : Distributes outside air through the windshield defroster and demister vents. Can be used to clear thin ice or fog from the windshield. To exit \(\text{\textbullet}\), select another mode.

3. **Rear defroster:**
Press to activate/deactivate rear window defroster. Refer to *Rear window defroster* in this section for more information.

4. **Recirculated air:**
Press to activate/deactivate air recirculation in the vehicle cabin. Recirculated air may reduce the amount of time to cool down the interior of the vehicle and may also help reduce undesirable odors from reaching the interior of the vehicle. Recirculation engages automatically with selection of MAX A/C or can be engaged manually in any other airflow selection except defrost. Recirculation may turn off automatically in all airflow selections except MAX A/C.

5. **A/C:**
Press to activate/deactivate air conditioning. Use with recirculated air to improve cooling performance and efficiency. Engages automatically in MAX A/C, \(\text{\textbullet}\) (defrost) and \(\text{\textbullet}\) (floor/defrost). Cannot be disabled in MAX A/C mode.
Climate Controls

6. Fan speed adjustment: Controls the volume of air circulated in the vehicle.

Manual heating and air conditioning system operating tips

- To reduce fog build up on the windshield during humid weather, place the airflow selector in the \( \mathbf{R} \) position.
- To reduce humidity build up inside the vehicle: do not drive with the airflow selector in the O (OFF) position or with recirculated air \( \mathbf{R} \) engaged and A/C off.
- Do not put objects under the front seats that will interfere with the airflow to the back seats.
- Remove any snow, ice or leaves from the air intake area at the base of the windshield.
- To improve the A/C cool down, drive with the windows slightly open for 2-3 minutes after start up or until the vehicle has been “aired out.”
- For maximum cooling performance (MAX A/C):

In the MAX A/C mode:

- Move the temperature control selector to the coldest setting.
- Set the fan to the highest speed initially, then adjust to maintain passenger comfort.

In the \( \mathbf{F} \) and \( \mathbf{S} \) modes:

- Move the temperature control selector to the coldest setting.
- Select A/C and recirculated air \( \mathbf{R} \). Use \( \mathbf{A} \) with A/C to provide colder airflow.
- Set the fan to the highest speed initially, then adjust to maintain passenger comfort.

- To aid in side window defogging/demisting in cold weather:
  1. Select \( \mathbf{F} \).
  2. Select A/C.
  3. Set the temperature control to full heat.
  4. Set the fan speed to the highest setting.
  5. Direct the outer instrument panel vents towards the side windows.

AUTOMATIC TEMPERATURE CONTROL (ATC) SYSTEM (IF EQUIPPED)

\begin{itemize}
  \item 1. \( \mathbf{W} \) Defrost: Distributes outside air through the windshield defroster and demister vents. Can be used to clear thin ice or fog from the windshield. To exit \( \mathbf{W} \), select another mode.
  \item 2. \( \mathbf{F} \) Fan speed control: Press to manually increase or decrease the fan speed. To return to automatic fan operation, press AUTO.
  \item 3. \( \mathbf{R} \) Rear defroster: Press to defrost the rear window. Refer to Rear window defroster in this section for more information. If your vehicle is equipped with both rear defroster and heated mirrors, the same button will activate both.
\end{itemize}
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4. Recirculation control: Press to activate/deactivate air recirculation in cabin. Recirculated air may reduce the amount of time to cool down the interior of the vehicle and may also help reduce undesired odors from reaching the interior of the vehicle. Recirculation can be engaged manually in any other airflow selection except (defrost). Recirculation may turn off automatically in all airflow selections except MAX A/C.

5. A/C control: Press to activate/deactivate air conditioning. Use with recirculated air to improve cooling performance and efficiency. Engages automatically in AUTO, (defrost) and (floor/defrost).

6. : Distributes air through the windshield defroster ducts, demister outlets, and the front and rear seat floor ducts. The system will automatically provide outside air to reduce window fogging.

7. : Distributes air through the floor and rear seat floor ducts.

8. : Distributes air through the instrument panel and center console registers (if equipped) and the front and rear seat floor ducts.

9. : Distributes air through the instrument panel and center console registers (if equipped).

10. Manual override controls: Allows you to manually select where airflow is directed. To return to full automatic control, press AUTO.

11. OFF: Outside air is shut out and the fan will not operate.

12. Temperature control: Controls the temperature in the cabin of the vehicle. Press to increase/decrease the temperature.

13. AUTO: To engage automatic temperature control, press AUTO and select the desired temperature using the temperature control. The system will automatically determine fan speed, airflow location, A/C on or off, and outside or recirculated air, to heat or cool the vehicle to reach the desired temperature.

14. EXT: Press to display outside temperature. Press again to display cabin temperature settings.

Temperature conversion: To switch between Fahrenheit and Celsius: If your vehicle is equipped with a full message center, refer to Units (Fahrenheit/Celsius) in the Driver Controls chapter. If your vehicle is equipped with a mini message center, refer to Mini message center electronic compass temperature display in the Driver Controls chapter.

MAX A/C setting: In order to achieve maximum cooling performance, press , A/C, , and set the temperature to 60°F (16°C) and the highest blower setting.

1. Defrost: Distributes outside air through the windshield defroster and demister vents. Can be used to clear thin ice or fog from the windshield. To exit select another mode.

2. Fan speed control: Press to manually increase or decrease the fan speed. To return to automatic fan operation, press AUTO.

3. Rear defroster: Press to defrost the rear window. Refer to Rear window defroster in this section for more information. If your vehicle is equipped with both rear defroster and heated mirrors, the same button will activate both.

4. Passenger heated seat control: Press to heat the passenger seat. Press once to activate high heat (two indicator lights). Press again to activate low heat (one indicator light). Press again to deactivate the...
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passenger heated seat. Note: The passenger heated seat will turn off automatically after 15 minutes of use.
5. ![Air Distribution](image) : Distributes air through the windshield defroster ducts, demister outlets, and the front and rear seat floor ducts. The system will automatically provide outside air to reduce windshield fogging.
6. ![Floor Air Distribution](image) : Distributes air through the floor and rear seat floor ducts.
7. ![Center Console Air Distribution](image) : Distributes air through the instrument panel and center console registers (if equipped) and the front and rear seat floor ducts.
8. ![Floor/Defrost Air Distribution](image) : Distributes air through the instrument panel and center console registers (if equipped).
9. ![Driver Heated Seat Control](image) : Press to heat the driver seat. Press once to activate high heat (two indicator lights). Press again to activate low heat (one indicator light). Press again to deactivate the driver heated seat. Note: The driver heated seat will turn off automatically after 15 minutes of use.
10. Manual Override Controls: Allows you to manually select where airflow is directed. To return to full automatic control, press AUTO.
11. ![Recirculation Control](image) : Press to activate/deactivate air recirculation in cabin. Recirculated air may reduce the amount of time to cool down the interior of the vehicle and may also help reduce undesired odors from reaching the interior of the vehicle. Recirculation can be engaged manually in any other airflow selection except ![Defrost](image) (defrost). Recirculation may turn off automatically in all airflow selections except MAX A/C.
12. A/C Control: Press to activate/deactivate air conditioning. Use with recirculated air to improve cooling performance and efficiency. Engages automatically in AUTO, ![Defrost](image) (defrost) and ![Floor/Defrost](image) (floor/defrost).
13. OFF: Outside air is shut out and the fan will not operate.
14. Temperature Control: Press to increase/decrease the temperature in the vehicle cabin.
15. AUTO: To engage automatic temperature control, press AUTO and select the desired temperature using the temperature control. The system will automatically determine fan speed, airflow location, A/C on or off, and outside or recirculated air, to heat or cool the vehicle to reach the desired temperature.
16. EXT: Press to display outside temperature. Press again to display cabin temperature settings.

Automatic Temperature Control (ATC) system operating tips
- To reduce fog build up on the windshield during humid weather, place the air flow selector in the ![Defrost](image) position.
- To reduce humidity build up inside the vehicle, do not drive with the system OFF, or with recirculated air ![Recirc](image) engaged and A/C off.
- Do not put objects under the front seats that will interfere with the airflow to the back seats.
- Remove any snow, ice or leaves from the air intake area at the base of the windshield.
- To improve the A/C cool down, drive with the windows slightly open for 2-3 minutes after start up or until the vehicle has been “aired out.”
- For maximum cooling performance (MAX A/C):
  - **Automatic operation:**
    - Press AUTO for full automatic operation.
    - Do not override A/C or ![Recirc](image) (recirculated air).
    - Set the temperature to 60° F (16° C).
  - **Override operation:**
    - Select air distribution.
    - Select A/C and ![Recirc](image) (recirculated air). Use ![Recirc](image) (recirculated air) with A/C to provide colder airflow.
    - Set the temperature to 60° F (16° C).
    - Set highest fan speed initially, then adjust to maintain comfort.
  - **In MAX A/C setting:**
    - Move the temperature control to full cold.
    - Set highest fan speed initially, then adjust to maintain comfort.
  - **In ![Floor](image) (panel) or ![Floor/Defrost](image) (panel/floor) modes:**
    - Move temperature control to full cold.
    - Select A/C and ![Recirc](image) (recirculated air). Use recirculated air with A/C to provide colder airflow.
    - Set highest fan speed initially, then adjust to maintain comfort.
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- To aid in side window defogging/demisting in cold weather:
  1. Select $\text{F}$.
  2. Select A/C.
  3. Adjust the temperature control to maintain comfort.
  4. Set the fan speed to the highest setting.
  5. Direct the outer instrument panel vents towards the side windows.
To increase airflow to the outer instrument panel vents, close the vents located in the middle of the instrument panel.

⚠️ Do not place objects on top of the instrument panel as these objects may become projectiles in a collision or sudden stop.

REAR WINDOW DEFROSTER$^{[49]}$

The rear defroster control is located on the climate control panel and works to clear the rear window of fog and thin ice.

The ignition must be in the 3 (RUN) position to operate the rear window defroster.

The rear defroster turns off automatically after 10 minutes or when the ignition is turned to the 1 (LOCK) position. To manually turn off the defroster before 10 minutes have passed, push the control again.

Do not use razor blades or other sharp objects to clean the inside of the rear window or to remove decals from the inside of the rear window. This may cause damage to the heated grid lines and will not be covered by your warranty.