

WATER LEAK/ WIND NOISE DIAGNOSIS AND REPAIR

3A

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WATER LEAKS

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GENERAL

The problem of water leaks is closely related to dust leakage due to the fact that, under certain conditions, water can enter the vehicle body at any point where dirt and dust can enter.

The key to correcting any water leak problem is complete and accurate diagnosis. To do this a thorough check of the following five general causes of leakage must be accomplished:

- Maladjusted components
- Improperly installed, misrouted or faulty weatherstrips
- Omission of sealers
- Misfitted panels
- Missing body plugs

Leaks can be deceiving. The point where water is detected may not be the point where it entered the vehicle.

Spray Test

The first thing to do on any water leak problem, is to pin-point the leak. The best way to do this is to perform a water spray test.

Sit inside the vehicle and have someone spray water over the suspected leak area. **Always start spraying along the bottom. By starting at the bottom, the exact level at which the leaks occur will be determined.** If water was sprayed at the highest point, water would be at all suspect areas and it would be difficult to determine the exact problem area.

Do not rush the water spray test. The water may have to flow awhile before it shows up. Try to simulate as close as possible the effect of wind-driven water.

Ultrasonic Test

Another way to test the vehicle for water leaks is use the Listener Tool J-23455-01. This tool makes use of the fact that ultrasonic energy (high frequency sound) has certain properties that are similar to those of fluids (liquids and gases). Ultrasonic energy does not penetrate solids, such as glass or metal. It is, however, transmitted through cracks and openings, such as those that cause water or air leaks.

An operating ultrasonic generator placed inside vehicle body will fill the vehicle with sound energy. **This energy will leak at the same locations that permit water and air leaks.** The water path or opening must be dry since the ultrasonic sound will be blocked if an opening or hole is full of water.

An ultrasonic generator and detector gun form an ideal combination for determining the location and magnitude of water and air leaks. The ultrasonic leak detector can be used effectively as a diagnostic tool realizing it is not an exact tool and has certain limitations.

Light Test

Another method of finding water leaks is the light test. This method is good for finding sealer skips in the sheet metal joints and seams, particularly in the wheel-house area. Sit inside the vehicle and have someone pass

a bright light along the seams and joints from under the vehicle.

Water/Rust Streaks

Another thing to look for in diagnosing water leaks is a pattern of rust or water streaks on interior sheet metal and trim. For instance, a symptom of rear window leakage or inadequately sealed coach joint is water dripping into the rear compartment. This will show up as water or rust streaks on the rear compartment trim or wheelhouse.

Adhesive, Sealant and Coating Materials

- Adhesives join or bond materials together
- Sealants close gaps or seams between sheet metal or materials and prevent the passage of water, dust, air, etc.
- Coatings protect against corrosion and abrasion, and dampen sound or vibration—and may also be used to seal out water and dust

Bonding Surface Preparation

For the various materials to adhere and form an effective bond, it is essential that they are applied to clean, dry surfaces. After a water test, dry the joint or seam with clean dry compressed air then wipe the joint, or seam, with a cloth dampened in 3M General Purpose Adhesive Cleaner, or equivalent.

WATER IN FRONT PASSENGER COMPARTMENT

Windshield

Leaks can occur between the windshield glass and rubber weatherstrip or between the rubber weatherstrip and body pinchweld flange. Leaks between the windshield glass and rubber weatherstrip will be indicated by water which is visible on the inside of the glass or on the front floor. Leaks between the rubber weatherstrip and body pinchweld flange will track down to appear on the front floor. Also, water can enter at the weld studs or burn holes in the body pinchweld flange.

Spray Diagnosis and Repair

- (1) Remove windshield reveal mouldings, as described in Chapter 3N.
- (2) Perform the following spray test using guidelines described under Spray Test above.
 - (a) Starting at base of windshield A-pillar on one side of vehicle, spray water onto glass across the bottom between the dash panel assembly and glass.
 - (b) Test vertical section of A-pillar and across top of glass.
 - (c) Repeat steps (a) and (b) for other side of vehicle.

- (3) If leaks are noted, dry out suspect area as described under Bonding Surface Preparation.

- (4) Seal windshield as described in detail in Chapter 3N.

- (5) Repeat spray test to ensure that an effective repair has been made.

- (6) Install windshield reveal mouldings.

Ultrasonic Diagnosis and Repair

- (1) Dry suspect areas thoroughly. If an opening or hole is full of water, the ultrasonic sound will be blocked.

- (2) Remove windshield reveal mouldings, as described in Chapter 3N.

- (3) Using Listener Tool J-23455-01, perform Ultrasonic Test as follows:

- (a) Place transmitter in vehicle adjacent to windshield and turn switch on.

- (b) Close all doors, windows and air vents.

- (c) Slowly pass listener all around windshield opening.

- (d) Mark any area where a meter reading of approximately 5 is obtained, as a indication of a possible leak.

- (4) Clean suspect area as described above under Bonding Surface Preparation.

- (5) Seal windshield as described in detail in Chapter 3N.

- (6) Repeat ultrasonic test to ensure that an effective repair has been made.

- (7) Install windshield reveal mouldings.

Dash Panel Assembly

Water leaks can occur at the inside of dash panel assembly due to spot weld burn holes or excessive gaps and/or lack of sealer at the dash panel joints. Water leaks from these burn holes or joints will result in water puddles forming on the front carpet or floorpan. Water can also enter through the many holes stamped into the dash panel assembly due to, loose grommets and/or incorrectly installed components and attaching hardware. Water will appear on the front carpet or floorpan having tracked down the inside of the dash panel assembly.

Spray Diagnosis and Repair

- (1) Pull back carpet and sound insulation material, if equipped.

- (2) Open hood.

- (3) Perform the following spray test using guidelines described under Spray Test above.

- (a) Starting at bottom of dash panel on one side of vehicle spray water onto suspect joints, grommets and components.

- (b) Spray water across top of dash panel.

- (c) Repeat spray test on other side of vehicle.

(4) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(5) Straighten any distorted flanges.

(6) Seal suspect spot weld burn holes and dash panel joints using 3M All-Around Autobody Sealant, or equivalent.

NOTE: Use care not to direct sealer into air ducts.

(7) Seal interior plenum chamber leaks by attaching a length of flexible plastic hose to nozzle of applicator gun specified for use with 3M Joint and Seam Sealer, or equivalent.

(8) Check all grommets to be sure they are correctly installed. If necessary, apply sealant to ensure a water tight seal.

(9) Make sure that all suspect components and attaching hardware are properly installed. If necessary, apply sealant to ensure a water tight seal.

(10) Repeat spray test to ensure that an effective repair has been made.

(11) Properly position sound insulation material and carpet, if equipped.

(12) Close hood.

Ultrasonic Diagnosis and Repair

(1) Dry suspect areas thoroughly. If an opening or hole is full of water, the ultrasonic sound will be blocked.

(2) Pull back carpet and sound insulation material, if equipped.

(3) Open hood.

(4) Close all windows, doors and air vents.

(5) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to dash panel assembly and turn switch on.

(b) Slowly pass listener over each joint, grommet and component.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

(7) Straighten any distorted flanges or seams.

(8) Seal suspect spot weld burn holes and dash panel joints using 3M All-Around Autobody Sealant, or equivalent.

NOTE: Use care not to direct sealer into air ducts.

(9) Seal interior plenum chamber leaks by attaching a length of flexible plastic hose to nozzle of applicator gun specified for use with 3M Joint and Seam Sealer, or equivalent.

(10) Check all grommets to be sure they are correctly installed. If necessary, apply sealant to ensure a water tight seal.

(11) Make sure that all suspect components and attaching hardware are properly installed. If necessary, apply 3M All-Around Autobody Sealant, or equivalent, to ensure a water tight seal.

(12) Repeat ultrasonic test to ensure that an effective repair has been made.

(13) Properly position sound insulation material and carpet, if equipped.

(14) Close hood.

Front Floorpan, Side Sills, Cowl Side Panels or Front Hinge Pillars

Water can enter at dash panel assembly-to-front floorpan seams due to gaps, distorted panels and/or lack of sealer. Water appears under the front carpet or on front floorpan.

Leaks can occur between the side sills, front floorpan, cowl side panels or front hinge pillars due to excessive gaps and/or lack of sealer at the panel joints. Water leaks from these joints will result in a wet front carpet, sound insulation material or front floorpan.

Also, leaking floorpan plugs will allow water to enter the front floorpan area or under the carpet and sound insulation material.

Spray Diagnosis and Repair

(1) Remove front seat(s).

(2) Remove front carpet and sound insulation material, if equipped.

(3) Open hood.

(4) Perform the following spray test using guidelines described under Spray Test above.

(a) Spray water from under front fender at joint of floorpan and cowl side panel or front hinge pillar.

(b) Next spray across floorpan-to-dash panel seam and towards rear of vehicle at floorpan plugs.

(c) Move spray slowly upwards until water is directed at joint of dash panel-to-cowl side panel.

(d) Repeat spray test on other side of vehicle.

(e) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(5) Straighten any distorted panels.

(6) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(7) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing the plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(8) Repeat spray test to ensure that an effective repair has been made.

- (9) Close hood.
- (10) Install sound insulation material and front carpet, if equipped.
- (11) Install front seat(s).

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

- (2) Remove front seat(s).
- (3) Remove front carpet and sound insulation material, if equipped.
- (4) Close all windows, doors and air vents.
- (5) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.

(b) Slowly pass listener over each joint, plug and seam.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

- (7) Straighten any distorted panels.
- (8) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.
- (9) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Repeat ultrasonic test to ensure that an effective repair has been made.

(11) Install sound insulation material and front carpet, if equipped.

(12) Install front seat(s).

Front Doors and Glass

An improperly adjusted door or defective sealing system will allow water to leak onto the front carpet or floor.

NOTE: Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dried. Also, make sure that the door glass is properly adjusted.

Spray Diagnosis and Repair

(1) Perform the following spray test using guidelines described under Spray Test above.

(a) Starting at front lower corner of door, spray water between door lower edge to rocker panel.

(b) Move slowly up door to roof level.

(c) Move to door lower rear corner and spray water between door rear edge and adjacent panel.

(d) Move slowly up door to roof level.

(e) Test door top edge to roof section.

(f) Repeat spray test on other side of vehicle.

(2) If leaks are noted, dry suspect area as described above under Bonding Surface Preparation.

(3) Examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced, as outlined in Chapter 3J.

(4) Correct improperly installed rubber sealers as outlined in Chapter 3J.

(5) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Close all windows, doors and air vents.

(3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle near suspect door and turn switch on.

(b) Slowly pass listener around all door edges and sealers.

(c) Mark any area where a meter reading of approximately 5 is obtained, as an indication of a possible leak.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) Examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3J.

(6) Correct improperly installed rubber sealers as outlined in Chapter 3J.

(7) Repeat ultrasonic test to ensure that an effective repair has been made.

WATER ON FRONT OR REAR SEATS

Front and Rear Doors and Glass

Improperly adjusted doors or defective sealing systems will allow water to leak onto the front or rear seats.

NOTE: Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dried. Also, make sure that the door glass is properly adjusted.

Spray Diagnosis and Repair

Repeat Front Doors and Glass Spray Diagnosis and Repair procedures for both front and rear doors.

Ultrasonic Diagnosis and Repair

Repeat Front Doors and Glass Ultrasonic Diagnosis and Repair procedures for both front and rear doors.

Rear Quarter Windows and Sun Roofs

The stationary and opening rear quarter window seals can leak water that may appear on the rear seats. The sun roof seals can leak water that may appear on front seats.

NOTE: *Before starting rear quarter window leak diagnosis, make sure that the rear quarter windows are properly adjusted. Also ensure that the sun roof seal is properly cleaned and lubricated with petroleum jelly.*

Spray Diagnosis and Repair

- (1) Close and/or lock the windows.
- (2) Perform the following spray test using guidelines described under Spray Test above.
 - (a) Start spray test along lower edge.
 - (b) Spray water all around edges of window and opening.
 - (c) Repeat spray test on other side of vehicle.
- (3) If leaks are noted, dry suspect area as described above under Bonding Surface Preparation.
- (4) In instances of leakage from stationary quarter window or sun roof, apply 3M Windshield Sealer, or equivalent, between glass and sealer or sealer and body flange.
- (5) Open rear quarter windows or sun roof and examine rubber sealers for damage, distortion or incorrect position. Damaged or distorted rubber sealers should be replaced.
- (6) Correctly install rear quarter window rubber sealers as outlined in Chapter 3K and sun roof seals as outlined in Chapter 3L.
- (7) Make sure that flange is free from buckles or protrusions.
- (8) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

- (1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.
- (2) Close all windows, doors and air vents.
- (3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
 - (a) Place transmitter in vehicle adjacent to rear quarter window or sun roof and turn switch on.
 - (b) Slowly pass listener around window opening.

(c) Mark any area where a meter reading of approximately 5 is obtained as an indication of a possible leak.

(d) Repeat test on other side of vehicle.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) In instances of leakage from stationary quarter window, apply 3M Windshield Sealer, or equivalent, between glass and sealer or sealer and body flange.

(6) Open rear quarter windows or sun roof and examine rubber sealers for damage, distortion or incorrect location. Damaged or distorted rubber sealers should be replaced.

(7) Correctly install rear quarter window rubber sealers as outlined in Chapter 3K and sun roof seals as outlined in Chapter 3L.

(8) Also, make sure that flange is free from buckles or protrusions.

(9) Repeat ultrasonic test to ensure that an effective repair has been made.

WATER OFF HEADLINER**Luggage Racks and Sun Roofs****Spray Diagnosis and Repair**

- (1) Lower headliner in suspect area, if equipped.
- (2) Perform the following spray test using guidelines described under Spray Test above.
 - (a) Spray water along luggage rack, skid strip mouldings or sun roof.
 - (b) If necessary, repeat spray test on other side of vehicle.
- (3) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.
- (4) Remove luggage rack support posts, in suspect area, and seal wellnuts or screw holes to body using 3M Drip-Chek Sealer, or equivalent. Install support posts.
- (5) Remove luggage rack skid strips in suspect area, and ensure that all moulding clips are correctly installed. Remove sun roof as outlined in Chapter 3L.
 - (a) Replace improperly installed or defective moulding clips, if equipped.
 - (b) If necessary, add sealer to ensure a water tight seal.
 - (c) Install previously removed skid strips.
- (6) Repeat spray test to ensure that an effective repair has been made.
- (7) Install headliner.

Ultrasonic Diagnosis and Repair

- (1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

- (2) Remove headliner, if equipped.
- (3) Close all windows, doors and air vents.
- (4) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
 - (a) Place transmitter in vehicle adjacent to suspect area and turn switch on.
 - (b) Slowly pass listener over each luggage rack support post, skid strip or sun roof.
 - (c) Mark any area reading approximately 5 on the meter as an indication of a possible leak.
- (5) Clean suspect area as described above under Bonding Surface Preparation.
- (6) Remove luggage rack support posts, in suspect area, seal wellnuts or screw holes to body using 3M Drip-Chek Sealer, or equivalent. Install support posts.
- (7) Remove luggage rack skid strips, in suspect area, and ensure that all moulding clips are correctly installed, if equipped. Remove sun roof as outlined in Chapter 3L.
 - (a) Replace improperly installed or defective moulding clips.
 - (b) If necessary, add sealer to ensure a water tight seal.
 - (c) Install previously removed skid strips or sun roof.
- (8) Repeat ultrasonic test to ensure that an effective repair has been made.
- (9) Install headliner.

Drip Rail

Spray Diagnosis and Repair

- (1) Drop headliner in suspect area, if equipped.
- (2) Perform the following spray test using guidelines described under Spray Test above.
 - (a) Spray water along drip rail, starting at front of roof.
 - (b) If necessary, repeat spray test on other side of vehicle.
- (3) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.
 - (a) Examine suspect area for small pin holes in drip rail sealer.
 - (b) Apply 3M Drip-Chek Sealer, or equivalent, to drip rail and touch up with matching body color when sealant is dry.
- (4) Repeat spray test to ensure that an effective repair has been made.
- (5) Install headliner, if equipped.

Ultrasonic Diagnosis and Repair

- (1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.
- (2) Remove headliner, if equipped.
- (3) Close all windows, doors and air vents.

- (4) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
 - (a) Place transmitter in vehicle adjacent to suspect area and turn switch on.
 - (b) Slowly pass listener over suspect area.
 - (c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.
- (5) Clean suspect area as described above under Bonding Surface Preparation.
 - (a) Examine drip rail for small pin holes in drip rail sealer.
 - (b) Apply 3M Drip-Chek Sealer, or equivalent, to drip rail and touch up with matching body color when sealant is dry.
- (6) Repeat ultrasonic test to ensure that an effective repair has been made.
- (7) Install headliner, if equipped.

WATER IN REAR PASSENGER COMPARTMENT

Rear Floorpan, Side Sills and Rear Wheelhouse Panels

Water can enter at front floorpan-to-rear floorpan seams due to gaps, distorted panels and/or lack of sealer. Water from these leaks appears on the floorpan or under the rear carpet, if equipped.

Leaks can occur between the side sills or leading edge of rear wheelhouse panels due to excessive gaps and /or lack of sealer at the joints. Water leaks from these joints appears on the floorpan or as wet rear carpet or sound insulation material, if equipped.

Also, leaking rear floorpan plugs will allow water to enter under the carpet and sound insulation material, if equipped.

Spray Diagnosis and Repair

- (1) Remove rear seat, if equipped.
- (2) Remove rear carpet and sound insulation material, if equipped.
- (3) Perform the following spray test using guidelines described under Spray Test above.
 - (a) Spray water from under vehicle at joint of rear floorpan-to-side sill.
 - (b) Next spray across front floorpan-to-rear floorpan seam and towards rear of vehicle at floorpan plugs.
 - (c) Move spray slowly along rear floorpan-to-rear wheelhouse panel seams.
 - (d) Repeat spray test on other side of vehicle.
- (4) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.
- (5) Straighten out distorted panels.
- (6) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.
- (7) Examine suspect area for loose or missing body plugs.

(a) Check that hardened sealer or road dirt is not preventing the plug from seating.

(b) Check the hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(8) Repeat spray test to ensure that an effective repair has been made.

(9) Install sound insulation material and rear carpet, if equipped.

(10) Install rear seat, if equipped.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Remove rear seat, if equipped.

(3) Remove rear carpet and sound insulation material, if equipped.

(4) Close all windows, doors and air vents.

(5) Using Listener Tool, J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle adjacent to suspect area and turn switch on.

(b) Slowly pass listener over each joint, plug and seam.

(c) Mark any area reading approximately 5 on the meter as an indication of a possible leak.

(6) Clean suspect area as described above under Bonding Surface Preparation.

(7) Straighten any distorted panels.

(8) Seal suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(9) Examine suspect area for loose or missing body plugs.

(a) Check for hardened sealer or road dirt preventing plug from seating.

(b) Check hole to be sure that it is not distorted.

(c) If necessary, reshape rear floorpan at plug hole and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Repeat ultrasonic test to ensure that an effective repair has been made.

(11) Install sound insulation material and rear carpet, if equipped.

(12) Install rear seat, if equipped.

Rear Doors and Glass

An improperly adjusted door or defective sealing system will allow water to leak onto the rear carpet or floorpan.

NOTE: Before starting door leak diagnosis, ensure that the door is correctly set within the body opening paying particular attention to the door flushness relative to surrounding surfaces. The mating surfaces of body opening and door rubber sealer must be wiped clean and dry. Also, ensure that the door glass is properly adjusted.

Spray Diagnosis and Repair

Repeat Front Doors and Glass Spray Diagnosis and Repair procedures for the rear doors.

Ultrasonic Diagnosis and Repair

Repeat Front Doors and Glass Ultrasonic Diagnosis and Repair procedures for the rear doors.

Rear Quarter Windows

The stationary and opening rear quarter window seals can leak water that may appear on the rear carpet or floorpan.

NOTE: Before starting rear quarter window leak diagnosis, ensure that the rear quarter windows are properly adjusted.

Spray Diagnosis and Repair

Repeat Rear Quarter Windows Spray Diagnosis and Repair procedures as described under Water on Front or Rear Seats.

Ultrasonic Diagnosis and Repair

Repeat Rear Quarter Windows Ultrasonic Diagnosis and Repair procedures as described under Water on Front or Rear Seats.

WATER IN CARGO AREA

Liftgate and Tailgate

Improperly adjusted liftgate, tailgate or defective sealing system will allow water to leak into the cargo area.

NOTE: Before starting liftgate or tailgate leak diagnosis, ensure that the liftgate or tailgate are correctly set within the body opening. The mating surfaces of body opening and rubber sealer must be wiped clean and dry.

Spray Diagnosis and Repair

(1) Perform the following spray test using guidelines described under Spray Test above.

(a) Start a lower corner of liftgate or tailgate, spray water between lower edge and body panel.

- (b) Move slowly up to top of liftgate, or tailgate.
- (c) Move to opposite lower corner and spray between edge and adjacent body panel.
- (d) Move slowly up to top of liftgate, or tailgate.
- (e) Finally, test top edge to adjacent body panel.

(2) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(3) Examine rubber sealers for damage, distortion or incorrect installation. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3H.

(4) Correct improperly installed rubber sealers as outlined in Chapter 3H.

(5) In instances of leakage from spot weld burn holes, apply 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color when dry.

(6) Repeat spray test to ensure that an effective repair has been made.

Ultrasonic Diagnosis and Repair

(1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.

(2) Close all windows, doors, and air vents.

(3) Using Listener Tool J-23455-01, perform ultrasonic test as follows:

(a) Place transmitter in vehicle cargo compartment, turn switch on.

(b) Slowly pass listener around all edges and sealers.

(c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.

(4) Clean suspect area as described above under Bonding Surface Preparation.

(5) Examine rubber sealers for damage, distortion or incorrect installation. Damaged or distorted rubber sealers should be replaced as outlined in Chapter 3H.

(6) Correct improperly installed rubber sealers as outlined in Chapter 3H.

(7) In instances of leakage from spot weld burn holes, apply 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color when dry.

(8) Repeat ultrasonic test to ensure that an effective repair has been made.

Rear Floorpan, Wheelhouse Panels, Cross Sills, Quarter Panels, Center Panels, and Extensions

Water can enter at the rear floorpan, wheelhouse panels and quarter panel seams due to gaps, distorted panels and/or lack of sealer. Leaks can occur between the rear cross sill, center panel, rear floorpan or extension panels due to excessive gaps and/or lack of sealer.

Water can enter around rear taillamp housings or side marker lamps due to defective sealer/gasket or damaged housings. Also, leaking floorpan plugs will allow water to enter.

The light test, described above, may also be used for finding water leaks in the cargo area.

Spray Diagnosis and Repair

(1) Remove spare tire.

(2) Remove cargo mat and/or carpet and sound insulation material, if equipped.

(3) Remove rear trim panels in suspect area.

(4) Perform the following spray test using guidelines described under Spray Test above.

(a) Spray water from under vehicle at rear floorpan, wheelhouse panels and quarter panel seams.

(b) Next spray water across rear floorpan, cross sill, center panel and extension panel seams.

(c) Also, spray water across rear floorpan and extension panel plugs.

(d) Move spray slowly upwards until water is directed at each wheelhouse panel seam.

(e) Direct spray on lamp housings and coach seams.

(f) Repeat spray test on other side of vehicle.

(5) If leaks are noted, dry out suspect area as described above under Bonding Surface Preparation.

(6) Straighten any distorted panels.

(7) Seal small suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.

(8) Seal large suspect joints or seams using 3M Underseal Rubberized Undercoating, or equivalent.

(9) Examine suspect area for loose or missing body plugs.

(a) Check for hardened sealer or road dirt preventing plug from seating.

(b) Check plug hole to be sure that it is not distorted.

(c) If necessary, reshape floorpan or extension panels locally and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.

(10) Replace damaged or distorted lamp housing gaskets and/or seals. Also, tighten lamp housing attaching hardware.

(11) Seal coach seams with 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color after sealant has dried.

(12) Tighten fuel tank filler neck screws and seal any holes or breaks in gasket and/or sealer with above sealant.

(13) Repeat spray test to ensure that an effective repair has been made.

(14) Install previously removed rear trim panels.

(15) Install sound insulation material, if removed, and cargo mat and/or carpet.

(16) Install spare tire.

Ultrasonic Diagnosis and Repair

- (1) Make sure suspect areas are thoroughly dry. If an opening or hole is full of water, ultrasonic sound will be blocked.
- (2) Remove spare tire.
- (3) Remove cargo mat and/or carpet and sound insulation material, if equipped.
- (4) Remove rear trim panels in suspect area.
- (5) Close all windows, doors and air vents.
- (6) Using Listener Tool J-23455-01, perform ultrasonic test as follows:
 - (a) Place transmitter in cargo compartment, near suspect area, and turn switch on.
 - (b) Slowly pass listener around all suspect joints/seams.
 - (c) Mark any area reading approximately 5 on the meter as a indication of a possible leak.
- (7) Clean suspect area as described above under Bonding Surface Preparation.
- (8) Straighten any distorted panels.
- (9) Seal small suspect joints or seams using 3M All-Around Autobody Sealant, or equivalent.
- (10) Seal large suspect joints or seams using 3M Underseal Rubberized Undercoating, or equivalent.

- (11) Examine suspect area for loose or missing body plugs.
 - (a) Check for hardened sealer or road dirt preventing plug from seating.
 - (b) Check plug hole to be sure that it is not distorted.
 - (c) If necessary, reshape floorpan or extension panels and add a bead of 3M All-Around Autobody Sealant, or equivalent, around hole to ensure a satisfactory water tight seal.
- (12) Replace damaged or distorted lamp housing gaskets and/or seals. Also, tighten lamp housing attaching hardware.
- (13) Seal coach seams with 3M All-Around Autobody Sealant, or equivalent, and touch up with matching body color after sealant has dried.
- (14) Tighten fuel tank filler neck screws and seal any holes or breaks in gasket and/or sealer with 3M All-Around Autobody Sealant, or equivalent.
- (15) Repeat ultrasonic test to ensure that an effective repair has been made.
- (16) Install previously removed rear trim panels.
- (17) Install sound insulation material, if removed, and cargo mat and/or carpet.
- (18) Install spare tire.

INTERIOR WIND NOISES

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GENERAL

A systematic diagnosis is necessary to isolate interior wind noises. The spot where the noise is heard may not be where the trouble really originates. Before proceeding with a noise diagnosis, consider the forces that act on the vehicle to generate wind noise.

Air impacts the windshield and is forced around the A-pillar and along the sides of the vehicle. This air motion causes a low pressure area that moves along with the vehicle near the A-pillar and along the sides of the body.

At the same time, air rammed into the vehicle interior by forward motion enters through the heating and ventilating to build a positive pressure inside the vehicle which tends to force the window glass outward.

To maintain a weather-tight, noise-free seal against these two forces, the doors and glass must be properly maintained and adjusted.

STATIC TEST

Before beginning a static test, visually inspect the fit of the doors, liftgates, tailgates and glass. Proper door,

liftgate, tailgate and glass adjustments will cure most interior wind noise problems. Also, thoroughly inspect all weatherstrips to make sure they are not damaged or incorrectly installed. Correct improperly installed, mis-routed or faulty weatherstrips.

Close all the doors, windows, and vents and turn the blower motor on high. Use a stethoscope to listen for air leakage in the suspected area. If the air leakage appears to be excessive compared with the other side of the vehicle, perform the necessary repairs to correct the air leakage and recheck the repaired area.

Another way to static test the vehicle is to use the Listener Tool J-23455-01. This tool makes use of the fact that ultrasonic energy (high frequency sound) has certain properties that are similar to those of fluids (liquids and gases). Ultrasonic energy does not penetrate solids, such as glass or metal. It is, however, transmitted through cracks and openings, such as those that cause water or air leaks.

An operating ultrasonic generator placed inside vehicle body will fill the vehicle with sound energy. This energy will leak at the same location that permits water

and air leaks. However, if an opening or hole is full of water the ultrasonic sound will be blocked. The water path or opening must be dry.

An ultrasonic generator and detector gun form an ideal combination for determining the location and magnitude of water and air leaks. The ultrasonic leak detector can be used effectively as a diagnostic tool realizing it is not an exact tool and has certain limitations.

To use the Listener, place the tone generator inside the vehicle, close the doors, windows and air vents and listen for the signal in the problem area with the listener. A meter in the listener measures the strength of the signal being received and gives a direct read-out on a dial. This gives an accurate reference point for checking the repair. If the first static test shows a high reading and the after-repairs test shows a low reading, the problem has been repaired.

ROAD TEST

If the wind noise was not located and corrected during the static test, it will be necessary to road test the vehicle. Also, the vehicle should be road tested after repairs are completed to verify that the problem has been corrected. Be prepared to make minor adjustments or repairs on the road test.

Take the following tools and materials on the road test:

- Stethoscope
- Body tape
- Weatherstrip adhesive
- Caulking cord
- Silicone Spray
- Screwdrivers
- Knife
- Small socket wrench set

With the above tools and materials, have an assistant drive the vehicle to the test area. Make sure the test road is dry and smooth as possible. It is difficult to hear wind noise on wet, bumpy roads.

While the assistant drives the vehicle, move the stethoscope slowly along the suspected problem area, and listen for the point where the most noise is coming from. Make sure to test the vehicle with the fresh air vents open, because ram air pressure has an effect on the wind noise level. Also, drive the vehicle in both directions on the test road, as prevailing wind conditions could change the noise level.

After determining where the most noise is coming from, stop the road test and carefully inspect the problem area. If the cause is minor, repair it with the tools and material taken along and retest the vehicle to find out if the repair has worked.

If in doubt that the problem area has been found, cover the suspected area with body tape and continue the road test. If the noise has been eliminated with the body tape, the problem area has been located. However, if the noise continues, apply additional strips of body tape to other areas that may be causing the problem. Continue road testing and applying or removing strips of tape until the wind noise has been isolated.

Many wind noise problems can be satisfactorily repaired while on the road test. However, repair of some of the problems, like aligning a window frame or adjusting a door or window, may require returning to the shop for completion.

DOOR ADJUSTMENTS

Refer to Chapter 3J for detailed procedures on door adjustments.

LIFTGATE-TAILGATE ADJUSTMENTS

Refer to Chapter 3H for detailed procedures on liftgate-tailgate adjustments.

WINDOW ADJUSTMENTS

Refer to Chapter 3J and 3K for detailed procedures on window adjustments.

EXTERIOR WIND WHISTLES

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GENERAL

Noises generated by loose or unseated mouldings, trim, vibrating grille components, etc., can be difficult to diagnose. The most common noise is generally called a "tea kettle" whistle and is usually due to air flowing under instead of around or over a moulding.

ROAD TEST

There is no way to simulate the air flow that makes exterior wind whistles, so a road test is usually necessary. Take along a roll of body tape to help isolate the problem areas when they are located on the road test. It is usually helpful to have an assistant drive the vehicle

or locate the noise. Road test the vehicle with the front windows up and then down, to be sure the noise is coming from outside the vehicle. Also, drive the vehicle in both directions, as the prevailing wind could influence the noise level. Try to determine from which area of the vehicle the wind whistle is coming:

- Grille area
- Hood bezel
- Fender mouldings
- Windshield reveal mouldings
- Luggage rack

When the source of the wind whistle has been found, isolate that component by applying body tape to the suspected area. Retest the temporary repair. If the body tape stops the whistle, align and tighten the moulding/bezel or apply 3M Clear Auto Sealer or equivalent to fill the gap that is causing the whistle.

GRILLE AREA

A process of elimination is the only system to use in locating a wind whistle in the grille area. Make a wind deflector from a piece of cardboard, large enough to cover one-half of the grille area. Tape this deflector to the right front area of the vehicle and road test the vehicle. If the wind whistle is still there, move the deflector to the left front and road test the vehicle. After determining which half of the grille area is causing the wind whistle, apply body tape to all the mouldings and components around the grille opening. Continue road testing the vehicle, progressively remove tape segments until you have isolated the wind whistle. Align and tighten the mouldings or fill the gap with a clear sealer.

FENDER MOULDINGS

Fender mouldings that are not properly aligned or tightly seated to the fender can cause a wind whistle. If

this is the case, apply body tape to the suspected moulding and road test the vehicle. If the wind whistle has been eliminated with the body tape, align and tighten the moulding or fill the gap with a clear sealer.

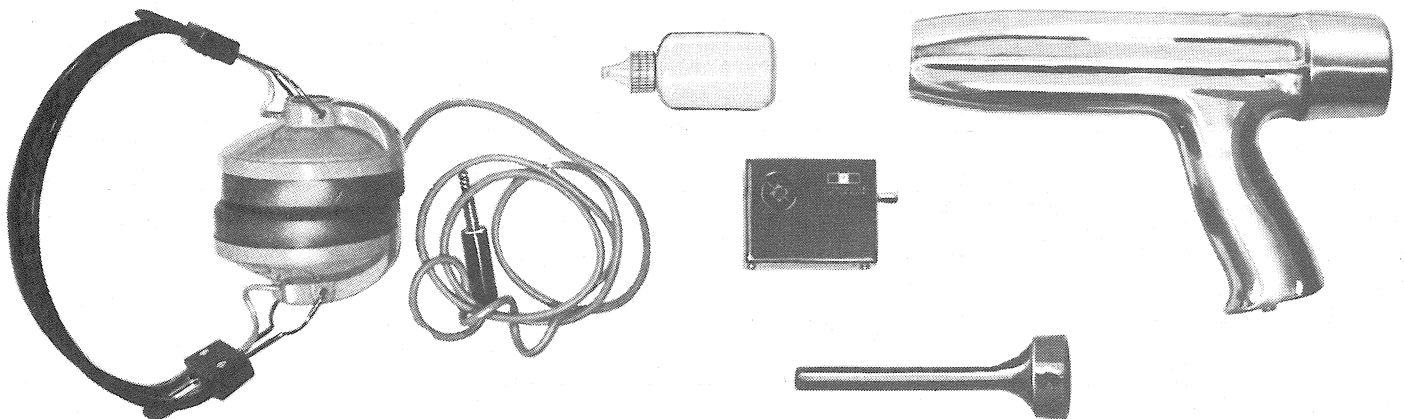
BODY MOULDINGS

Body or windshield reveal mouldings that are not properly aligned or tightly seated can allow air to flow under rather than over them, generating a wind whistle. Apply body tape to the suspected area and road test the vehicle. If the wind whistle is still there, apply additional strips of body tape to the area, until the wind whistle source is located. If a large area has been covered with body tape, continue the road test and progressively remove body tape segments until the wind whistle has been isolated. Align and tighten the moulding or fill the gap with a clear sealer.

LUGGAGE RACKS

Luggage racks present a problem area similar to the grille area covered above. Make a deflector from cardboard, large enough to cover one-half the frontal area of the luggage rack. Tape the deflector to the luggage rack and road test the vehicle. If the wind whistle is still there, move the deflector to the other side and repeat the road test. After determining which side of the luggage rack is causing the wind whistle, apply body tape to all mouldings, supports and rails. Continue the road test and progressively remove tape segments until the wind whistle has been isolated. Align and tighten the mouldings, supports and rails or fill the gap(s) with clear sealer.

Tools



LISTENER
J-23455-01