# WIPER AND WASHER SYSTEMS

CONTENTS



## DESCRIPTION AND OPERATION

### WINDSHIELD WIPER AND WASHER SYSTEM

#### DESCRIPTION

An electrically operated intermittent windshield wiper and washer system is standard factory-installed safety equipment on this model. The driver controls all front and rear wiper and washer system functions with the switches that are integral to the wiper and washer (right multi-function) switch mounted on the right side of the steering column. The windshield wiper and washer systems receive ignition switched battery current through a fuse and a circuit breaker in the junction block, and will operate only when the ignition switch is in the Accessory or On positions.

The intermittent wiper system allows the driver to select from two continuous wiper speeds, five intermittent wipe delay periods or a mist mode. This system also has a wipe-after-wash feature that operates the wipers for as long as the washer pump is energized, then provides about three additional sweeps of the wipers after the washer pump is de-energized. The intermittent wipe mode delay times are speed sensitive. Above about sixteen kilometers-per-hour (ten miles-per-hour) the delay is driver adjustable from about one-half second to about eighteen seconds. Below about sixteen kilometers-per-hour (ten miles-per-hour) the delay times are doubled, from about one second to about thirty-six seconds.

The windshield washer system shares its washer reservoir with the rear washer system, but has its own dedicated washer pump and plumbing. The front washer pump is mounted lower in the reservoir than the rear washer pump so that when the washer fluid level becomes low the front washers will continue to operate after the rear washer pump has run dry. Vehicles equipped with the optional Electronic Vehicle Information Center (VIC) have a low washer fluid warning feature that will give the driver an indication when the washer fluid needs to be replenished.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of Group 8V - Overhead Console Systems for more information on the customer programmable feature options.

A customer programmable feature option affecting the windshield wiper and washer system is: **Head-**

DESCRIPTION AND OPERATION (Continued)

**lamps On With Wipers** - This feature is only available on models that are also equipped with the Auto Headlamps option. If this feature is enabled, the headlamps will turn on automatically when the windshield wipers are turned on; and, if the headlamps were turned on automatically when the wipers were turned on, they will turn off automatically when the wipers are turned off.

The windshield wiper and washer system includes the following components:

- Washer fluid level sensor
- Washer reservoir and pump
- Windshield washer nozzle and plumbing
- Windshield wiper arm and blade
- Windshield wiper motor, linkage and pivot module
- Wiper and washer (right multi-function) switch
- Wiper high/low relay
- Wiper on/off relay.

Certain functions and features of the windshield wiper and washer systems rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect windshield wiper and washer system operation are as follows:

- **Body Control Module (BCM)** - Refer to **Body Control Module** in the Description and Operation section of Group 8E - Instrument Panel Systems for more information.
- **Electronic Vehicle Information Center (EVIC)** - Refer to **Electronic Vehicle Information Center** in the Description and Operation section of Group 8V - Overhead Console Systems for more information.
- **Powertrain Control Module (PCM)** - Refer to **Powertrain Control Module** in the Description and Operation section of Group 14 - Fuel System for more information.

Refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the major components in the windshield wiper and washer systems.

### OPERATION

The vehicle operator selects the desired windshield wiper and washer system functions using the wiper and washer (right multi-function) switch, which is located on the right side of the steering column. The right multi-function switch provides hard wired resistor multiplexed inputs to the BCM for all wiper system functions, except for the high speed wiper motor operation. The high speed wiper motor windings are activated by the wiper high/low relay when the relay control coil is energized through a direct hard wired circuit from the right multi-function switch.

The BCM also is provided with hard wired input from the wiper motor park switch and the windshield washer pump control circuit, along with message inputs received over the PCI data bus from other electronic modules in the vehicle. The BCM uses these inputs and its internal programming to control all other windshield wiper system functions. The BCM controls the low speed wiper motor windings through control outputs to and through the wiper on/off relay. The BCM uses this control of the low speed wiper motor windings to provide the low speed, intermittent, mist, wipe-after-wash and park functions for the windshield wiper system.

The windshield washer system is controlled by a direct hard wired battery current feed from the right multi-function switch to the front washer pump. The BCM monitors this circuit through a hard wired input so that it can provide low speed wiper operation to coincide with washer pump operation and the wipe-after-wash feature.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the windshield wiper and washer systems.

## REAR WIPER AND WASHER SYSTEM

### DESCRIPTION

An electrically operated intermittent rear wiper and washer system is standard factory-installed equipment on this model. The driver controls all front and rear wiper and washer system functions with the switches that are integral to the wiper and washer (right multi-function) switch mounted on the right side of the steering column. The rear wiper and washer systems are controlled by ignition switched battery current through a fuse in the junction block, and will operate only when the ignition switch is in the Accessory or On positions.

The intermittent rear wiper and washer system allows the driver to select from a continuous fixed-cycle wipe or an intermittent wipe mode. This system also has a wipe-after-wash feature that operates the rear wiper for as long as the washer pump is energized, then provides about three additional sweeps of the wiper after the washer pump is de-energized. The intermittent wipe mode delay time has a fixed delay interval of about five to eight seconds between sweeps.

DESCRIPTION AND OPERATION (Continued)

The rear wiper motor module operates on a separate non-switched battery current feed through a fuse in the junction block. The rear wiper motor parks the rear wiper blade off of the glass if the ignition switch has been turned off while the rear wiper blade was still on the glass. The rear wiper motor also monitors the liftgate and liftgate flip-up glass ajar switch circuits, and will park the rear wiper blade off of the glass any time it senses that the liftgate or the liftgate flip-up glass are ajar. These features ensure that the rear wiper blade will not interfere with or be damaged by the operation of the liftgate or liftgate flip-up glass. Refer to **Liftgate Ajar Switch** and **Liftgate Flip-Up Glass Ajar Switch** in the Vehicle Theft Security System section of Group 8Q - Vehicle Theft/Security Systems for more information on these switches.

The rear washer system shares the washer reservoir of the windshield washer system, but has its own dedicated washer pump and plumbing. The front washer pump is mounted lower in the reservoir than the rear washer pump so that when the washer fluid level becomes low the front washers will continue to operate after the rear washer pump has run dry. Vehicles equipped with the optional Electronic Vehicle Information Center (VIC) have a low washer fluid warning feature that will give the driver an indication when the washer fluid needs to be replenished.

The rear wiper and washer system includes the following components:

- Washer reservoir and pump
- Wiper and washer (right multi-function) switch
- Rear washer nozzle and plumbing
- Rear wiper arm and blade
- Rear wiper arm park ramp
- Rear wiper motor module.

Refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the major components in the windshield wiper and washer systems.

### OPERATION

The vehicle operator selects the desired rear wiper and washer system functions using the wiper and washer (right multi-function) switch, which is located on the right side of the steering column. The right multi-function switch provides direct hard wired battery current feeds to the rear wiper module for all rear wiper and washer system functions, and a direct hard wired battery current feed to the rear washer pump for the washer system function.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the rear wiper and washer systems.

## REAR WIPER ARM AND BLADE

### DESCRIPTION

All Grand Cherokee models have a single 30.48 centimeter (12 inch) rear wiper blade with a non-replaceable rubber element (squeegee). The center of the wiper blade has a molded plastic pivot block with an integral latch that is secured in a U-shaped formation on the end of the wiper arm.

The spring-loaded wiper arm features an over-center hinge. The spring tension of the wiper arm controls the pressure applied to the wiper blade on the glass. The over-center hinge allows the blade to stand off of the liftgate for easy snow removal and cleaning of the glass and squeegee.

The rear wiper arm is secured by a nut to the threaded studs of the rear wiper motor output shaft near the base of the liftgate flip-up glass. A molded plastic cap on the end of the wiper arm pivots and snaps over the end of the arm for a neat appearance. When the rear wiper arm is in its park position, an integral molded plastic support in the middle of the arm is positioned on a molded rubber park ramp on the liftgate. The wiper arm support and the park ramp also provide an alignment reference to ensure accurate rear wiper arm and blade installation.

Caution should be exercised to protect the rubber wiper blade squeegee from any petroleum-based cleaners or contaminants, which will rapidly deteriorate the rubber. Also, wiper squeegees exposed to the elements for a long time tend to lose their wiping effectiveness.

Periodic cleaning of the wiper blade squeegee is suggested to remove deposits of salt and road film. The wiper blades, arm, and rear glass should be cleaned with a sponge or cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the squeegee is damaged, worn, or contaminated the wiper blade should be replaced.

The wiper blade and wiper arm are available for service replacement. The wiper arm and wiper blade cannot be adjusted or repaired. If they are faulty or damaged, they must be replaced.

### OPERATION

When the wiper blade is moved back and forth across the rear glass, the rubber squeegee of the wiper blade clears the glass of rain, snow and other materials that can obstruct visibility. The spring loaded hinge of the wiper arm determines the pressure applied to the wiper blade on the glass. The multiple bridge formations of the wiper blade help to distribute the wiper arm spring pressure evenly over the length of the squeegee, and allow the squeegee to conform to the contour of the glass.

DESCRIPTION AND OPERATION (Continued)

## REAR WASHER NOZZLE AND PLUMBING

### DESCRIPTION

The rear washer system plumbing begins at the washer pump near the bottom of the washer reservoir below the left front wheel house extension and between the left inner and outer fenders. The washer reservoir hose is routed from the washer pump up along the washer reservoir filler neck into the engine compartment. Just rearward of the washer reservoir filler neck in the engine compartment an in-line connector joins the hose to the engine compartment hose. The engine compartment hose is routed along the top of the left front fender wheel house to the dash panel. This hose passes through a grommeted hole in the dash panel into the passenger compartment.

Below the instrument panel in the passenger compartment near the left cowl side inner panel, an in-line connector joins the engine compartment hose to the A-pillar hose. The A-pillar hose is routed up the left A-pillar to the headliner. At the headliner, an in-line connector joins the A-pillar hose to the headliner hose. The headliner hose is routed above the headliner and along the left roof side rail to the rear of the vehicle. At the rear of the vehicle, the headliner hose is routed above the headliner and along the upper liftgate opening panel toward the right side of the vehicle. The headliner hose then passes through a grommeted hole in the upper liftgate opening panel and through another grommeted hole into the upper inner liftgate panel to the rear washer nozzle.

The rear washer nozzle is a fluidic type unit that includes an integral check valve. The nozzle has a rubber seal on the back of it and is snapped into a hole in the liftgate outer panel above the liftgate flip-up glass. The washer nozzle is not adjustable. The washer nozzles and hose fittings cannot be repaired and, if faulty or damaged, they must be replaced. The headliner washer hose is integral to the headliner unit and, if faulty or damaged, the headliner unit must be replaced. The remaining hoses for the rear washer system are serviceable.

### OPERATION

Pressurized washer fluid is fed through the washer system plumbing to the rear washer nozzle by the rear washer pump on the washer reservoir. The fluidic rear nozzle helps to disperse a fine and even spray over a wide area of the rear glass. The integral rear washer nozzle check valve prevents the washer fluid from draining from the nozzle back to the reservoir or from leaking out of the nozzle after washer operation is complete.

## REAR WIPER MOTOR MODULE

### DESCRIPTION

The rear wiper motor module is secured with two screws and an integral bracket to two keyed holes in the liftgate inner panel, below the liftgate flip-up glass opening and behind the liftgate trim panel. The motor output shaft passes through the liftgate outer panel where a gasket, bezel and nut seal and secure the output shaft to the liftgate outer panel. A molded plastic nut cover snaps onto the bezel to conceal the nut and improve appearance.

The rear wiper motor module is a self-contained unit. The module contains the wiper motor, transmission, linkage and integral rear wiper system electronic logic and controls. The electronic controls for the motor include an electronic speed control that speeds the wiper blade near the center of the glass, but slows the wiper blade during directional reversals at each end of the wipe pattern and during wiper blade off of the glass parking for quieter operation.

The rear wiper motor module cannot be repaired or adjusted. If faulty or damaged, the entire rear wiper motor module unit must be replaced.

### OPERATION

The rear wiper motor module receives non-switched battery current through a fuse in the junction block and is grounded at all times. The module also receives external control inputs from the wiper and washer (right multi-function) switch and the liftgate/liftgate flip-up glass ajar switch circuits. The rear wiper motor module electronic control logic uses these inputs, its internal inputs and its programming to provide continuous wipe, delay wipe, wipe-after-wash and off of the glass wiper blade parking.

## WASHER FLUID LEVEL SENSOR

### DESCRIPTION

The washer fluid level sensor is mounted near the bottom of the washer reservoir on the forward facing side. A barbed nipple on the sensor is press-fit into a rubber grommet seal installed in the mounting hole on the washer reservoir. The washer fluid level sensor uses a pivoting float to monitor the fluid level in the washer reservoir. The pivoting float opens and closes the switch contacts in the sensor.

The washer fluid level sensor cannot be adjusted or repaired and, if faulty or damaged, the sensor unit must be replaced.

### OPERATION

The washer fluid level sensor is hard wired directly to the Body Control Module (BCM). The BCM sends

DESCRIPTION AND OPERATION (Continued)

five volts to the sensor on a single circuit. When the washer fluid level is at or above the float level in the reservoir, the internal switch contacts of the sensor are open. When the washer fluid level in the reservoir falls below the float of the sensor, the float changes position and closes the internal switch contacts of the sensor to ground.

When the BCM senses ground on the circuit, it is programmed to send low washer fluid messages to the Electronic Vehicle Information Center (EVIC) over the Programmable Communications Interface (PCI) data bus. The EVIC is programmed to respond to this message by displaying the Washer Fluid Low warning and sending a chime request message back to the BCM over the PCI data bus. Then the BCM generates an audible chime tone warning.

## WASHER RESERVOIR AND PUMP

### DESCRIPTION

A single washer fluid reservoir is used for both the windshield and rear washer systems. The washer fluid reservoir is concealed behind the inner fender liner ahead of the left front wheel. The reservoir is secured to the inner fender shield, between the inner and outer fender panels. The washer reservoir filler neck extends upward through a hole in the left front wheelhouse extension into the engine compartment. The washer fluid reservoir has a snap-fit filler cap with a rubber seal. The cap hinges on and is secured to a molded-in hook formation on the rear of the reservoir filler neck. The reservoir also has a provision for a washer fluid level sensor on the forward facing side of the reservoir body.

Each of the two washer pump and motor units has a permanently lubricated and sealed motor coupled to a rotor-type pump. The two washer pump and motor units have a barbed nipple on the inlet side of the pump, which is installed through a rubber grommet seal inserted in a hole near the bottom of the outboard side of the washer reservoir. A smaller barbed nipple on the outlet side of the pump is connected to the washer hose.

Both the washer reservoir and the washer pump and motor units cannot be repaired. If they are faulty or damaged, they must be replaced. The washer reservoir, the grommet seals, the filler cap and the two washer pump and motor units are all available for service replacement.

### OPERATION

Washer fluid is gravity-fed from the washer reservoir to the washer pump inlet. One brush of the washer pump motor is grounded at all times. When the washer switch is actuated, battery current is provided to the other brush, energizing the washer pump motor. When the washer pump motor is energized, it spins the pump rotor which pressurizes the washer fluid and forces it out the pump outlet nipple and through the washer plumbing to the washer nozzle(s).

## WINDSHIELD WASHER NOZZLE AND PLUMBING

### DESCRIPTION

The windshield washer system plumbing begins at the washer pump near the bottom of the washer reservoir below the left front wheel house extension and between the left inner and outer fenders. The washer reservoir hose is routed from the washer pump up along the washer reservoir filler neck into the engine compartment. Just rearward of the washer reservoir filler neck in the engine compartment an in-line connector joins the hose to the engine compartment hose. The engine compartment hose is routed along the top of the left front fender wheel house to the plenum panel. This hose passes through a grommeted hole in the plenum panel into the cowl plenum.

On the left side of the cowl plenum, an in-line connector joins the engine compartment hose to the cowl grille cover hose. The cowl grille cover hose is routed through routing clips on the underside of the cowl grille cover to a wye fitting. The cowl grille cover hose is connected to one nipple on the wye fitting and the two washer nozzle hoses are connected to the other two wye fitting nipples. The washer nozzle hoses are routed along the underside of the cowl grille cover to the two washer nozzles.

The two windshield washer nozzles are fluidic type units. The nozzles are snapped into holes in the cowl grille cover near the base of the windshield. The washer nozzles are not adjustable. The wye fitting contains an integral check valve. The washer nozzles, wye fitting and hose fittings cannot be repaired and, if faulty or damaged, they must be replaced. The washer hoses for the windshield washer system are serviceable.

### OPERATION

Pressurized washer fluid is fed through the washer system plumbing to the windshield washer nozzles by the front washer pump on the washer reservoir. The fluidic washer nozzles help to disperse a fine and even spray over a wide area of the windshield glass. The integral wye fitting check valve prevents the washer fluid from draining from the nozzles back to the reservoir or from leaking out of the nozzles after washer operation is complete.

DESCRIPTION AND OPERATION (Continued)

## WINDSHIELD WIPER ARM AND BLADE

### DESCRIPTION

All Grand Cherokee models have two 50.8 centimeter (20 inch) long windshield wiper blades with non-replaceable rubber elements (squeegees). The center of the wiper blade has a molded plastic pivot block with an integral latch that is secured in a U-shaped formation on the end of the wiper arm.

The spring-loaded wiper arms feature over-center hinges. The spring tension of the wiper arm controls the pressure applied to the wiper blade on the glass. The over-center hinges allow the blades to stand off of the glass for easy snow removal and cleaning of the glass and squeegees.

The windshield wiper arms are secured by a nut to the threaded studs on the two wiper pivots near the base of the windshield. A molded plastic cap fits over the nut for a neat appearance. Alignment marks molded into the windshield near the base of the glass ensure accurate wiper arm and blade installation.

Caution should be exercised to protect the rubber wiper blade squeegees from any petroleum-based cleaners or contaminants, which will rapidly deteriorate the rubber. Also, wiper squeegees exposed to the elements for a long time tend to lose their wiping effectiveness.

Periodic cleaning of the wiper blade squeegees is suggested to remove deposits of salt and road film. The wiper blades, arms, and windshield glass should be cleaned with a sponge or cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the squeegees are damaged, worn, or contaminated the wiper blades should be replaced.

The wiper blades and wiper arms are available for service replacement. The wiper arms and wiper blades cannot be adjusted or repaired. If they are faulty or damaged, they must be replaced.

### OPERATION

When the wiper blades are moved back and forth across the windshield glass, the rubber squeegees of the wiper blade clear the glass of rain, snow and other materials that can obstruct visibility. The spring loaded hinges of the wiper arms determine the pressure applied to the wiper blade on the glass. The multiple bridge formations of the wiper blade help to distribute the wiper arm spring pressure evenly over the length of the squeegee, and allow the squeegee to conform to the contour of the glass.

## WINDSHIELD WIPER MOTOR, PIVOT AND LINKAGE MODULE

### DESCRIPTION

The windshield wiper motor, pivot and linkage module is secured with four screws through rubber isolators to the cowl plenum panel beneath the cowl plenum cover/grille panel. The two-speed permanent magnet windshield wiper motor has an integral transmission and park switch. The park switch opens and closes as the wiper motor operates. When the wipers are up off the base of the windshield, the park switch is closed; and, when the wipers are near the base of the windshield (parked), the park switch is open. The wiper motor is secured below the center of the module bracket with three screws. The wiper motor output shaft passes through a clearance hole, where a nut secures the wiper motor crank arm to the motor output shaft above the module bracket.

The two wiper pivots are secured at the ends of the module bracket. The two wiper pivot lever arms and the wiper motor crank arm each have ball studs on their ends. The motor crank arm ball stud is the longer of the three. Two drive links connect the motor crank arm to the pivot lever arms. The passenger side drive link has a plastic socket-type bushing on each end. The driver side drive link has a plastic socket-type bushing on one end, and a plastic sleeve-type bushing on the other end. The socket-type bushing on one end of each drive link is snap-fit over the ball stud on the lever arm of its respective pivot. The driver side drive link sleeve-type bushing end is then fit over the motor crank arm ball stud, and the other socket-type bushing of the passenger side drive link is snap-fit over the exposed end of the motor crank arm ball stud.

The wiper motor, pivots, linkage, bushings, motor crank arm and mounting bracket are only serviced as a complete unit. If any part of this unit is faulty or damaged, the entire wiper motor pivot and linkage module must be replaced.

### OPERATION

The windshield wiper motor speed is controlled by current flow to the proper set of brushes. When the wiper motor is turned on, the park switch provides the Body Control Module (BCM) with a pulse signal that allows the BCM wiper system logic to monitor the number and frequency of the wipe cycles. When the wiper motor is turned off, the closed park switch (wipers up) provides battery voltage to the wiper motor until the park switch opens (wipers down or parked). The wiper motor crank arm, linkage and pivots convert the rotary action of the wiper motor output shaft to the back and forth wiping motion of the wiper arms and blades.

DESCRIPTION AND OPERATION (Continued)

## WIPER SWITCH AND WASHER SWITCH

### DESCRIPTION

All of the windshield and rear wiper and washer system switches are integral to the right (wiper) multi-function switch unit, which is secured to the right side of the multi-function switch mounting housing at the top of the steering column (Fig. 1). The only visible part of the right multi-function switch is the control stalk that extends from the right side of the steering column. The right multi-function switch control stalk has both nomenclature and international control symbols on it, which identify its many functions. The remainder of the right multi-function switch is concealed beneath the steering column shrouds.

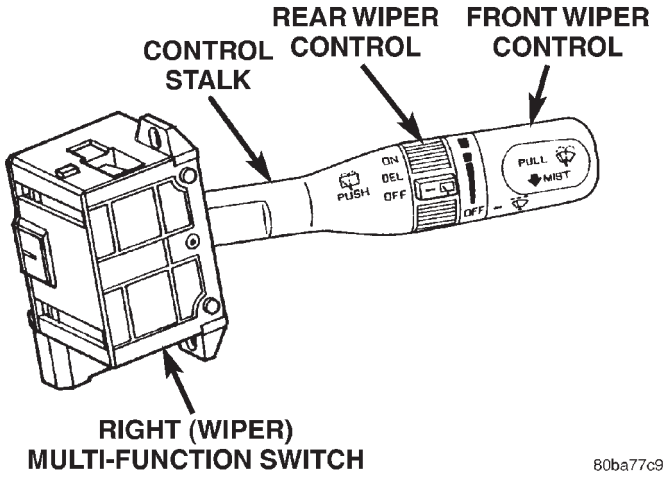



*Fig. 1 Right (Wiper) Multi-Function Switch*

The wiper and washer system switches cannot be repaired. If these switches or any other circuit or component of the right multi-function switch unit is faulty or damaged, the entire right multi-function switch unit must be replaced.

### OPERATION

A rotary switch knob on the end of the right multi-function switch control stalk is rotated to select the desired windshield wiper continuous speed setting or one of five intermittent wipe mode delay intervals. The control stalk is pulled toward the driver to activate the windshield washer system. The control stalk is moved downward to activate the windshield wiper mist function.

A rotary switch ring on the right multi-function switch stalk just below the windshield wiper switch knob controls the rear wiper system functions. The switch ring is rotated to select the rear wiper delay or continuous wipe modes. The control stalk is pushed away from the driver, toward the instrument panel to activate the rear washer system.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the wiper and washer (right multi-function) switches.

## WIPER HIGH/LOW RELAY

### DESCRIPTION

The wiper high/low relay is a electromechanical device that switches battery current from the wiper motor low speed coil windings to the high speed coil windings when the wiper and washer (right multi-function) switch grounds the relay coil. The wiper high/low relay is located in the Power Distribution Center (PDC) in the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for wiper high/low relay identification and location.

The wiper high/low relay is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The wiper high/low relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

### OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

## WIPER ON/OFF RELAY

### DESCRIPTION

The wiper on/off relay is a electromechanical device that switches battery current to the wiper high/low relay when the Body Control Module (BCM) grounds the relay coil. The wiper on/off relay is located in the

DESCRIPTION AND OPERATION (Continued)

Power Distribution Center (PDC) in the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for wiper on/off relay identification and location.

The wiper on/off relay is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The wiper on/off relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

### OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

## DIAGNOSIS AND TESTING

### WINDSHIELD WIPER SYSTEM

Following are tests that will help to diagnose the hard wired components and circuits of the windshield wiper system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the windshield wiper system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the windshield wiper system components must be checked.

The most reliable, efficient, and accurate means to diagnose the windshield wiper system requires the use of a DRB scan tool and the proper Diagnostic Procedures manual. The DRB scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the wiper on/off and wiper high/low relays are being sent the proper hard wired outputs by the Body Control Module (BCM) for them to perform their windshield wiper system functions.

For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Check the fused ignition switch output (run/accessory) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/accessory) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run/accessory) circuit to the ignition switch as required.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector from the wiper and washer (right multi-function) switch connector receptacle. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output circuit cavity of the instrument panel wire harness connector for the wiper and washer switch. If OK, go to Step 4. If not OK, repair the open circuit to the junction block fuse as required.

(4) Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM). Check for continuity between the windshield wiper switch return circuit cavity of the instrument panel wire harness connector for the wiper and washer switch and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted windshield wiper switch return circuit to the BCM as required.

(5) Check for continuity between the windshield wiper switch return circuit cavities of the instrument panel wire harness connector for the wiper and washer switch and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, go to Step 6. If not OK, repair the open windshield wiper switch return circuit to the BCM as required.

(6) Check for continuity between the windshield wiper switch mux circuit cavity of the instrument

DIAGNOSIS AND TESTING (Continued)

panel wire harness connector for the wiper and washer switch and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the shorted windshield wiper switch mux circuit to the BCM as required.

(7) Check for continuity between the windshield wiper switch mux circuit cavities of the instrument panel wire harness connector for the wiper and washer switch and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, reconnect the 22-way instrument panel wire harness connector to the BCM connector receptacle and go to Step 8. If not OK, repair the open windshield wiper switch mux circuit to the BCM as required.

(8) Refer to **Wiper and Washer Switch** in the Diagnosis and Testing section of this group. If the wiper and washer switch tests OK, reconnect the instrument panel wire harness connector to the wiper and washer switch connector receptacle and go to Step 9. If the wiper and washer switch does not test OK, replace the faulty wiper and washer switch.

(9) If the problem being diagnosed is that the wiper blades do not park, but all other functions are OK, go to Step 10. If the problem being diagnosed is that the wipers will operate in low speed when an intermittent delay is selected and the wiper blades do not park, go to Step 11. If the problem being diagnosed is no wiper operation in any mode, go to Step 14. If the problem being diagnosed is that the wipers will not operate in high speed, go to Step 18.

(10) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Backprobe the fused ignition switch output (V6) circuit cavity of the left headlamp and dash wire harness connector at the windshield wiper motor. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage. If OK, go to Step 11. If not OK, repair the open fused ignition switch output (V6) circuit to the junction block wiper system circuit breaker as required.

(11) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector from the windshield wiper motor connector receptacle. Disconnect the 52-way (C2) instrument panel wire harness connector from the junction block connector receptacle. Check for continuity between the wiper park switch sense circuit cavity of the left headlamp and dash wire harness connector for the windshield wiper motor and a good ground. There should be no continuity. If OK, go to Step 12. If not OK, repair the shorted wiper park switch sense circuit as required.

(12) Check for continuity between the wiper park switch sense circuit cavities of the left headlamp and dash wire harness connector for the windshield wiper motor and the 52-way (C2) instrument panel wire harness connector for the junction block. There should be continuity. If OK reconnect the 52-way (C2) instrument panel wire harness connector to the junction block connector receptacle and go to Step 13. If not OK, repair the open wiper park switch sense circuit as required.

(13) Reconnect the left headlamp and dash wire harness connector to the windshield wiper motor connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. Backprobe the wiper park switch sense circuit cavity of the left headlamp and dash wire harness connector at the windshield wiper motor. Check for battery voltage. With the wiper switch in the Low or High position, the meter should switch between battery voltage and zero volts. Turn the wiper switch to the Off position and the meter should read battery voltage until the wiper blades park, and then read a steady zero volts. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to diagnose the BCM. If not OK, replace the faulty windshield wiper motor.

(14) Backprobe the ground circuit cavity of the left headlamp and dash wire harness connector at the windshield wiper motor. Check for continuity to a good ground. There should be continuity. If OK, go to Step 15. If not OK, repair the open ground circuit to ground as required.

(15) Remove the wiper system circuit breaker from the junction block. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/accessory) cavity for the wiper system circuit breaker in the junction block. If OK, go to Step 16. If not OK, repair the open fused ignition switch output (run/accessory) circuit to the ignition switch as required.

(16) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Install the wiper system circuit breaker in the junction block. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (V6) circuit cavity for the wiper system circuit breaker in the junction block. If OK, go to Step 17. If not OK, replace the faulty wiper system circuit breaker.

(17) Refer to **Wiper On/Off Relay** in the Diagnosis and Testing section of this group. If the wiper on/off relay tests OK, go to Step 18. If the wiper on/off relay does not test OK, replace the faulty wiper on/off relay.

(18) Refer to **Wiper High/Low Relay** in the Diagnosis and Testing section of this group. If the wiper

DIAGNOSIS AND TESTING (Continued)

high/low relay tests OK, replace the faulty windshield wiper motor. If the wiper on/off relay does not test OK, replace the faulty wiper high/low relay.

## REAR WIPER SYSTEM

For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Check that the interior lighting switch on the control stalk of the left multi-function switch is not in the dome lamp disable position. Open the liftgate. The interior lamps should light. Close all four doors, the liftgate and the liftgate flip-up glass. Note whether the interior lamps remain lighted. They should turn off after about thirty seconds. If OK, go to Step 2. If not OK, go to Step 9.

(2) Check the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(3) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(4) Check the fused ignition switch output (run/accessory) fuse in the junction block. If OK, go to Step 5. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(5) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/accessory) fuse in the junction block. If OK, turn the ignition switch to the Off position and go to Step 6. If not OK, repair the open fused ignition switch output (run/accessory) circuit to the ignition switch as required.

(6) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector from the wiper and washer (right multi-function) switch connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/accessory) circuit cavity of the instrument panel wire harness connector for the wiper and washer switch. If OK, go to Step 7. If not OK, repair the open fused ignition switch output (run/accessory) circuit to the junction block fuse as required.

(7) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Refer to **Wiper and Washer Switch** in the Diagnosis and Testing section of this group. If the wiper and washer switch tests OK, reconnect the instrument panel wire harness connector to the wiper and washer switch connector receptacle and go to Step 8. If the wiper and washer switch does not test OK, replace the faulty wiper and washer switch.

(8) Remove the liftgate inner trim panel. Disconnect the liftgate wire harness connector from the rear wiper motor module connector receptacle. Check for continuity between the ground circuit cavity of the liftgate wire harness connector for the rear wiper motor module and a good ground. There should be continuity. If OK, go to Step 9. If not OK, repair the open ground circuit to ground as required.

(9) Check for continuity between the liftgate ajar switch sense circuit cavity of the liftgate wire harness connector for the rear wiper motor module and a good ground. There should be continuity with the liftgate and/or the liftgate flip-up glass open, and no continuity with the liftgate and the liftgate flip-up glass closed. If OK, go to Step 10. If not OK, repair the liftgate and/or the liftgate flip-up glass ajar circuits as required.

(10) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the liftgate wire harness connector for the rear wiper motor module. If OK, go to Step 11. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

(11) Turn the ignition switch to the On position. Turn the rear wiper switch to the Delay position. Check for battery voltage at the rear wiper motor intermittent control circuit cavity of the liftgate wire harness connector for the rear wiper motor module. If OK, go to Step 12. If not OK, repair the open rear wiper motor intermittent control circuit to the wiper and washer switch as required.

(12) Turn the rear wiper switch to the On position. Check for battery voltage at the rear wiper motor control circuit cavity of the liftgate wire harness connector for the rear wiper motor module. If OK, replace the faulty rear wiper motor module. If not OK, repair the open rear wiper motor control circuit to the wiper and washer switch as required.

## WASHER SYSTEM

### WINDSHIELD

The diagnosis found here addresses an inoperative windshield washer system or wipe-after-wash feature. If the washer pump operates, but no washer fluid is emitted from the washer nozzles, be certain to check the fluid level in the reservoir. Check for ice

DIAGNOSIS AND TESTING (Continued)

or other foreign material in the reservoir, and for pinched, disconnected, broken, or incorrectly routed washer system plumbing. For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Turn the ignition switch to the On position. Turn the windshield wiper switch to the Low or High speed position. Check whether the windshield wipers operate. If OK, go to Step 2. If not OK, refer to **Windshield Wiper System** in the Diagnosis and Testing section of this group.

(2) Turn the wiper switch to the Off position. Actuate the windshield washer switch. The washer pump should operate and the windshield wipers should operate for about three sweep cycles after the switch is released before they park. If the wipers are OK, but the washers are not, go to Step 3. If the washers are OK, but the wipers are not, go to Step 5.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector from the front washer pump connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the front washer pump and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Reconnect the battery negative cable. Turn the ignition switch to the On position. With the windshield washer switch activated, check for battery voltage at the washer pump control switch output circuit cavity of the left headlamp and dash wire harness connector for the front washer pump. If OK, replace the faulty washer pump. If not OK, repair the open washer pump control switch output circuit to the wiper and washer (right multi-function) switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. With the windshield washer switch activated, check for battery voltage at the washer pump control switch output circuit cavity of the 22-way instrument panel wire harness connector for the BCM. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to diagnose the BCM. If not OK, repair the open washer pump control switch output circuit to the wiper and washer (right multi-function) switch as required.

## REAR

The diagnosis found here addresses an inoperative rear washer system. If the washer pump operates, but no washer fluid is emitted from the washer nozzles, be certain to check the fluid level in the reservoir. Check for ice or other foreign material in the reservoir, and for pinched, disconnected, broken, or incorrectly routed washer system plumbing. For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Turn the ignition switch to the On position. Turn the rear wiper switch to the On position. Check whether the rear wiper system is operating. If OK, go to Step 2. If not OK, refer to **Rear Wiper System** in the Diagnosis and Testing section of this group.

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector from the rear washer pump connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit to ground as required.

(3) Connect the battery negative cable. Turn the ignition switch to the On position. With the rear washer switch actuated, check for battery voltage at the rear washer motor control circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump. If OK, replace the faulty rear washer pump. If not OK, repair the open rear washer motor control circuit to the wiper and washer (right multi-function) switch as required.

DIAGNOSIS AND TESTING (Continued)

## WIPER AND WASHER SWITCH

The windshield and rear wiper switches and the windshield and rear washer switches are integral to the right multi-function switch. Refer to **Windshield Wiper System** or **Rear Wiper System** in the Diagnosis and Testing section of this group before testing the right multi-function switch. For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the instrument panel wire harness connector from the right multi-function switch connector receptacle.

(3) Using an ohmmeter, perform the continuity and resistance tests at the terminals in the switch connector receptacle as shown in the Right Multi-Function Switch Test chart (Fig. 2).

(4) If the right multi-function switch fails any of the continuity or resistance tests, replace the faulty right multi-function switch unit as required.

## WIPER HIGH/LOW RELAY

The wiper high/low relay (Fig. 3) is located in the Power Distribution Center (PDC) between the battery and the fender on the right side of the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for wiper high/low relay identification and location. For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

(1) Remove the wiper high/low relay from the PDC. Refer to **Wiper Relays** in the Removal and Installation section of this group for the procedures.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

### RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to the common feed terminal of the wiper on/off relay. When the wiper high/low relay is de-energized, this terminal connects the wiper on/off relay output circuit to the windshield wiper motor low speed coil. When the wiper high/low relay is energized, this terminal connects the wiper on/off relay output circuit to the windshield wiper motor high speed coil. There should be continuity between the cavity for terminal 30 of the wiper high/low relay and the cavity for terminal 30 of the wiper on/off relay at all times. If OK, go to Step 2. If not OK, repair the open wiper on/off relay output circuit to the common feed terminal cavity for the wiper on/off relay in the PDC as required.

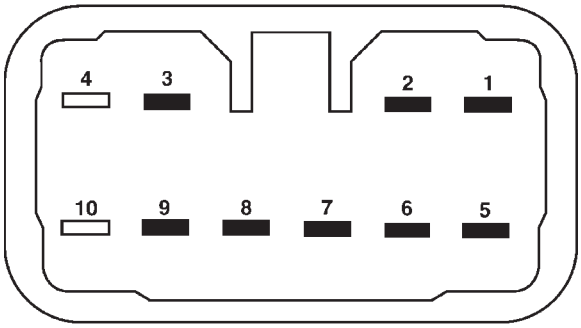
(2) The relay normally closed terminal (87A) is connected to the wiper high/low relay low speed output circuit. There should be continuity between the cavity for terminal 87A of the wiper high/low relay and the wiper high/low relay low speed output circuit terminal cavity of the windshield wiper motor connector at all times. If OK, go to Step 3. If not OK, repair the open wiper high/low relay low speed output circuit to the windshield wiper motor as required.

(3) The relay normally open terminal (87) is connected to the wiper high/low relay high speed output circuit. There should be continuity between the cavity for terminal 87 of the wiper high/low relay and the wiper high/low relay high speed output circuit terminal cavity of the windshield wiper motor connector at all times. If OK, go to Step 4. If not OK, repair the open wiper high/low relay high speed output circuit to the windshield wiper motor as required.

(4) The coil battery terminal (86) is connected to the wiper high/low relay control circuit. There should be battery voltage at the cavity for terminal 86 of the wiper high/low relay when the ignition switch is in the On or Accessory positions and the wiper switch is in the High position. If OK, go to Step 5. If not OK, repair the open wiper high/low relay control circuit to the wiper and washer (right multi-function) switch as required.

(5) The coil ground terminal (85) is connected to the ground circuit and should be grounded at all times. Check for continuity between the cavity for terminal 85 of the wiper high/low relay and a good ground. If OK, refer to **Wiper On/Off Relay** in the Diagnosis and Testing section of this group. If not OK, repair the open ground circuit to ground as required.

DIAGNOSIS AND TESTING (Continued)




| RIGHT (WIPER) MULTI-FUNCTION SWITCH | | | |
|---|---|---|---|
| FRONT WIPERS SWITCH TESTS | | | |
| SWITCH POSITION | CONTINUITY BETWEEN | RESISTANCE BETWEEN | RESISTANCE RANGE (OHMS) |
| Off | — | Pins 7 & 8 | 4286-4379 |
| Intermittent Wipe Position 1 | — | Pins 7 & 8 | 1445-1480 |
| Intermittent Wipe Position 2 | — | Pins 7 & 8 | 847- 870 |
| Intermittent Wipe Position 3 | — | Pins 7 & 8 | 556- 573 |
| Intermittent Wipe Position 4 | — | Pins 7 & 8 | 367- 380 |
| Intermittent Wipe Position 5 | — | Pins 7 & 8 | 218-229 |
| Low Speed | — | Pins 7 & 8 | 99-106 |
| High Speed | Pins 1 & 9 | Pins 7 & 8 | 99-106 |
| Mist | — | Pins 7 & 8 | 49-56 |
| Wash | Pins 1 & 3 | — | — |

| REAR WIPER SWITCH TESTS | | | |
|---|---|---|---|
| SWITCH POSITION | CONTINUITY BETWEEN | RESISTANCE BETWEEN | RESISTANCE RANGE (OHMS) |
| Off | — | — | — |
| Delay | Pins 1 & 6 | — | — |
| On | Pins 1 & 5 | — | — |
| Wash | Pins 1 & 5 & 6 | — | — |

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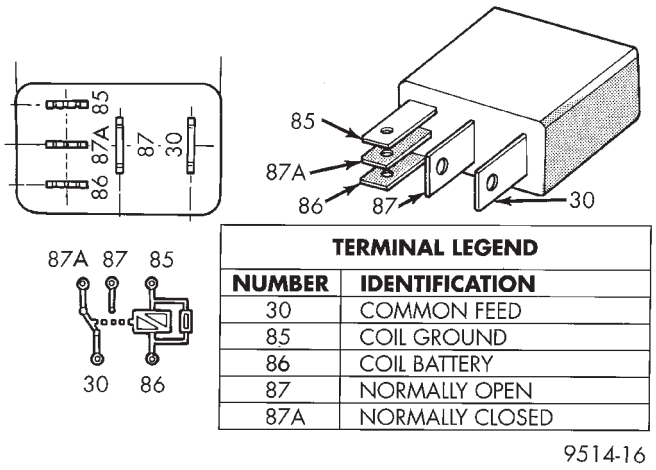
*Fig. 2 Right Multi-Function Switch Test*

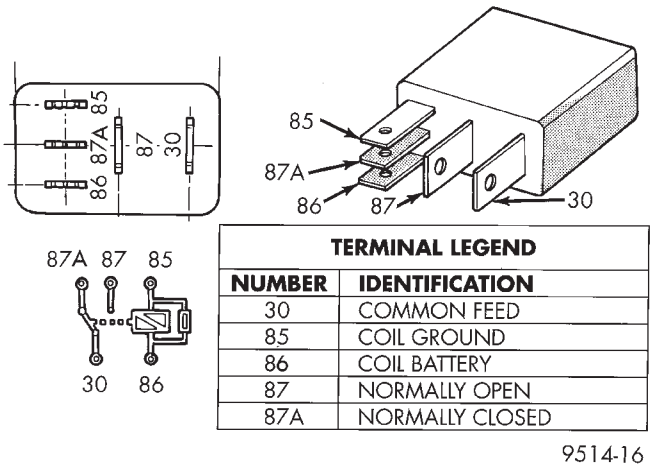
DIAGNOSIS AND TESTING (Continued)




| TERMINAL LEGEND | |
|---|---|
| NUMBER | IDENTIFICATION |
| 30 | COMMON FEED |
| 85 | COIL GROUND |
| 86 | COIL BATTERY |
| 87 | NORMALLY OPEN |
| 87A | NORMALLY CLOSED |

9514-16

*Fig. 3 Wiper High/Low Relay*




| TERMINAL LEGEND | |
|---|---|
| NUMBER | IDENTIFICATION |
| 30 | COMMON FEED |
| 85 | COIL GROUND |
| 86 | COIL BATTERY |
| 87 | NORMALLY OPEN |
| 87A | NORMALLY CLOSED |

9514-16

*Fig. 4 Wiper On/Off Relay*

## WIPER ON/OFF RELAY

The wiper on/off relay (Fig. 4) is located in the Power Distribution Center (PDC) between the battery and the fender on the right side of the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for wiper on/off relay identification and location. For complete circuit diagrams, refer to **Wipers** in the Contents of Group 8W - Wiring Diagrams.

(1) Remove the wiper on/off relay from the PDC. Refer to **Wiper Relays** in the Removal and Installation section of this group for the procedures.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

## RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to the common feed terminal of the wiper high/low relay. When the wiper on/off relay is de-energized, this terminal connects the wiper park switch sense circuit to the wiper high/low relay. When the wiper on/off relay is energized, this terminal connects the fused ignition switch output from the wiper system circuit breaker to the wiper high/low relay. There should be continuity between the cavity for terminal 30 of the wiper on/off relay and the cavity for terminal 30 of the wiper high/low relay at all times. If OK, go to Step 2. If not OK, repair the open wiper on/off relay output circuit to the common feed terminal cavity for the wiper high/low relay in the PDC as required.

(2) The relay normally closed terminal (87A) is connected to the wiper park switch sense circuit. There should be continuity between the cavity for terminal 87A of the wiper on/off relay and the wiper park switch sense circuit cavity of the windshield wiper motor connector at all times. If OK, go to Step 3. If not OK, repair the open wiper park switch sense circuit to the windshield wiper motor as required.

(3) The relay normally open terminal (87) is connected to the fused ignition switch output circuit. There should be battery voltage at the cavity for terminal 87 of the wiper on/off relay when the ignition switch is in the On or Accessory positions. If OK, go to Step 4. If not OK, repair the open fused ignition switch output circuit to the wiper system circuit breaker in the junction block as required.

(4) The coil battery terminal (86) is also connected to the fused ignition switch output circuit. There should be battery voltage at the cavity for terminal 86 of the wiper on/off relay when the ignition switch is in the On or Accessory positions. If OK, go to Step 5. If not OK, repair the open fused ignition switch output circuit to the wiper system circuit breaker in the junction block as required.

(5) The coil ground terminal (85) is connected to the wiper on/off relay control circuit. It is grounded by the Body Control Module (BCM) to energize the wiper on/off relay. There should be continuity between the cavity for terminal 85 of the wiper on/off relay and the wiper on/off relay control circuit cavity of the 26-way instrument panel wire harness connector for the BCM at all times. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to diagnose the BCM. If not OK, repair the open wiper on/off relay control circuit to the BCM as required.

## REMOVAL AND INSTALLATION

### WIPER BLADE

### REMOVAL

#### WINDSHIELD

(1) Lift the wiper arm and blade off of the windshield glass until the wiper arm hinge is in its over-center position.

(2) Depress the latch release tab located on the bottom of the plastic wiper blade pivot block near the center of the blade and at the end of the wiper arm (Fig. 5).

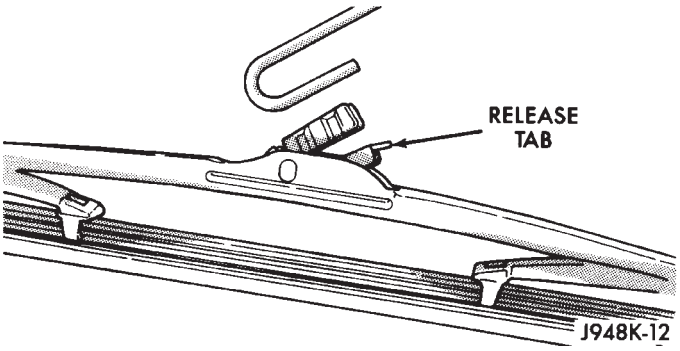



*Fig. 5 Wiper Blade Remove/Install - Typical*

(3) Slide the wiper blade down the wiper arm towards the wiper pivot at the base of the windshield.

(4) Push the lower end of the wiper blade away from the underside of the wiper arm far enough for the plastic wiper blade pivot block to clear the hook formation on the end of the arm.

(5) Disengage the wiper blade from the wiper arm.

#### REAR

(1) Disengage the rear wiper arm support from the rubber rear wiper arm park ramp on the right side of the liftgate just below the flip-up glass.

(2) Lift the wiper arm and blade away from the liftgate until the wiper arm hinge is in its over-center position.

(3) Depress the latch release tab located on the bottom of the plastic wiper blade pivot block near the center of the blade and at the end of the wiper arm (Fig. 5).

(4) Slide the wiper blade down the wiper arm towards the rear wiper motor output shaft below the center of the liftgate flip-up glass.

(5) Push the lower end of the wiper blade away from the underside of the wiper arm far enough for the plastic wiper blade pivot block to clear the hook formation on the end of the arm.

(6) Disengage the wiper blade from the wiper arm.

### INSTALLATION

#### WINDSHIELD

(1) Position the wiper blade to the underside of the wiper arm.

**NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.**

(2) Engage the wiper blade pivot block with the hook formation on the end of the wiper arm.

(3) Slide the wiper blade up the wiper arm towards the hook formation until the plastic pivot block latch has fully engaged. Latch engagement will be accompanied by an audible click.

(4) Lower the wiper arm and blade gently onto the windshield glass.

#### REAR

(1) Position the wiper blade to the underside of the wiper arm.

**NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the rear wiper motor output shaft.**

(2) Engage the wiper blade pivot block with the hook formation on the end of the wiper arm.

(3) Slide the wiper blade up the wiper arm towards the hook formation until the plastic pivot block latch has fully engaged. Latch engagement will be accompanied by an audible click.

(4) Lower the wiper arm and blade gently onto the liftgate rear wiper arm park ramp.

### WIPER ARM

### REMOVAL

#### WINDSHIELD

(1) Carefully pry the plastic nut cap off of the pivot end of the wiper arm (Fig. 6).

(2) Remove the nut that secures the wiper arm to the wiper pivot shaft.

(3) Use a battery terminal puller to disengage the wiper arm from the wiper pivot shaft splines (Fig. 7).

(4) Remove the wiper arm and blade from the base of the windshield.

REMOVAL AND INSTALLATION (Continued)

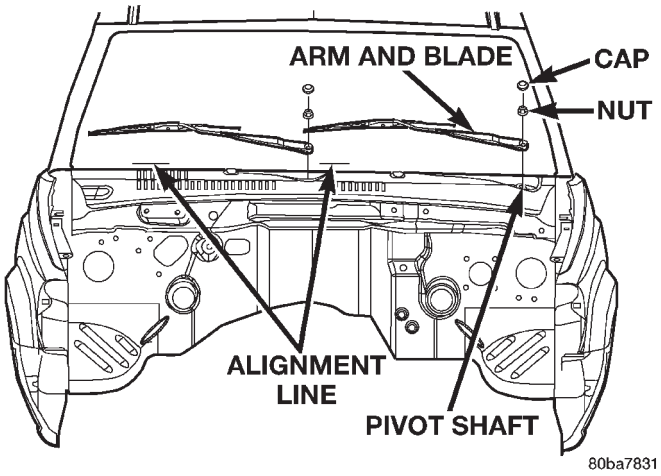



*Fig. 6 Wiper Arm Remove/Install*

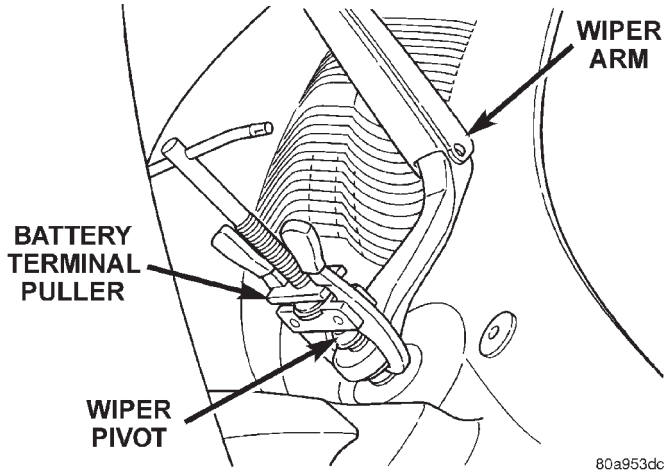



*Fig. 7 Wiper Arm Puller - Typical*

**REAR**

(1) Unsnap the rear wiper arm pivot cover by lifting it at the rear wiper motor output shaft end of the arm (Fig. 8).

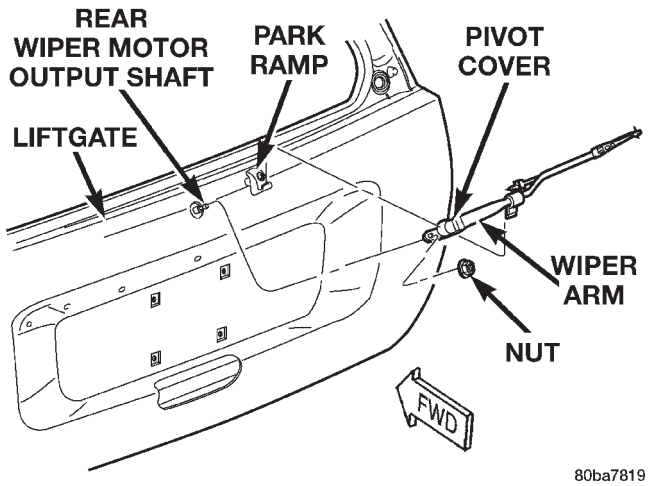



*Fig. 8 Rear Wiper Arm Remove/Install*

(2) Remove the nut that secures the wiper arm to the rear wiper motor output shaft.

(3) Use a battery terminal puller to disengage the wiper arm from the rear wiper motor output shaft splines (Fig. 7).

(4) Remove the rear wiper arm and blade from the liftgate.

## INSTALLATION

**WINDSHIELD**

**NOTE: Always install the wiper arm and blade with the wiper motor in the Park position.**

(1) Place the wiper arm and blade onto the base of the windshield with the pivot hole on the end of the arm positioned over the wiper pivot shaft.

(2) Align the lower edge of the blade with the wiper alignment lines located in the lower edge of the windshield glass (Fig. 6).

(3) With the wiper blade aligned, push the pivot hole on the end of the wiper arm down over the wiper pivot shaft.

(4) Install and tighten the nut that secures the wiper arm to the wiper pivot shaft. Tighten the nut to 23.7 N·m (210 in. lbs.).

(5) Operate the wipers with the windshield glass wet, then turn the wiper switch to the Off position. Check for correct wiper blade alignment and readjust if required.

(6) Install the plastic nut cap onto the wiper arm pivot nut.

**REAR**

**NOTE: Always install the wiper arm and blade with the wiper motor in the Park position.**

(1) Place the wiper arm and blade onto the liftgate with the wiper arm support positioned on the park ramp and the pivot hole on the end of the arm positioned over the rear wiper motor output shaft.

(2) Position the ridge of the wiper arm support on the liftgate park ramp in the Installation Position (Fig. 9).

(3) With the wiper arm in the Installation Position, push the pivot hole on the end of the wiper arm down over the rear wiper motor output shaft.

(4) Install and tighten the nut that secures the wiper arm to the rear wiper motor output shaft. Tighten the nut to 18 N·m (160 in. lbs.).

(5) Close the rear wiper pivot cover back over the rear wiper arm mounting nut.

(6) Lift the rear wiper arm and blade away from the liftgate park ramp and place the wiper arm support in the Park Position (Fig. 9).

REMOVAL AND INSTALLATION (Continued)

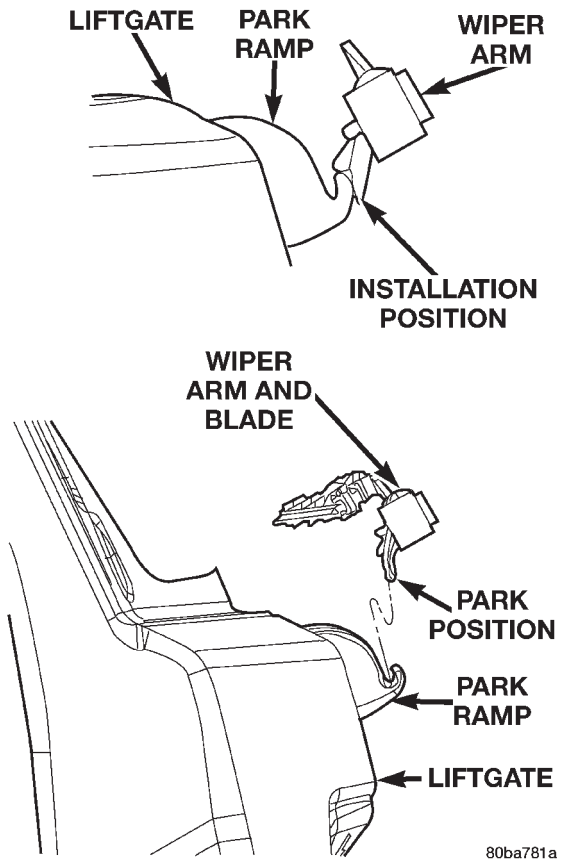



*Fig. 9 Rear Wiper Arm Installation*

## REAR WIPER ARM PARK RAMP

### REMOVAL

(1) Disengage the rear wiper arm support from the rubber rear wiper arm park ramp on the right side of the liftgate just below the flip-up glass.

(2) Lift the wiper arm and blade away from the liftgate until the wiper arm hinge is in its over-center position.

(3) Remove the screw that secures the park ramp to the liftgate (Fig. 10).

(4) Remove the rear wiper arm park ramp from the liftgate.

### INSTALLATION

(1) Position the rear wiper arm park ramp onto the liftgate.

(2) Install and tighten the screw that secures the park ramp to the liftgate. Tighten the screw to 6.8 N·m (60 in. lbs.).

(3) Lower the wiper arm and blade gently onto the liftgate rear wiper arm park ramp.

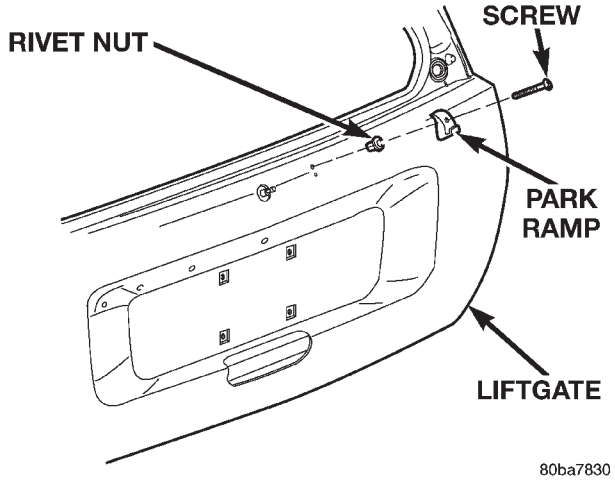



*Fig. 10 Rear Wiper Arm Park Ramp Remove/Install*

## WINDSHIELD WIPER MOTOR, PIVOT AND LINKAGE MODULE

### REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the wiper arms from the wiper pivots. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(3) Open the hood and pull the hood to plenum seal off of the forward flanges of the cowl grille cover and the plenum panel.

(4) Remove the six plastic nuts (2 short and 4 long) that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield (Fig. 11).

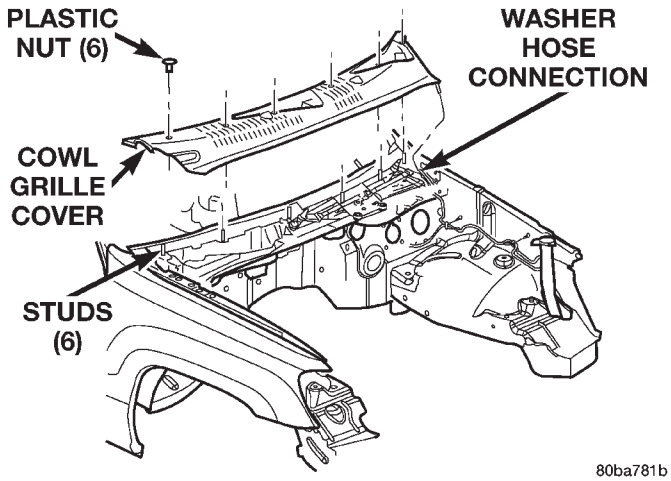



*Fig. 11 Cowl Grille Cover Remove/Install*

REMOVAL AND INSTALLATION (Continued)

(5) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the windshield washer plumbing.

(6) Disconnect the windshield washer supply hose at the in-line connector.

(7) Remove the cowl grille cover from the cowl plenum and cowl top panels through the opening between the hood and the windshield.

(8) Remove the four screws that secure the wiper motor, pivot and linkage module to the cowl plenum panel (Fig. 12).

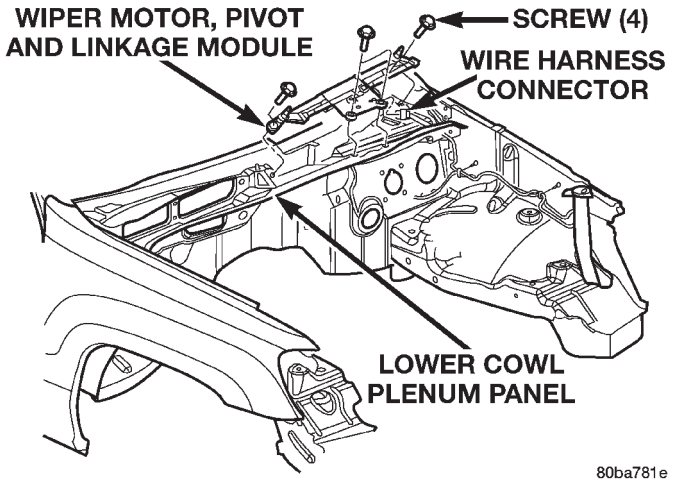



*Fig. 12 Wiper Motor, Pivot and Linkage Module Remove/Install*

(9) Lift the left end of the wiper motor, pivot and linkage module far enough to access the wiper motor wire harness connector.

(10) Disconnect the left headlamp and dash wire harness connector from the wiper motor connector receptacle.

(11) Remove the wiper motor, pivot and linkage module from the cowl plenum.

### INSTALLATION

(1) Position the wiper motor, pivot and linkage module into the cowl plenum.

(2) Lift the left end of the wiper motor, pivot and linkage module far enough to access the wiper motor wire harness connector.

(3) Reconnect the left headlamp and dash wire harness connector to the wiper motor connector receptacle.

(4) Loosely install one of the wiper motor, pivot and linkage module mounting screws to the mounting hole near the pivot on the right end of the module to locate the module in the plenum.

(5) Working from left to right, install and tighten the four screws that secure the wiper motor, pivot and linkage module to the cowl plenum panel. Tighten the screws to 8 N·m (72 in. lbs.).

(6) Position the cowl grille cover onto the cowl plenum and cowl top panels through the opening between the hood and the windshield.

(7) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the windshield washer plumbing.

(8) Reconnect the windshield washer supply hose at the in-line connector.

(9) Install the six plastic nuts that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield. These nuts are to be installed by pushing them onto the studs in the following sequence:

(a) First, install the short nuts to the third stud from the right, then the second stud from the left.

(b) Next, install long nuts to the right outboard stud, then the left outboard stud.

(c) Finally, install the two remaining long nuts to the third stud from the left, then the second stud from the right.

(10) Starting at the ends and working toward the center, push the hood to plenum seal onto the forward flanges of the cowl grille cover and the plenum panel.

(11) Install the wiper arms onto the wiper pivots. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(12) Reconnect and isolate the battery negative cable.

## REAR WIPER MOTOR MODULE

### REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) From the outside of the liftgate, remove the rear wiper arm from the rear wiper motor output shaft. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(3) Use a door trim panel removal tool to gently pry at the base of the nut cover where it meets the wiper motor output shaft bezel and grommet on the outer liftgate panel until it unsnaps from the rear wiper motor output shaft (Fig. 13). Be certain to use proper caution to protect the outer liftgate panel and its paint finish from damage during this procedure.

(4) Remove the nut that secures the rear wiper motor output shaft to the outer liftgate panel.

(5) Remove the bezel and gasket from the rear wiper motor output shaft.

(6) Remove the trim panel from the inside of the liftgate. Refer to **Liftgate Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

REMOVAL AND INSTALLATION (Continued)

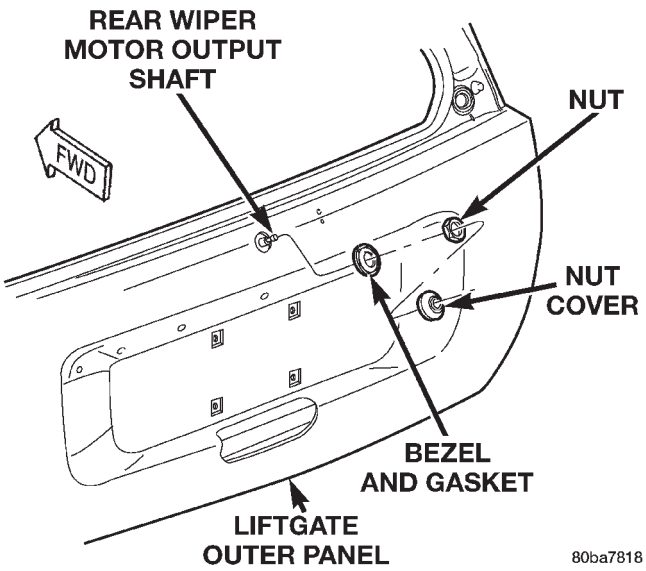



*Fig. 13 Rear Wiper Motor Output Shaft Remove/ Install*

(7) Disconnect the liftgate wire harness connector from the rear wiper motor module connector receptacle (Fig. 14).

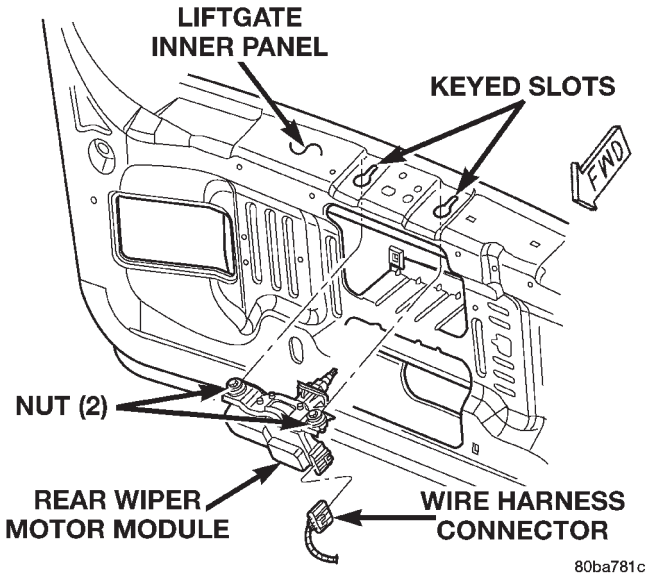



*Fig. 14 Rear Wiper Motor Module Remove/Install*

(8) Loosen the two nuts that secure the rear wiper motor mounting bracket to the liftgate inner panel.

(9) Slide the rear wiper motor module and mounting bracket forward far enough to disengage the mounting nuts from the keyed holes in the liftgate inner panel.

(10) Remove the rear wiper motor module from the liftgate inner panel.

## INSTALLATION

(1) Position the rear wiper motor module to the liftgate inner panel.

(2) Insert the rear wiper motor output shaft through the hole in the liftgate outer panel and engage the mounting nuts in the keyed holes in the liftgate inner panel.

(3) From the outside of the liftgate, center the rear wiper motor output shaft in the liftgate outer panel mounting hole and install the gasket and bezel over the centered shaft.

(4) Install and tighten the nut that secures the rear wiper motor output shaft to the outer liftgate panel. Tighten the nut to 4.8 N·m (43 in. lbs.).

(5) From the inside of the liftgate, install and tighten the two nuts that secure the rear wiper motor mounting bracket to the liftgate inner panel. Tighten the nuts to 5.3 N·m (47 in. lbs.).

(6) Reconnect the liftgate wire harness connector to the rear wiper motor module connector receptacle.

(7) Install the trim panel onto the inside of the liftgate. Refer to **Liftgate Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

(8) From the outside of the liftgate, press the nut cover firmly and evenly over the rear wiper motor output shaft bezel using thumb pressure until it snaps into place.

(9) Install the rear wiper arm onto the rear wiper motor output shaft. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(10) Reconnect the battery negative cable.

## WIPER AND WASHER SWITCH

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

REMOVAL AND INSTALLATION (Continued)

## REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the screw that secures the lower tilting steering column shroud to the steering column multi-function switch mounting housing (Fig. 15).

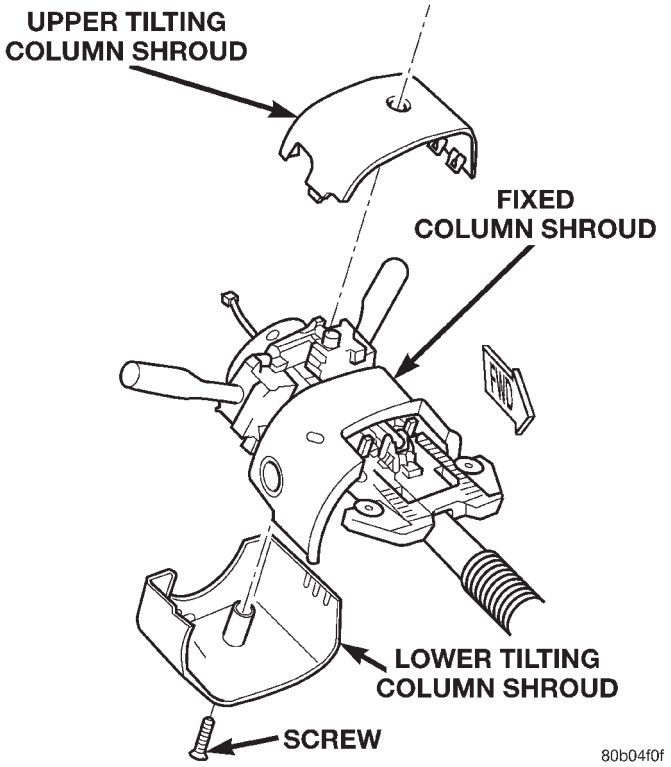



*Fig. 15 Steering Column Shrouds Remove/Install*

(3) Unsnap the two halves of the tilting steering column shroud from each other and remove both halves from the steering column.

(4) Disconnect the instrument panel wire harness connector from the wiper and washer (right multi-function) switch connector receptacle.

(5) Remove the two screws that secure the right multi-function switch to the multi-function switch mounting housing (Fig. 16).

(6) Remove the right multi-function switch from the multi-function switch mounting housing.

## INSTALLATION

(1) Position the right multi-function switch onto the multi-function switch mounting housing.

(2) Install and tighten the two screws that secure the right multi-function switch to the multi-function switch mounting housing. Tighten the screws to 2.5 N·m (22 in. lbs.).

(3) Reconnect the instrument panel wire harness connector to the right multi-function switch connector receptacle.

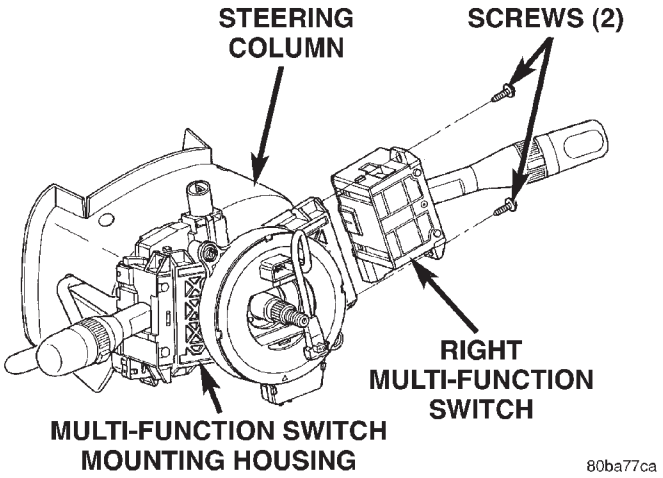



*Fig. 16 Right Multi-Function Switch Remove/Install*

(4) Position the lower tilting steering column shroud to the underside of the steering column.

(5) Install and tighten the screw that secures the lower tilting steering column shroud to the multi-function switch mounting housing. Tighten the screw to 1.9 N·m (17 in. lbs.).

(6) Position the upper tilting column shroud over the steering column with the hazard warning switch button inserted through the hole in the upper surface of the shroud. Align the upper tilting steering column shroud to the lower shroud and snap the two shroud halves together.

(7) Reconnect the battery negative cable.

# WIPER RELAYS

## REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 17).

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for wiper high/low relay and wiper on/off relay identification and location.

(4) Remove the wiper high/low relay or wiper on/off relay from the PDC.

## INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper wiper high/low relay or wiper on/off relay location.

(2) Position the wiper high/low relay or wiper on/off relay in the proper receptacle in the PDC.

(3) Align the wiper high/low relay or wiper on/off relay terminals with the terminal cavities in the PDC receptacle.

REMOVAL AND INSTALLATION (Continued)

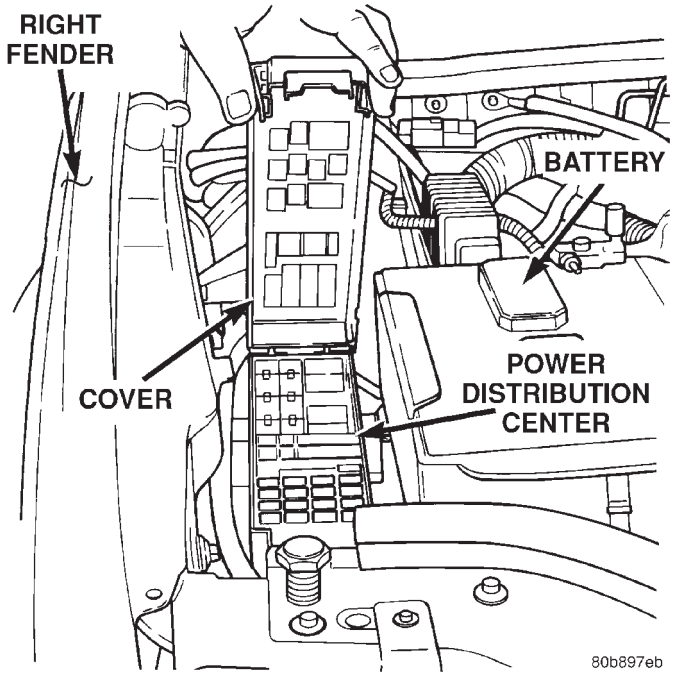



*Fig. 17 Power Distribution Center*

(4) Push down firmly on the wiper high/low relay or wiper on/off relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Install the cover onto the PDC.

(6) Reconnect the battery negative cable.

## WASHER NOZZLE AND PLUMBING

### REMOVAL

#### WINDSHIELD

This procedure can be used to remove either of the two windshield washer nozzles or the combination wye fitting/check valve unit.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the wiper arms from the wiper pivots. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(3) Open the hood and pull the hood to plenum seal off of the forward flanges of the cowl grille cover and the plenum panel.

(4) Remove the six plastic nuts (2 short and 4 long) that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield (Fig. 18).

(5) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the windshield washer plumbing.

(6) Disconnect the windshield washer supply hose at the in-line connector.

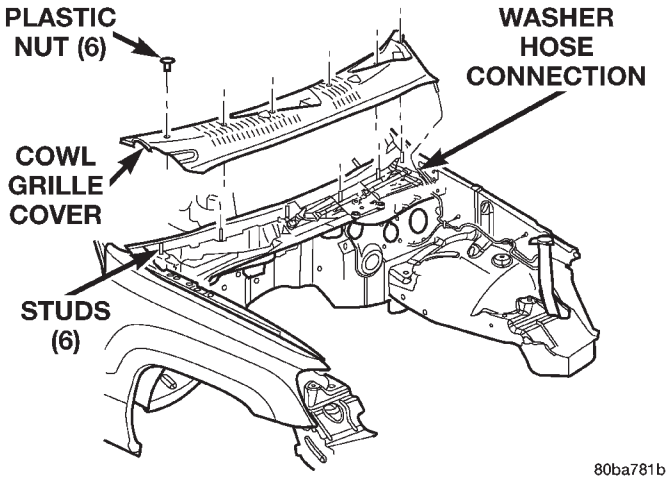



*Fig. 18 Cowl Grille Cover Remove/Install*

(7) Remove the cowl grille cover from the cowl plenum and cowl top panels through the opening between the hood and the windshield.

(8) From the underside of the cowl grille cover, disconnect the washer hose(s) from the barbed nipple(s) of the windshield washer nozzle(s) or the combination wye fitting/check valve unit.

(9) The combination wye fitting/check valve unit can now be removed from cowl grille cover. To remove the windshield washer nozzles from the cowl grille cover, go to Step 10.

(10) From the underside of the cowl grille cover, release the latches of the windshield washer nozzle and push the nozzle out through the mounting hole to the top side of the cowl grille cover.

#### REAR

The headliner washer hose (Fig. 19) is serviced only as a unit with the headliner. If this washer hose is damaged or faulty, the headliner unit must be replaced. The remaining washer hoses for the rear washer nozzle plumbing are available for service replacement. The check valve for the rear washer nozzle is integral to the nozzle.

(1) Using a trim stick or another suitable wide flat-bladed tool, gently pry at the sides of the rear washer nozzle to release the latches that secure it to the liftgate outer panel.

(2) Pull the rear washer nozzle out from the liftgate outer panel far enough to access the washer supply hose (Fig. 20).

(3) Disconnect the washer supply hose from the barbed nipple of the rear washer nozzle.

(4) Remove the rear washer nozzle from the liftgate.

REMOVAL AND INSTALLATION (Continued)

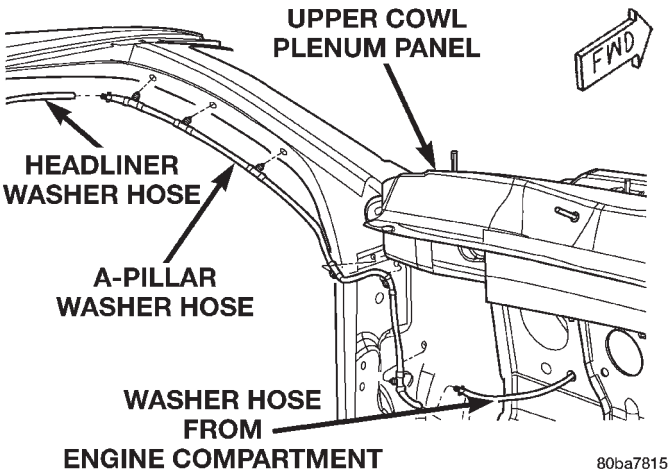



*Fig. 19 Rear Washer Nozzle Plumbing*

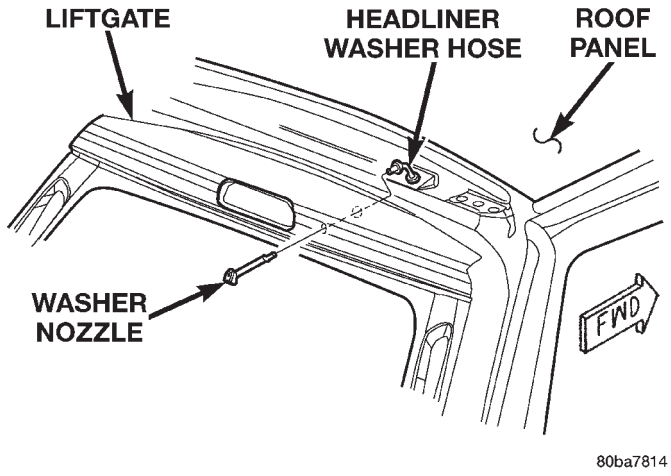



*Fig. 20 Rear Washer Nozzle Remove/Install*

## INSTALLATION

### WINDSHIELD

(1) From the top side of the cowl grille cover, insert the nipple end of the windshield washer nozzle through the mounting hole in the cowl grille cover.

(2) Push firmly and evenly on the top of the windshield washer nozzle until the latches snap into place on the underside of the cowl grille cover.

(3) From the underside of the cowl grille cover, reconnect the washer hose(s) to the barbed nipple(s) of the windshield washer nozzle(s) or the combination wye fitting/check valve unit.

(4) Install the washer hoses for the windshield washer nozzles or the combination wye fitting/check valve unit into their routing clips on the underside of the cowl grille cover.

(5) Position the cowl grille cover onto the cowl plenum and cowl top panels through the opening between the hood and the windshield.

(6) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the windshield washer plumbing.

(7) Reconnect the windshield washer supply hose at the in-line connector.

(8) Install the six plastic nuts that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield. These nuts are to be installed by pushing them onto the studs in the following sequence:

(a) First, install the short nuts to the third stud from the right, then the second stud from the left.

(b) Next, install long nuts to the right outboard stud, then the left outboard stud.

(c) Finally, install the two remaining long nuts to the third stud from the left, then the second stud from the right.

(9) Starting at the ends and working toward the center, push the hood to plenum seal onto the forward flanges of the cowl grille cover and the plenum panel.

(10) Install the wiper arms onto the wiper pivots. Refer to **Wiper Arm** in the Removal and Installation section of this group for the procedures.

(11) Reconnect and isolate the battery negative cable.

### REAR

(1) Position the rear washer nozzle to the liftgate.

(2) Reconnect the washer supply hose to the barbed nipple of the rear washer nozzle.

(3) Insert the rear washer nozzle supply hose and nipple into the mounting hole in the liftgate outer panel.

(4) Push firmly and evenly on the rear washer nozzle until the latches snap into place on the inside of the liftgate outer panel mounting hole.

## WASHER PUMP

## REMOVAL

The windshield and rear washer pumps can be removed from the washer reservoir without removing the reservoir from the vehicle. The same procedure is used to remove either washer pump and motor unit.

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the liner from the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(4) Disconnect the left headlamp and dash wire harness connector from the inoperative windshield or rear washer pump connector receptacle (Fig. 21).

REMOVAL AND INSTALLATION (Continued)

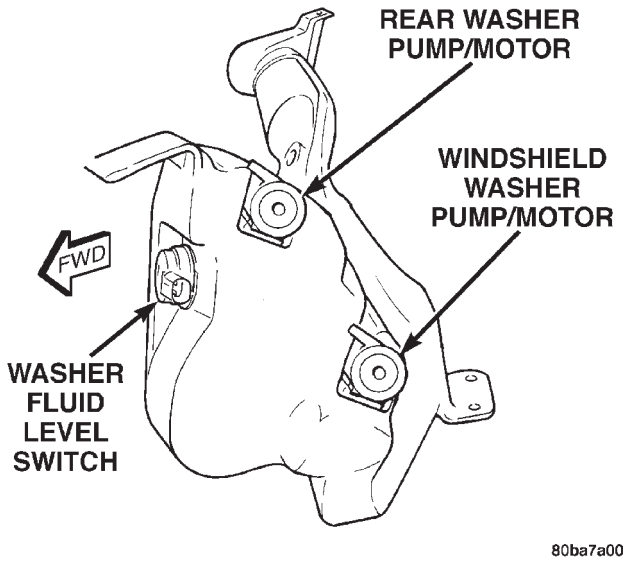



*Fig. 21 Washer Pumps (Viewed from Bottom of Reservoir)*

(5) Disconnect the washer hose from the barbed outlet nipple of the inoperative washer pump and allow the washer fluid to drain into a clean container for reuse.

(6) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed inlet nipple of the washer pump out of the rubber grommet seal in the reservoir. Care must be taken not to damage the reservoir.

(7) Remove the rubber grommet seal from the washer pump mounting hole in the washer reservoir and discard.

## INSTALLATION

(1) Install a new rubber grommet seal into the washer pump mounting hole in the washer reservoir. Always use a new rubber grommet seal on the reservoir.

(2) Position the barbed inlet nipple of the washer pump into the rubber grommet seal in the reservoir.

(3) Press firmly and evenly on the washer pump until the barbed inlet nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.

(4) Reconnect the washer hose to the barbed outlet nipple of the washer pump.

(5) Reconnect the left headlamp and dash wire harness connector to the windshield or rear washer pump connector receptacle.

(6) Install the liner into the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(7) Lower the vehicle.

(8) Fill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.

(9) Reconnect the battery negative cable.

# WASHER RESERVOIR

## REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the liner from the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(3) Remove the air cleaner housing from the top of the left front fender wheel house. Refer to **Air Cleaner Housing** in the Removal and Installation section of Group 14 - Fuel System for the procedures.

(4) Disconnect the two washer reservoir washer hoses from the two engine compartment washer hoses at the in-line connectors located on the top of the left front fender wheel house (Fig. 22).

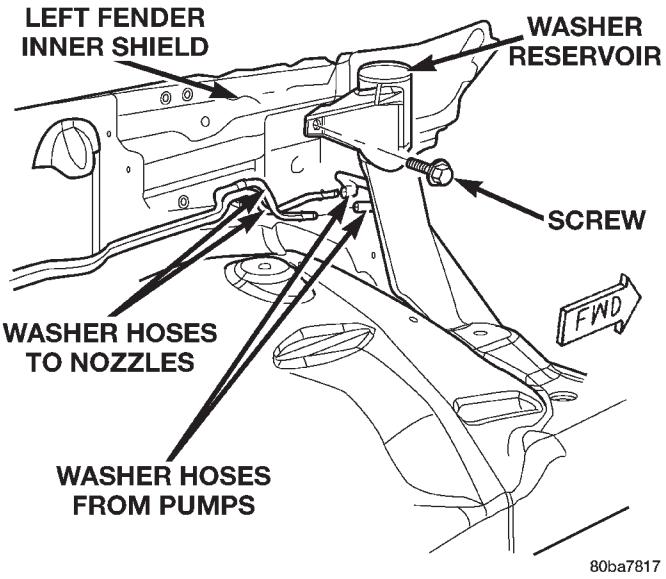



*Fig. 22 Washer Reservoir Filler Neck Mounting*

(5) Open the washer reservoir filler cap and unsnap the filler cap hinge from the hook on the filler neck.

(6) Remove the one screw that secures the washer reservoir filler neck to the left inner fender shield.

(7) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

(8) Disconnect the left headlamp and dash wire harness connectors from the two washer pump connector receptacles (Fig. 23).

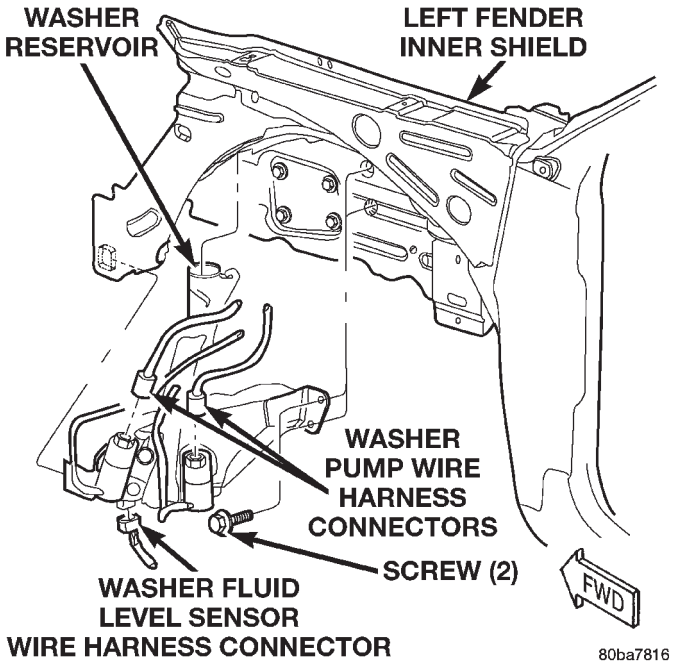



*Fig. 23 Washer Reservoir Remove/Install*

(9) Remove the two screws that secure the inboard mounting tab of the washer reservoir to the left inner wheel house.

(10) Pull the bottom of the washer reservoir rearward far enough to access the washer fluid level sensor wire harness connector on the front of the reservoir.

(11) Disconnect the left headlamp and dash wire harness connector from the washer fluid level sensor connector receptacle.

(12) Pull the bottom of the washer reservoir rearward far enough to disengage the outboard mounting tab from the mounting slot on the inner fender shield.

(13) Rotate the washer reservoir far enough so that the inboard mounting tab clears the front suspension components, then lower the reservoir far enough to remove the filler neck from the engine compartment.

(14) Remove the washer reservoir from the left front fender wheel house.

### INSTALLATION

(1) Position the washer reservoir into the left front fender wheel house.

(2) Raise the washer reservoir filler neck through the hole in the left front fender wheelhouse extension into the engine compartment and orient the inboard mounting tab over the top of the front suspension components.

(3) Pull the bottom of the washer reservoir rearward far enough to engage the outboard mounting tab with the mounting slot on the inner fender shield.

(4) Pull the bottom of the washer reservoir rearward far enough to access the washer fluid level sensor connector receptacle on the front of the reservoir.

(5) Reconnect the left headlamp and dash wire harness connector to the washer fluid level sensor connector receptacle.

(6) Install and tighten the two screws that secure the inboard mounting tab of the washer reservoir to the left inner wheel house. Tighten the screws to 7.4 N·m (66 in. lbs.).

(7) Reconnect the left headlamp and dash wire harness connectors to the two washer pump connector receptacles.

(8) Lower the vehicle.

(9) Install and tighten the one screw that secures the washer reservoir filler neck to the left inner fender shield. Tighten the screw to 7.4 N·m (66 in. lbs.).

(10) Install the washer reservoir filler cap hinge onto the hook on the filler neck and close the cap.

(11) Reconnect the two washer reservoir washer hoses to the two engine compartment washer hoses at the in-line connectors located on the top of the left front fender wheel house.

(12) Install the air cleaner housing onto the top of the left front fender wheel house. Refer to **Air Cleaner Housing** in the Removal and Installation section of Group 14 - Fuel System for the procedures.

(13) Install the liner into the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(14) Reconnect the battery negative cable.

## WASHER FLUID LEVEL SENSOR

### REMOVAL

The washer fluid level sensor can be removed from the washer reservoir without removing the reservoir from the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the one screw that secures the washer reservoir filler neck to the left inner fender shield.

(3) Raise and support the vehicle.

(4) Remove the liner from the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(5) Disconnect the washer hose from the barbed outlet nipple of the rearmost (windshield) washer

REMOVAL AND INSTALLATION (Continued)

pump and allow the washer fluid to drain into a clean container for reuse.

(6) Remove the two screws that secure the inboard mounting tab of the washer reservoir to the left inner wheel house.

(7) Pull the bottom of the washer reservoir rearward far enough to access the washer fluid level sensor wire harness connector on the front of the reservoir.

(8) Disconnect the left headlamp and dash wire harness connector from the washer fluid level sensor connector receptacle.

(9) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed nipple of the washer fluid level sensor out of the rubber grommet seal on the front of the reservoir (Fig. 24). Care must be taken not to damage the reservoir.

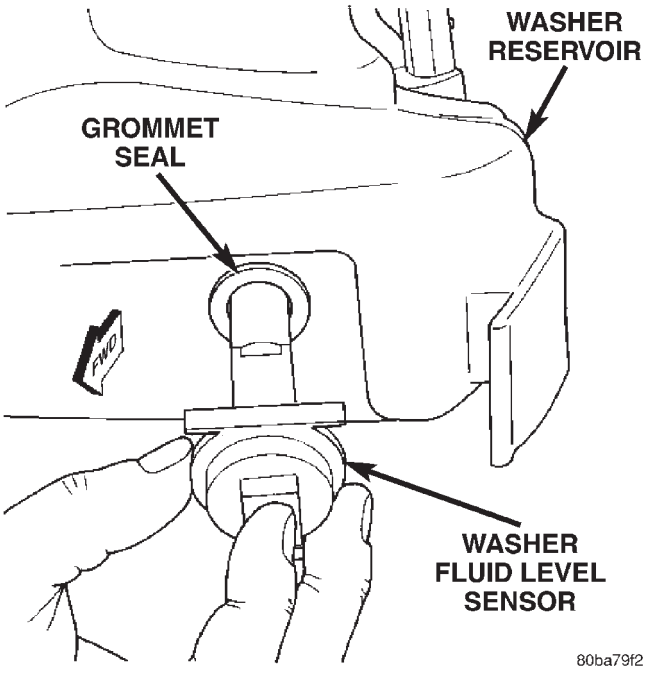



*Fig. 24 Washer Fluid Level Sensor Remove/Install*

(10) Remove the washer fluid level sensor and float from the washer reservoir.

(11) Remove the rubber grommet seal from the washer fluid level sensor mounting hole in the washer reservoir and discard.

## INSTALLATION

(1) Install a new rubber grommet seal into the washer fluid level sensor mounting hole in the front of the washer reservoir. Always use a new rubber grommet seal on the reservoir.

(2) Position the float of the washer fluid level sensor through the rubber grommet seal in the washer reservoir. The connector receptacle of the washer fluid level sensor should be pointed downward.

(3) Press firmly and evenly on the washer fluid level sensor until the barbed nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.

(4) Reconnect the left headlamp and dash wire harness connector to the washer fluid level sensor connector receptacle.

(5) Reconnect the washer hose to the barbed outlet nipple of the washer pump.

(6) Install and tighten the two screws that secure the inboard mounting tab of the washer reservoir to the left inner wheel house. Tighten the screws to 7.4 N·m (66 in. lbs.).

(7) Install the liner into the left front fender wheel house. Refer to **Front Fender** in the Removal and Installation section of Group 23 - Body for the procedures.

(8) Lower the vehicle.

(9) Install and tighten the one screw that secures the washer reservoir filler neck to the left inner fender shield. Tighten the screw to 7.4 N·m (66 in. lbs.).

(10) Fill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.

(11) Reconnect the battery negative cable.