



WINDSHIELD WIPER AND WASHER SYSTEMS

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GENERAL INFORMATION

WARNING: VEHICLES ARE EQUIPPED WITH AN AIR BAG, REFER TO GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN SERVICE PROCEDURES.

The windshield wipers will only operate when the ignition switch is in the ACCESSORY or IGNITION position. A fuse, located in the fuse block, protects the circuitry of the wiper system and the vehicle.

The wiper motor has permanent magnet fields. The speeds are determined by current flow to the appropriate set of brushes.

The intermittent wiper system, in addition to low and high speed, has a delay mode. The delay mode has a range of 1/2 to 18 seconds. The wiper delay times will double to a range of 1 to 36 seconds when the vehicle speed is less than 10 mph. The delay is done by a variable resistor in the wiper switch and two relays. One relay turns the wipers ON/OFF and the other changes the speeds.

The wiper system completes the wipe cycle when the switch is turned OFF. The blades park in the lowest portion of the wipe pattern.

When using the DRB, refer to the Body Chassis Diagnostic Manual for the procedures.

WIPER BLADES

Wiper blades, exposed to the weather for a long period of time, tend to lose their wiping effectiveness. Periodic cleaning of the wiper blade is suggested to remove the accumulation of salt and road film. The wiper blades, arms, and windshield should be cleaned with a sponge or cloth and a mild detergent or nonabrasive cleaner. If the blades continue to streak or smear, they should be replaced. The right and left wipers are different blade

lengths. The driver side length is 600 mm and the passenger side length is 550 mm. The blades should not be interchanged.

WIPER BLADE REPLACEMENT

(1) Turn wiper switch ON, position blades to a convenient place by turning the ignition switch ON and OFF. When in position turn ignition switch OFF.

(2) Lift wiper arm to raise blade off glass.

(3) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 1 and 2). The vertebra is curved on the right blade only. Install with the curve matching the shape of the windshield.

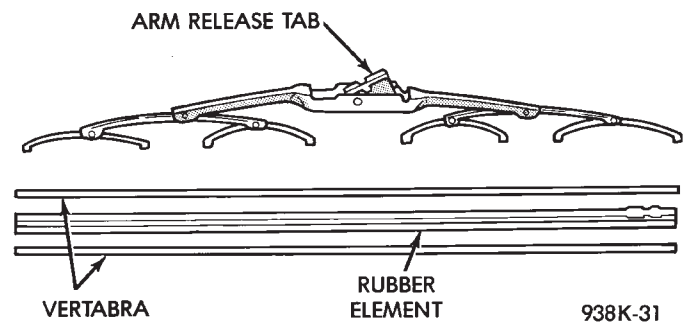


Fig. 1 Wiper Blade and Element

(4) Gently place wiper arm tip on glass surface.

(5) For installation reverse above procedures. When complete turn ignition switch ON. Turn wiper switch OFF allowing the wiper blades PARK, then turn ignition switch OFF.

WIPER BLADE ELEMENT REPLACEMENT

(1) Lift wiper arm to raise blade off glass.

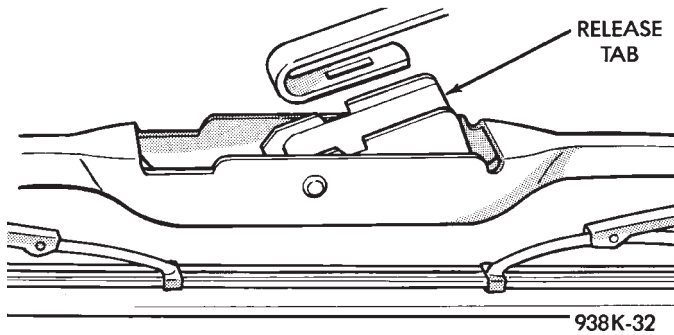


Fig. 2 Remove Blade from Arm

(2) Remove blade assembly from arm by pushing release tab under arm tip and slide blade away from arm tip (Fig. 1 and 2). Gently place wiper arm tip on glass surface.

(3) To remove wiping element from blade assembly:

- Pull stopper, of the rubber element, out of the end claw together with vertebra (metal rails) (Fig. 3).

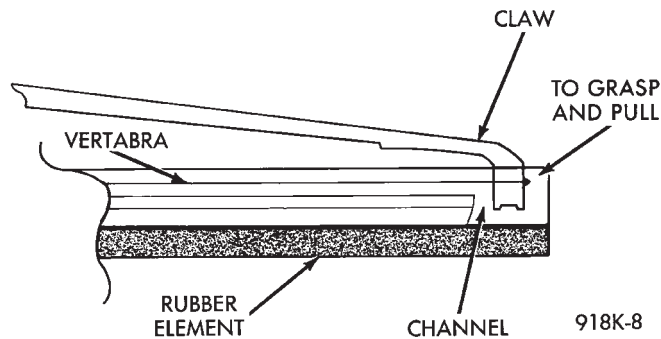


Fig. 3 Wiper Blade and Element

- Remove wiper element and vertebra by sliding them out of the claws.

(4) For installation reverse above procedures. Check that the element and vertebra is through all claws and the final claw is locked in the stopper. The right blade, the vertebra is curved to match the shape of the windshield. Install the vertebra with the curve down.

WIPER ARM REPLACEMENT

(1) Place the wiper arm/blades in the PARK position and turn ignition OFF.

(2) Lift wiper arm to raise blade off glass and move retainer tab to hold the arm up.

(3) Remove the arm from the pivot using a rocking motion.

(4) Disconnect the washer hose at the plastic in-line connector. Be sure that the in-line connector is saved.

WIPER ARM ADJUSTMENT

(1) Cycle the wiper motor into the PARK position.

(2) Check the tips of the blades in blackout area. From the bottom edge of the windshield to the blade should be no closer than 24 mm (1 in.) (Fig. 4).

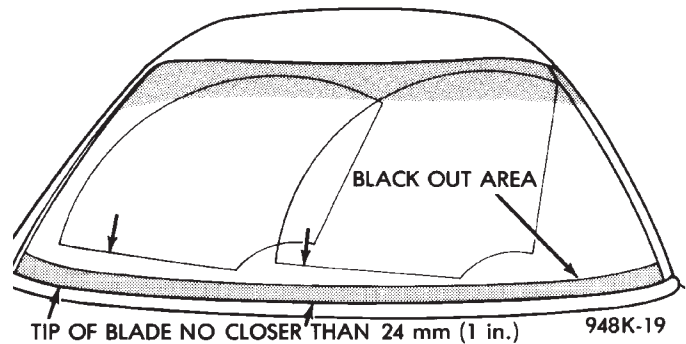


Fig. 4 Arm Adjustment

(3) Operate the wipers if the requirements are not met, check linkage and pivot assembly for worn parts.

During high speed wet glass operation, the right hand blade tip may override the cowl screen slightly. This is normal and should not affect the wiper system's performance.

The wiper arm is supplied with a plastic key insert that aligns with a slot in the pivot.

In the event that the wiper blade tip excessively strikes:

- Glass molding
- Cowl screen

Due to long term normal wear, remove the plastic key from wiper arm and reposition the arm on the pivot with the wipers in the PARK position only.

WIPER MOTOR SYSTEM TEST PROCEDURES

WARNING: ON VEHICLES EQUIPPED WITH AIR BAGS, SEE GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN REMOVAL PROCEDURES.

Whenever a wiper motor malfunction occurs, verify that the wire harness is properly connected start normal diagnosis and repair procedures. Refer to Wiper Motor Diagnosis Chart (Fig. 5 and 6).

The following is a list of general wiper motor system problems, the tests that are to be performed to locate the faulty part, and the corrective action to be taken. These tests will cover both two speed and intermittent wiper functions.

INTERMITTENT WINDSHIELD WIPER SWITCH TESTS

WARNING: ON VEHICLES EQUIPPED WITH AIR BAGS, SEE GROUP 8M, RESTRAINT SYSTEMS FOR STEERING WHEEL OR COLUMN REMOVAL PROCEDURES.

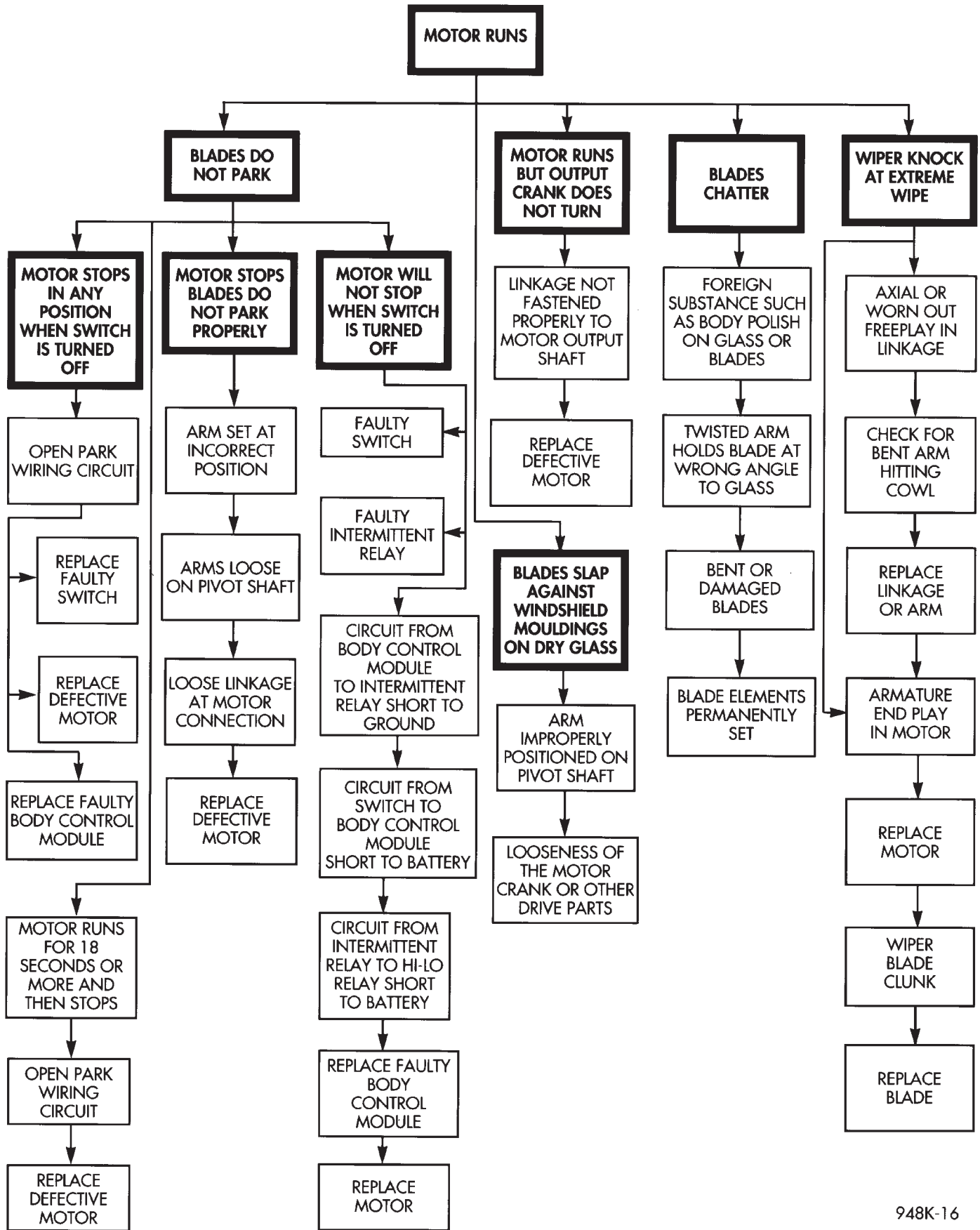


Fig. 5 Wiper Motor Runs Diagnosis

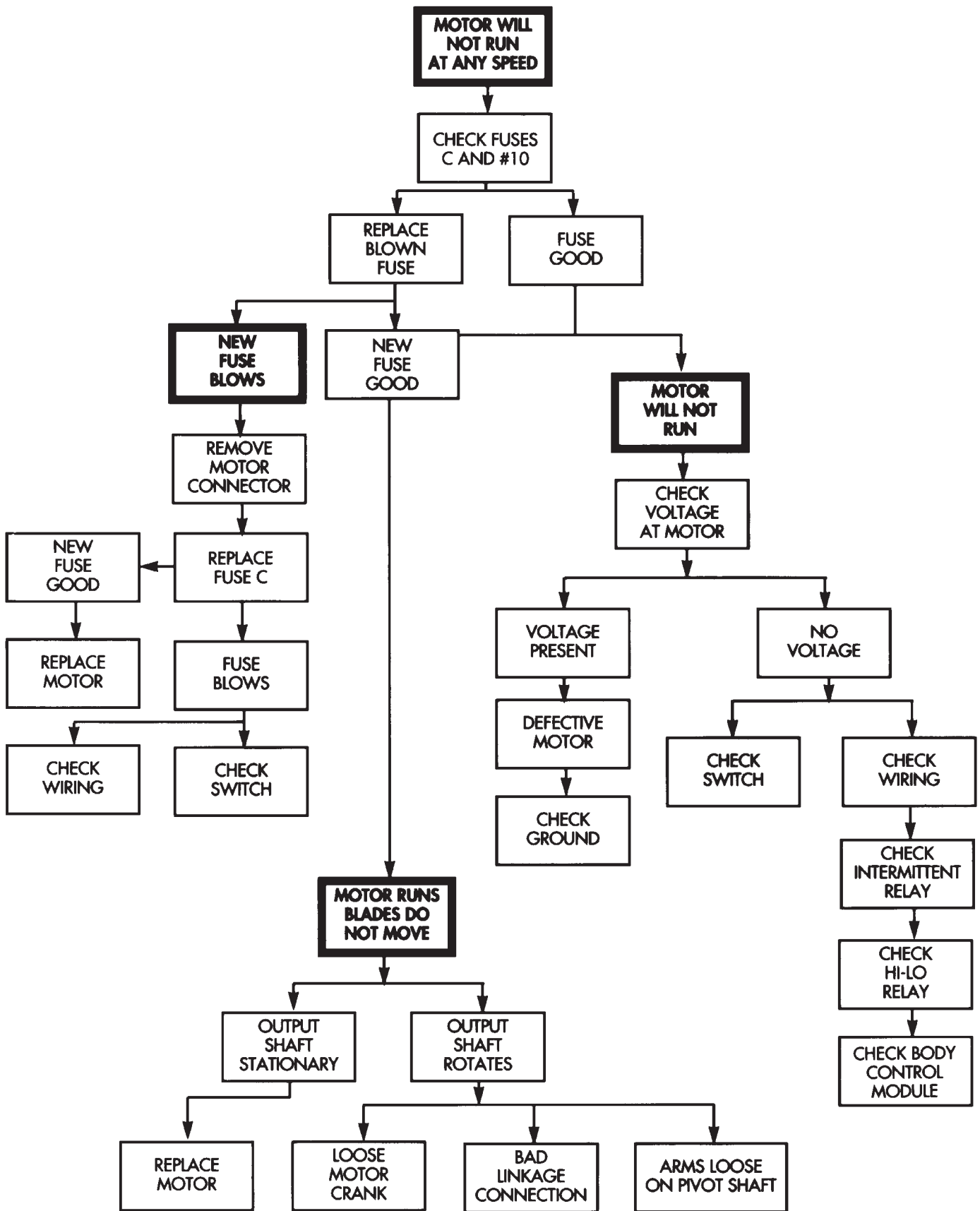


Fig. 6 Wiper Motor Will Not Run Diagnosis



The intermittent wiper function is controlled by the body control module, located in the passenger compartment behind the right side kick panel (Fig. 7). If the body control module is determined to be the problem, refer to Group 8E, Instrument Panels and Gauges, for replacement procedures.

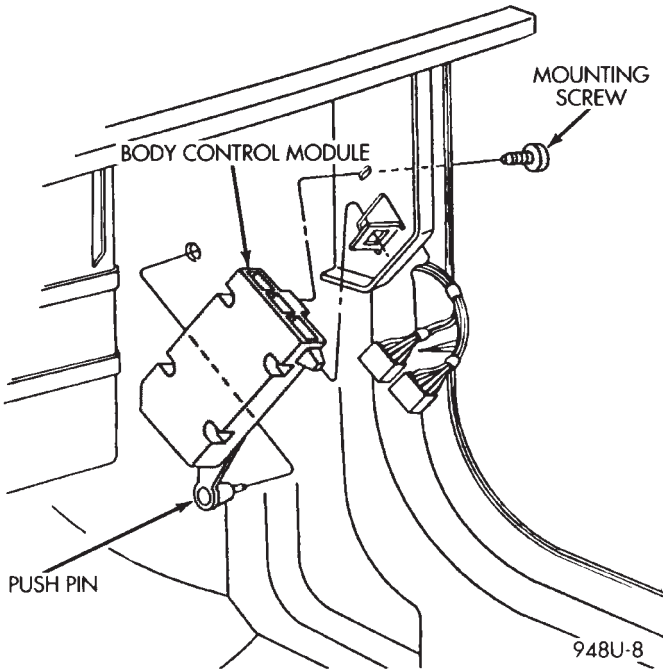


Fig. 7 Body Control Module Location

Whatever the problem, disconnect motor wire harness and clean the terminals. Connect harness and test motor.

CONDITION: MOTOR WILL NOT RUN IN ANY SWITCH POSITION

PROCEDURE

(1) Check fuse #10, in the junction block and fuse #C in the power distribution center (Fig. 8 and 9).

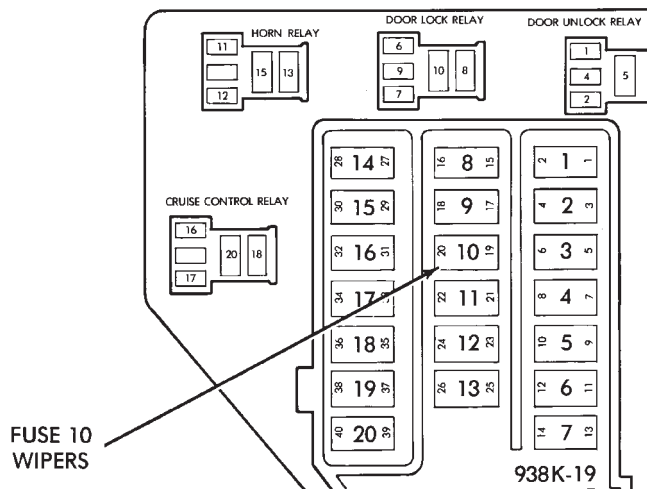


Fig. 8 Junction Block

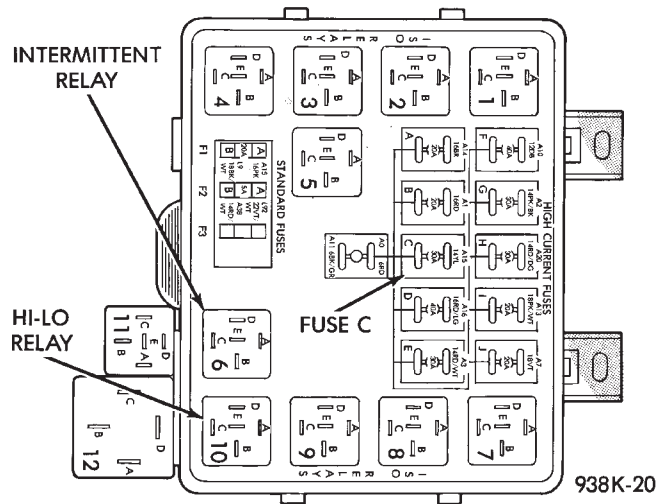
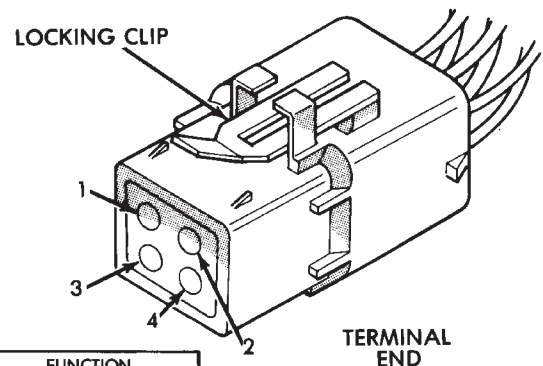


Fig. 9 Power Distribution Center

- (a) If fuse(s) are good, go to step 2.
- (b) If fuse(s) are defective, replace and check motor operation in all switch positions.
- (c) If motor is still inoperative and the fuse does not blow, go to step 2.
- (d) If replacement fuse blows, go to step 11.
- (2) Disconnect motor wire connector.
- (3) Check motor low speed. Using two jumper wires, connect one jumper wire between the battery positive terminal and Pin 4 of the motor connector (Fig. 10). Connect the other jumper wire to the battery negative terminal and Pin 3 of the motor connector (Fig. 11). Check motor high speed, connect the positive jumper wire to Pin 2 of the motor connector. Connect the negative jumper wire to Pin 4 of the motor connector.



CAV	FUNCTION
1	PARK SWITCH SENSE
2	HI SPEED OUTPUT
3	LOW SPEED OUTPUT
4	SYSTEM GROUND

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Fig. 10 Motor Connector on Body harness

- (a) If motor runs, go to step 5.
- (b) If motor does not run, high or low speed go to step 4.

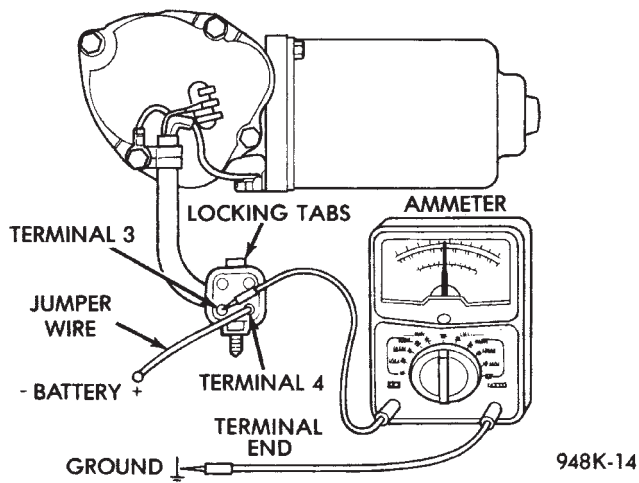


Fig. 11 Ammeter Test

(4) Using an ohmmeter, check for good ground at Pin 4 of the motor wiring harness connector. If OK, replace motor. If not repair the ground circuit as necessary.

(5) The wiper switch in the ON position. Using an voltmeter, check for battery voltage at terminal D of the intermittent wiper relay in the distribution center. Cycle the ignition switch OFF/ON to reset the body control module. If no voltage check fuse C (Fig. 9). If OK, go to step 6. If not repair as necessary.

(6) Using an ohmmeter, check from terminal D of the HI-LO wiper relay to terminal 2 of the body wiring harness connector at motor for continuity. Check from terminal E of the HI-LO wiper relay to Pin 3 of the wiring harness connector at motor for continuity. If OK, go to step 7. If not repair as necessary.

(7) Using an ohmmeter, check for continuity between the HI-LO wiper relay and the intermittent wiper relay. Check from terminal B of the HI-LO wiper relay to terminal B of the intermittent wiper relay. If OK, check for faulty relays. If not repair as necessary.

(8) Disconnect the J3 24-way connector from the body control module (Fig. 12).

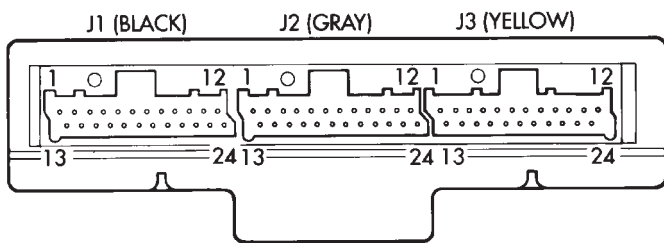


Fig. 12 Body Control Module J3 Connector

(9) Using an ohmmeter, check for continuity from terminal 1 of the J3 24-way connector to the terminal

C of the intermittent wiper relay. If OK, go to step 10. If not repair as necessary.

(10) Using a voltmeter, connect positive lead to terminal 16 of the body control module J3 24-way connector. Turn ignition switch to the ON position. Slowly move the wiper switch from OFF position through each position to HIGH.

(a) If voltage increases from zero to approximately 10 volts in the HIGH position, replace body control module. If no voltage, go to step b.

(b) Using an ohmmeter, check for continuity from terminal 1 of wiper switch connector to terminal 16 of the body control module J3 24-way connector. If no continuity, repair circuit. If OK, go to step c.

(c) Using a voltmeter, connect positive lead to terminal 3 of the wiper switch connector. If ignition voltage is present, replace the wiper switch. If no voltage, check continuity from fuse #10 to terminal 3 of the wiper switch connector. Repair circuit as necessary.

(11) Disconnect motor connector and replace fuse #10 from the junction block.

(a) If fuse does not blow, go to step 2.

(b) If fuse blows, wiper control circuitry is at fault repair as necessary, refer to Group 8W, Wiring Diagram.

CONDITION: MOTOR RUNS SLOWLY AT ALL SPEEDS

(1) Disconnect wire connector at motor. Remove wiper arms and blades. Disconnect motor drive link from motor. Connect an ammeter between battery negative terminal and Pin 4 of the motor connector (Fig. 11). Connect battery positive wire to Pin 3 of the motor connector. When replacing drive link nut tighten to 11 to 12 N·m (98 to 106 in. lbs.) torque.

(a) If average ammeter reading is more than 6 amps, replace motor.

(b) If motor runs and average ammeter reading is less than 6 amps, go to step 2.

(2) Check to see if wiper linkage or pivots are binding or caught.

CONDITION: MOTOR WILL RUN AT HIGH SPEED, BUT NOT MOVE AT LOW SPEED. MOTOR WILL RUN AT LOW SPEED, BUT WILL NOT MOVE AT HIGH SPEED

(1) Disconnect motor connector.

(2) If motor will not run on low speed, connect a jumper wire between battery positive terminal and Pin 3 of the motor connector. Connect a second jumper wire between ground and Pin 4 of the motor connector (Fig. 11).

(a) If motor runs, go to step 4.

(b) If motor does not run, replace the motor.

(3) If motor will not run on high speed, connect a jumper wire between battery positive terminal and



Pin 2. Connect a second jumper wire between ground and Pin 4 of the motor connector.

(a) If motor runs, go to step 5.

(b) If motor does not run, replace the motor.

(4) If wipers will not run at low speed, using an ohmmeter, check for open circuit. Check between terminal E of the HI-LO wiper relay to Pin 3 of the wiper motor wire harness connector for continuity. If OK, go to step 6. If not repair as necessary.

(5) If wiper will not run at the high speed, using an ohmmeter, check for an open circuit. Check between terminal D of the HI-LO wiper relay and Pin 2 of the wiper motor wire harness connector for continuity. If OK, go to step 6. If not repair as necessary.

(6) Check for faulty HI-LO wiper relay.

CONDITION: WIPERS RUN AT HIGH SPEED WITH SWITCH IN LOW SPEED POSITION. WIPERS OPERATE IN INTERMITTENT MODE, BUT EACH WIPE IS AT HIGH SPEED.

(1) Disconnect motor connector.

(2) Using two jumper wires, connect one between the battery positive terminal and Pin 3 of the motor wire harness connect. Connect the second lead between battery negative terminal and Pin 4 of the motor wire harness connector (Fig. 11).

(a) If motor runs at low speed, go to step 3.

(b) If motor runs at high speed, wires are crossed at Pins 2 and 3 in the motor pigtail wire connector.

(3) Check for faulty HI-LO wiper relay. Check for crossed wires in harness from HI-LO relay to motor.

(4) Using an ohmmeter, check for short to ground. Disconnect J3 24-way connector from the body controller and remove the intermittent wiper relay.

(5) If none of the above conditions are present, replace the body control module.

CONDITION: WIPERS RUN AT LOW SPEED WITH SWITCH IN HIGH SPEED POSITION

(1) Check for faulty HI-LO wiper relay.

(2) Using an ohmmeter, check for open circuit between terminal C of the HI-LO wiper relay and terminal 18 of the body control module J3 24-way connector. If OK, go to step 3. If not OK, repair as necessary.

(3) Check wiper switch.

(4) Check for binding linkage

(5) Refer to *CONDITION: MOTOR RUNS SLOWLY AT ALL SPEEDS.*

CONDITION: MOTOR WILL KEEP RUNNING WITH SWITCH IN OFF POSITION.

(1) Check wiper motor wiring harness for shorts between the low speed motor feed terminal 3 or high speed motor feed terminal 2 and battery or ignition.

(2) Check for faulty wiper intermittent or Hi/Lo relay.

(3) Check circuit from intermittent relay cavity B to Hi/Low relay cavity B for short to battery or ignition.

(4) Disconnect body controller J3 24-way connector. Check circuit from terminal 1 of J3 24-way connector to terminal C of the intermittent wiper relay for short to ground.

(5) Using a voltmeter, connect positive lead to terminal 16 of the body control module J3 24-way connector. Connect negative lead to ground. If voltmeter reads greater than 0 volts, check wiper switch and wiring.

(6) Using a voltmeter, connect positive lead to terminal 10 of the body control module J3 24-way connector.

(a) If voltmeter reads 10 to 15 volts, check the circuit for short to battery or ignition.

(b) If the voltmeter reads 0 volts, replace the body control module.

CONDITION: WIPER WILL RUN CONTINUOUSLY WITH SWITCH IN THE INTERMITTENT POSITION. WHEN COLUMN SWITCH IS TURNED OFF, WIPERS STOP WHEREVER THEY ARE, WITHOUT RETURNING TO PARK POSITION.

(1) Using an ohmmeter, check for ground at the wiper motor wire connector Pin 1. If grounded, replace motor.

(2) Using an ohmmeter, with the wiper motor in the PARK position, check for continuity between Pin 1 and Pin 4 of the motor connector. If continuous continuity, go to step 3. If not OK, replace motor.

(3) Check for continuity between terminal 1 of the motor wire harness connector and terminal 2 of J3 24-way connector of the body control module. Using an voltmeter, check for short circuit to a battery source or ignition feed in this circuit.

WIPERS DO NOT RUN WHEN WASHER MOTOR IS ENGAGED

(1) Disconnect the J3 24-way connector from the body control module.

(2) Using a voltmeter, connect positive lead to terminal 10 of the 24-way connector.

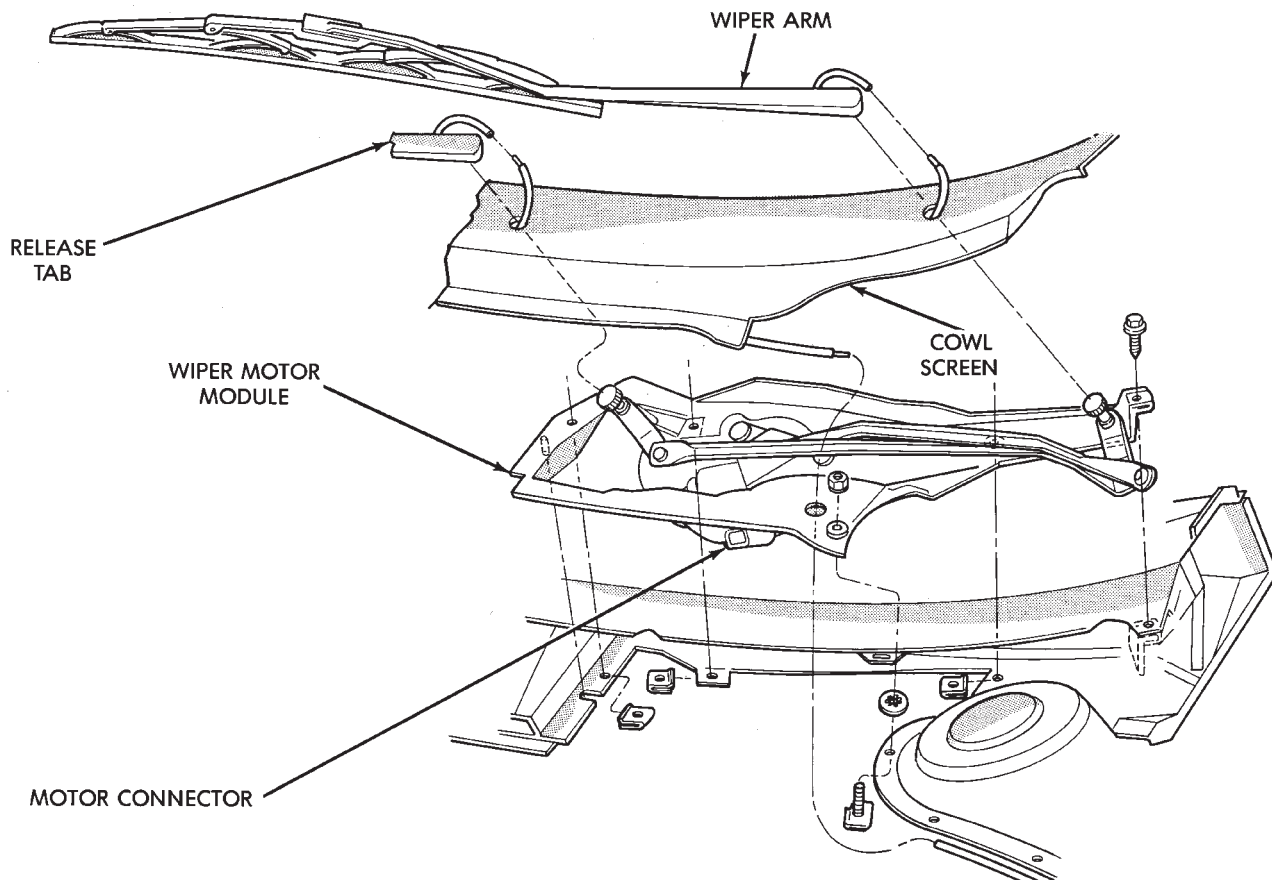
(3) Engage the washer switch so that the washer motor runs continuously.

(a) If the voltage is zero, check the wiring between the washer motor and the body control module. Repair as necessary.

(b) If the voltage is 10 to 15 volts, replace the body control module.

WIPER MOTOR REPLACEMENT

(1) Remove wiper arms and blades, disconnect hoses from in-line connectors (Fig. 13). Be sure that the in-line connector is saved.



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Fig. 13 Wiper Motor and Linkage Module

(2) Remove the rear hood seal with the cowl top plastic screen and disconnect the washer hose at in-line connector. Save in-line connector.

(3) Disconnect motor connector at back side of housing.

(4) Remove four wiper housing module mounting screws then remove housing.

(5) Remove nut and disconnect wiper drive link from motor crank.

(6) Remove three motor mounting screws.

(7) Lift motor and mounting plate out of housing.

(8) Disconnect motor harness grommet from housing.

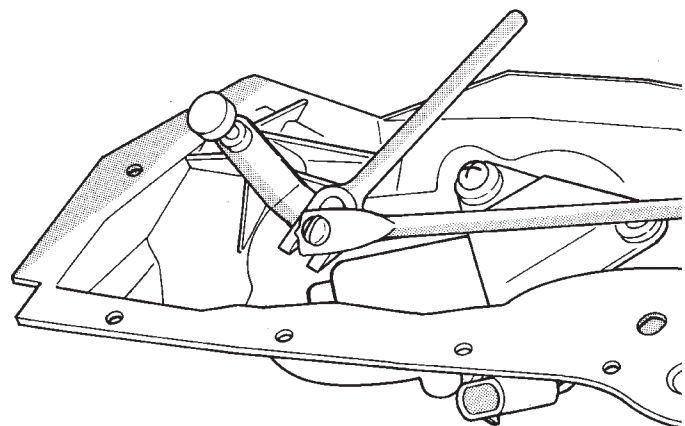
(10) For installation, reverse above procedures. Tighten the motor crank nut to 11 to 14 N·m (89 to 124 in. lbs.) torque. Tighten the motor mounting screws to 11 to 12 N·m (89 to 106 in. lbs.) torque.

LINKAGE OR CAP REPLACEMENT

(1) Remove wiper arms and blades, disconnect hoses from in-line connectors. Be sure that the in-line connector is saved.

(2) Remove the rear hood seal with the cowl top plastic screen and disconnect the washer hose at in-line connector. Save in-line connector.

(3) Disconnect wiper arm linkage, by using a ball joint/tie rod separator, separate the ball cap from the ball (Fig. 14).



938K-24

Fig. 14 Linkage Removal

(4) To remove cap(s), place the cap shoulder over a socket larger than shoulder and tap on the cap into the socket to remove. To replace cap use a socket larger than the cap. Place linkage on the socket, install cap into position over socket and tap on shoulder of cap to lock into position (Fig. 15 and 16). There are two types of caps, one for the round ball and the other round ball with a pin on top.

(5) For installation, reverse above procedures.

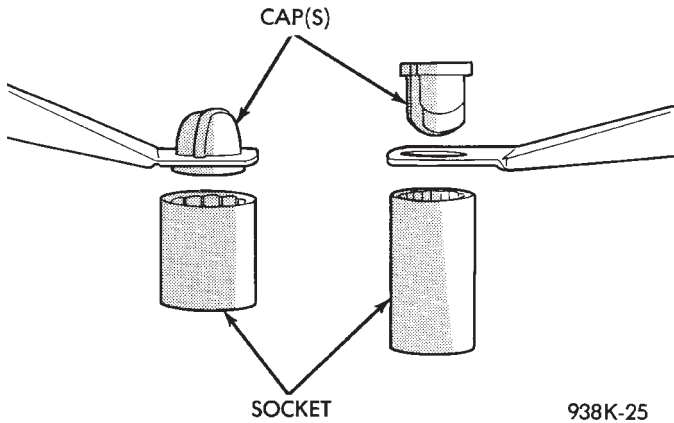


Fig. 15 Cap Removal

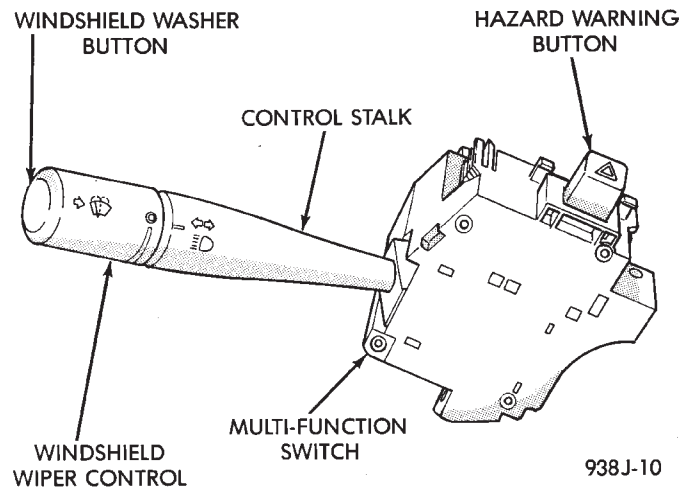


Fig. 17 Multi-Function Switch

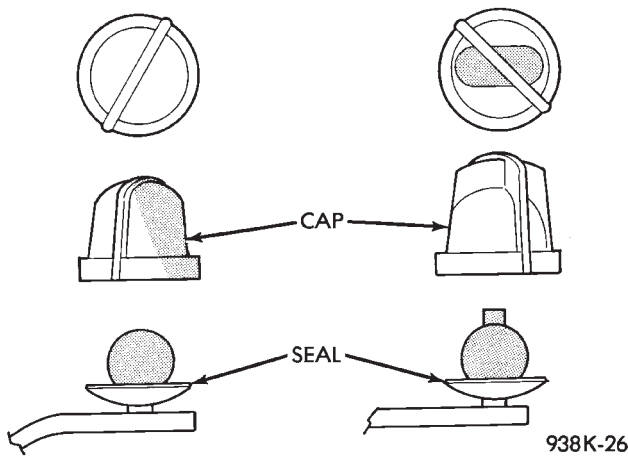
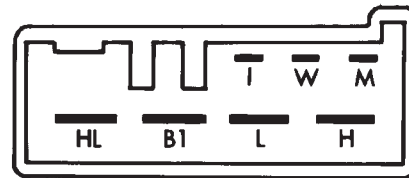


Fig. 16 Caps and Seals



SWITCH POSITION	TERMINALS	RESISTANCE VALUE
OFF	PIN I to M	OPEN \geq 300 K OHMS
DELAY LEVEL	1	PIN I to M 9.72 K OHMS
	2	PIN I to M 8.22 K OHMS
	3	PIN I to M 6.61 K OHMS
	4	PIN I to M 5.12 K OHMS
	5	PIN I to M 3.67 K OHMS
	6	PIN I to M 2.22 K OHMS
LOW	PIN I to M	1.02 K OHMS
HIGH	PIN I to M	0.51 K OHMS
WASH	PIN I to W	OPEN
RESISTANCE AT MAXIMUM DELAY POSITION SHOULD BE		9,720 OHMS
RESISTANCE AT MINIMUM DELAY POSITION SHOULD BE		2,220 OHMS

948K-18

Fig. 18 Resistance Test

MULTI-FUNCTION INTERMITTENT WIPER SWITCH TEST

To test the switch, first disconnect the switch wires from the body wiring in the steering column (Fig. 17). Using an ohmmeter, test for continuity between the terminals of the switch, as indicated in the following continuity chart. The identity of each terminal is shown in Fig. 18.

For test purposes, the first position is the OFF position, the next six positions are for the DELAY wipe. LOW is the next detent position and HIGH is the full counterclockwise detent position.

In any wiper mode, if the knob is pushed all the way in, the washer circuit will be completed.

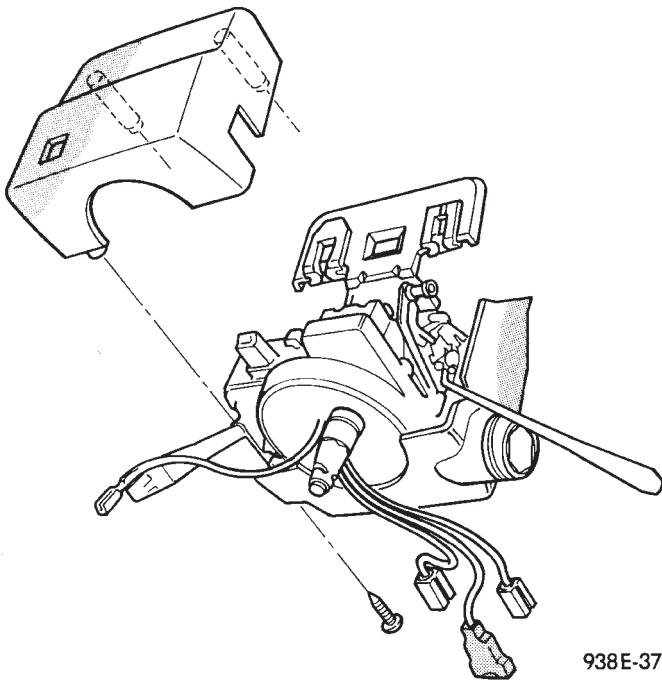
INTERMITTENT WIPER SWITCH REPLACEMENT

- (1) Tilt column up and remove six screws holding lower column shroud.
- (2) Tilt column down and remove upper shroud (Fig. 19).
- (3) Tilt column up and remove one steering column tilt lever screw at base of lever. Remove tilt lever and lower shroud.

- (4) Using a screwdriver in place of the lever, tilt column down.

Remove two mounting screws on switch and remove switch. Remove wiring from hooks and disconnect two electrical connections on multi-function switch. Remove multi-function switch.

- (5) For installation, reverse above procedures.



938E-37

Fig. 19 Upper Shroud Removal

button depressed when the switch is in the OFF position will operate the wipers and washer motor pump continuously until the washer button is released. Releasing the button will stop the washer pump but the wipers will complete the current wipe cycle. Followed by an average of two more wipe cycles (± 1) before the wipers park and the module turns off.

Whenever a windshield washer malfunction occurs, first verify that the windshield washer wire harness is properly connected to all connectors before starting normal diagnosis and repair procedures. Refer to Windshield Washer Diagnosis Chart (Fig. 20).

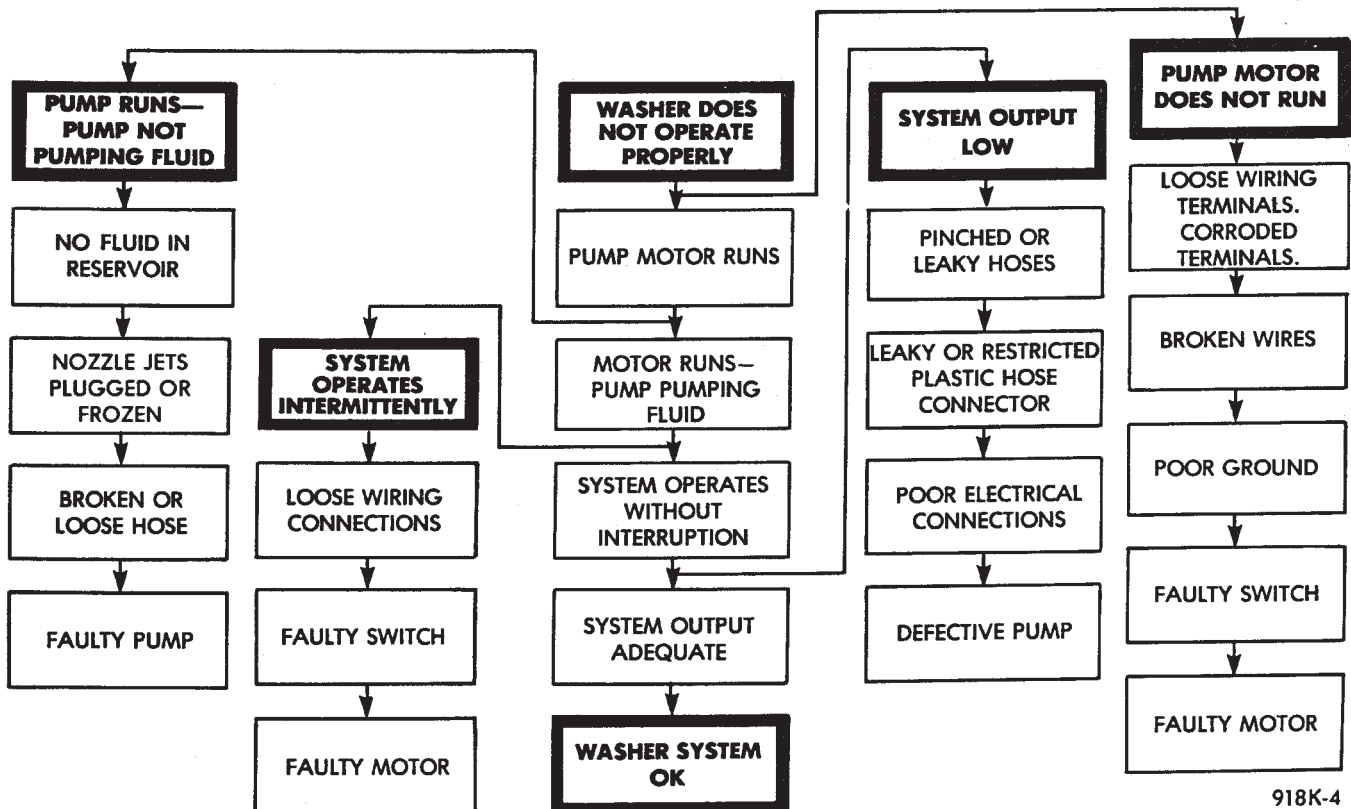
The electric pump assembly is mounted directly to the reservoir. A permanently lubricated motor is coupled to a rotor type pump. Fluid, gravity fed from the reservoir, is forced by the pump through rubber hoses to the arm mounted nozzles which direct the fluid streams to the windshield.

The pump and reservoir are serviced as separate assemblies on all vehicles.

WINDSHIELD WASHERS

All models are equipped with electric operated windshield washer pumps.

The wash function can be accessed in the OFF position of the wiper control switch. Holding the wash



918K-4

Fig. 20 Windshield Washer Diagnosis



WASHER RESERVOIRS

REMOVAL

(1) Disconnect the battery terminals. Remove battery and battery tray (Fig. 21).

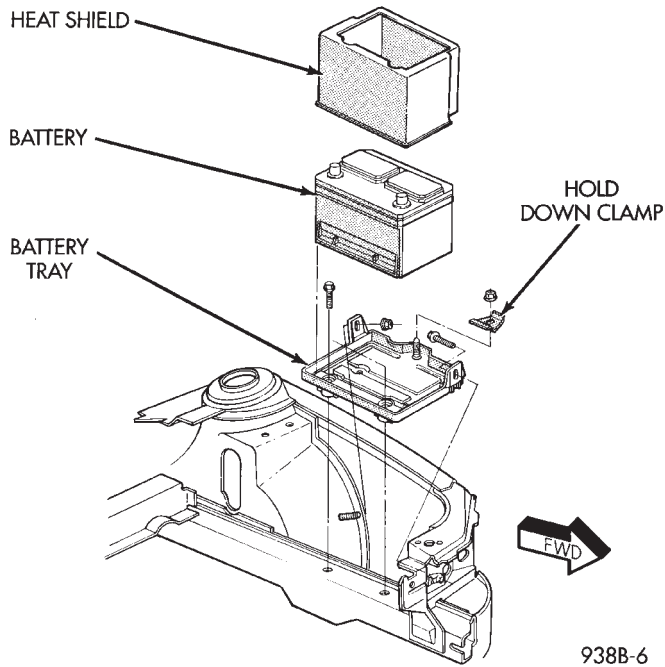


Fig. 21 Battery Removal

(2) Remove two reservoir retaining nuts and screw then remove reservoir (Fig. 22).

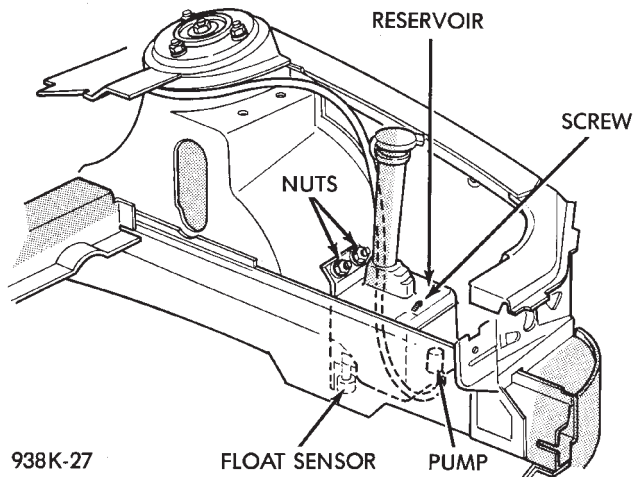


Fig. 22 Reservoir Removal

(3) Disconnect the wire connector from the reservoir pump and float sensor.

(4) Disconnect the washer hose and block the liquid outlet to prevent the liquid from running out of the reservoir.

INSTALLATION

- (1) Connect washer hose and install the reservoir.
- (2) Connect the wire connectors.

(3) Install reservoir retaining nuts and screw. Tighten to 9 to 14 N·m (80 to 124 in. lbs.) torque.

(4) Install battery tray and battery. Connect battery terminals.

WASHER RESERVOIR PUMP

(1) Remove liquid from reservoir.

(2) Disconnect battery terminals. Remove battery and tray.

(3) Disconnect electrical lead and rubber hose from bottom of pump.

(4) Remove two reservoir retaining nuts and screw, then remove reservoir.

(5) Gently pry pump away from reservoir and out of grommet. Care must be taken not to puncture reservoir (Fig. 23).

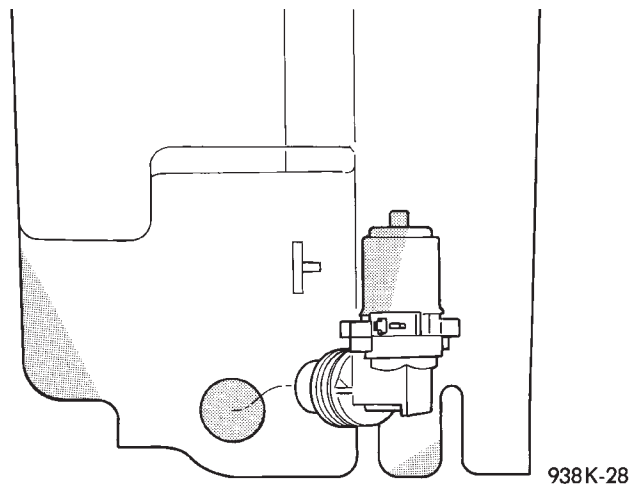


Fig. 23 Washer Pump

(6) Remove rubber grommet from reservoir and throw away.

(7) For installation, reverse above procedures. Tighten the reservoir nuts and screw to 9 to 14 N·m (80 to 124 in. lbs.) torque. Fill reservoir.



WASHER FLUID LEVEL SENSOR

- (1) Raise and support vehicle on safety stands.
- (2) Disconnect sensor wire connector.
- (3) Press up on the sensor lock and pull sensor out of housing. There will be no loss of fluid because there is no hole in housing (Fig. 24).

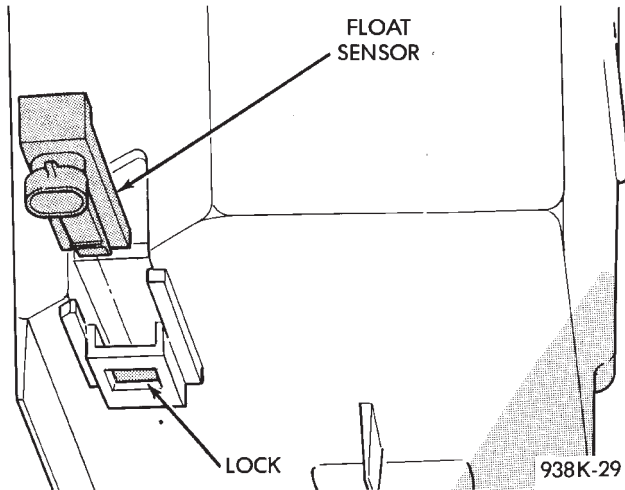


Fig. 24 Remote Sensor

- (4) Clean connector and seal.
- (5) To install, slide remote sensor in till locked into position.

- (6) Connect wire connector to remote sensor.

WASHER NOZZLE

All models are equipped with the washer nozzles attached to the wiper arms. Each arm has two nozzles. The washer system requires no adjustment. If nozzle performance is unsatisfactory, they should be replaced. The inner nozzles can be installed 180° out of position. The spray should be on the same side as the outer nozzle (Fig. 25).



INNER NOZZLE CAN BE
INSTALLED 180 DEGREES
OUT OF POSITION

938K-30

Fig. 25 Washer Nozzles

REMOVAL

- (1) Unsnap hose guard and nozzles from wiper arm and disconnect hose.
- (2) To install make sure that both the nozzle and the hose guard are securely snapped into position.