

SECTION A

WINDSHIELD WIPER AND WASHER SYSTEM (43000 Series Non-Depressed Park)

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DIVISION I SPECIFICATIONS AND ADJUSTMENTS

10-1 SPECIFICATIONS

a. Tightening Specifications

Part	Location	Torque Lb. In.
Screw	Washer Pump Mounting.	18
Bolt	Motor Tie	30
Nut	Crank Arm	65
Nut	Armature Adjusting Screw Jam.	55

b. General Specifications

Operating Volts	12 VDC
Gear Ratio.	36:1
Crank Arm Rotation (Looking at Crank Arm)	CCW
Crank Arm Speed: (RPMs, No Load)	
Lo.	34 Min.
Hi.	65 Min.
Current Draw: (Amps)	
No Load (Lo Speed).	3.6 Max.
Stall	12 Max.
Shunt Field Resistor.	20 OHMS
Lubricant	High Melting Point, Water Proof, Medium Grade

DIVISION II
DESCRIPTION
AND OPERATION

10-2 DESCRIPTION AND OPERATION
OF WIPER MOTOR

a. Description

The non-depressed park wiper motor (see Figure 10-1), is a rectangular shaped compound wound motor (series and shunt field).

b. Operation

A combination pictorial and schematic circuit is shown in Figure 10-2. An explanation

of "LO", "HI" and parking circuits follows:

1. Lo Speed Circuit

When the wiper switch on the instrument panel is moved to the "LO" speed position (ignition switch on) current from the battery flows through the series field coil and divides; part passing through the shunt field coil to ground through the instrument panel switch. The other part passing through the armature to ground through the instrument panel switch. See Figure 10-3.

2. Hi Speed Circuit

Moving the wiper switch to the



Figure 10-1-Windshield Wiper Motor and Washer Pump

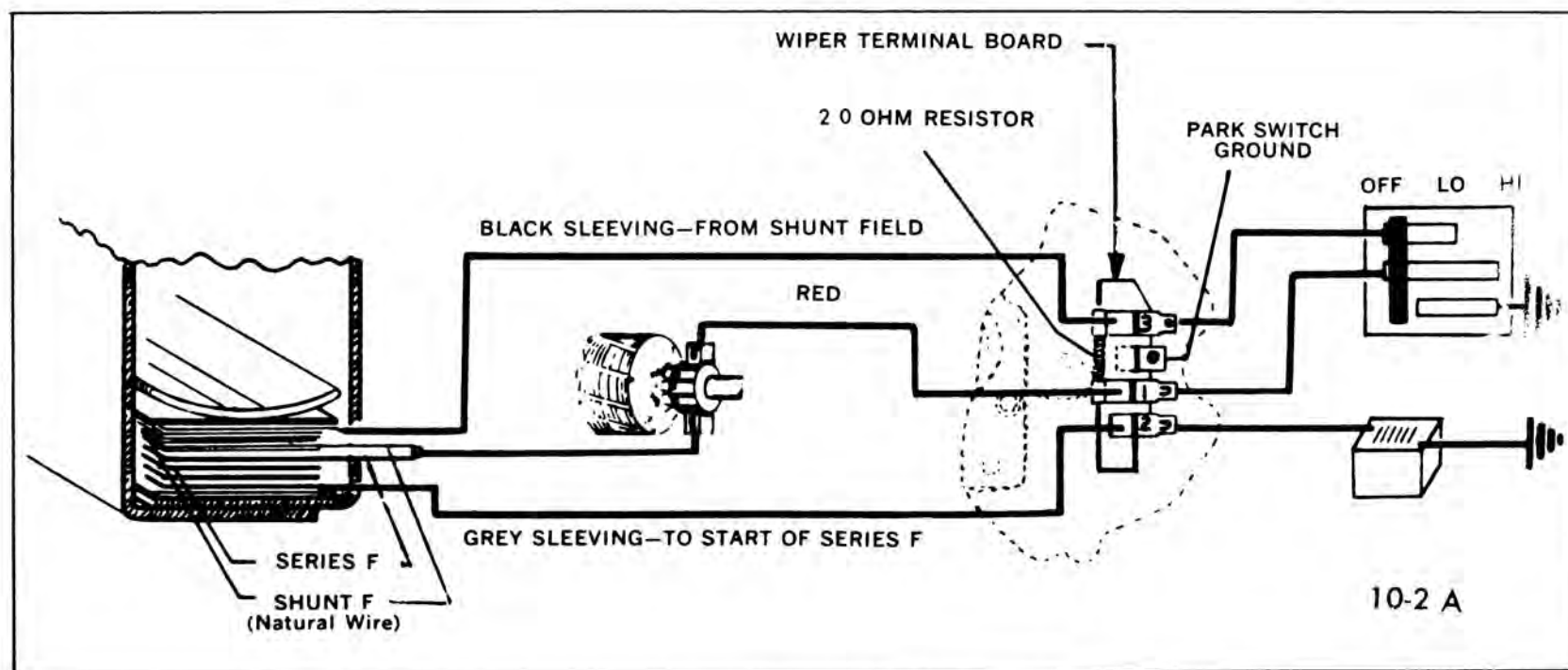


Figure 10-2-Wiper Motor Wiring Diagram

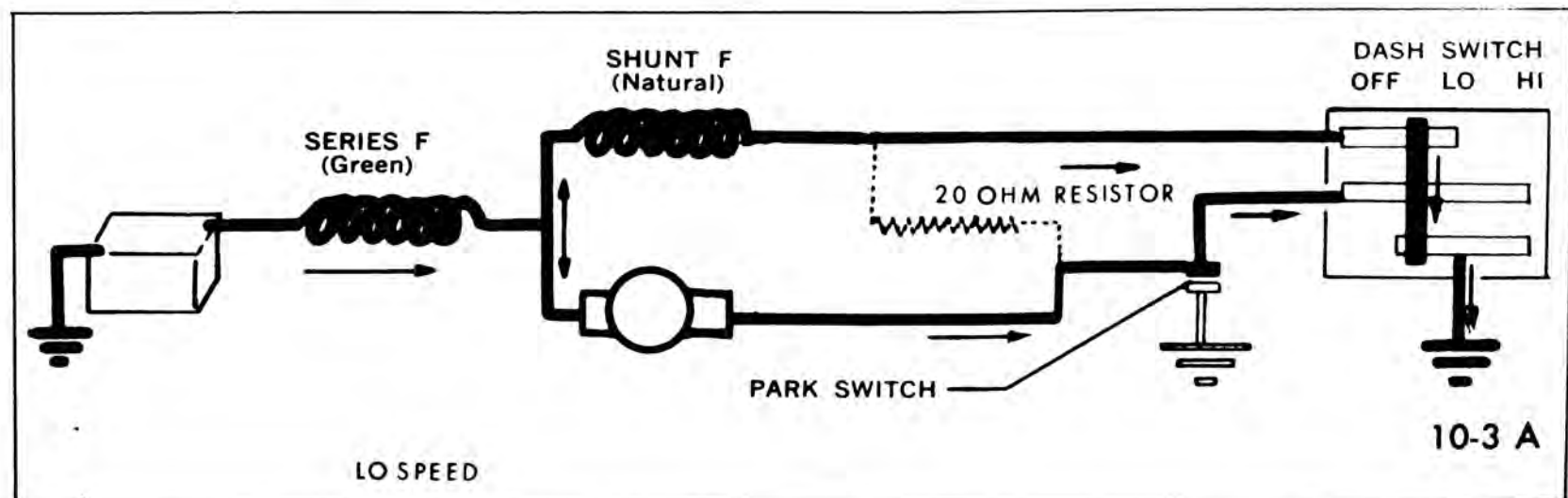


Figure 10-3-Wiring Diagram-Lo Speed Circuit

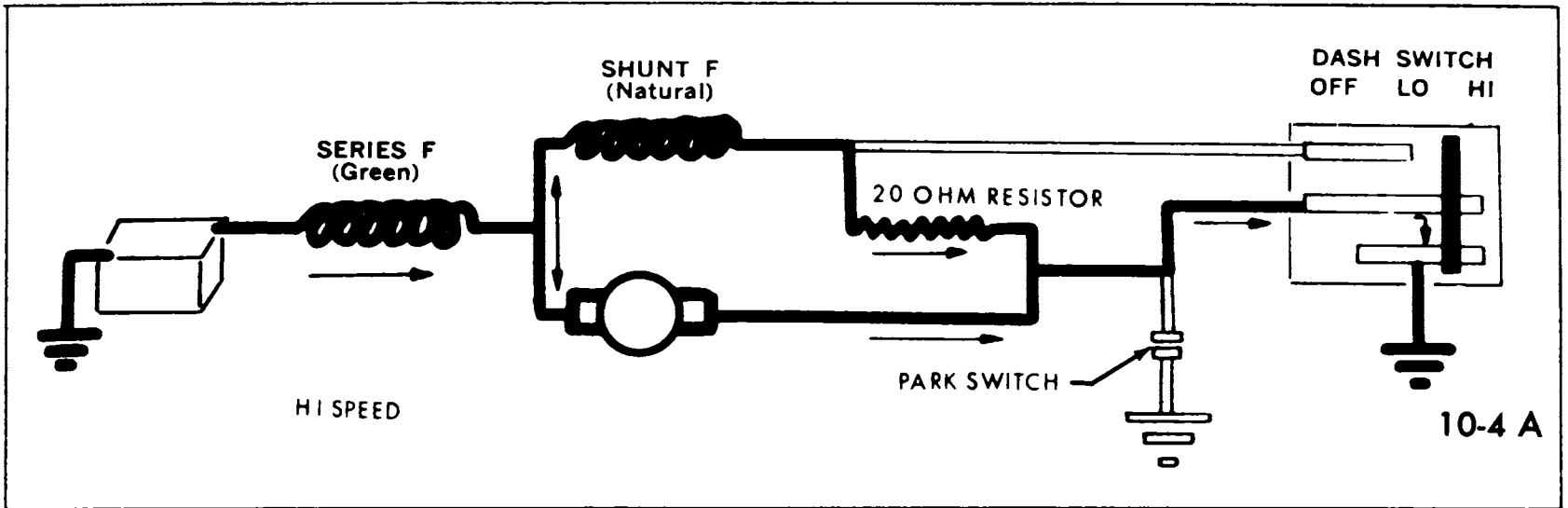


Figure 10-4-Wiring Diagram-Hi Speed Circuit

"HI" speed position opens the shunt field circuit to ground through the instrument panel switch and keeps the armature circuit closed to ground. The shunt field current must then pass through a 20 ohm resistor located on the back of the wiper terminal board, and then through the same lead that connects the armature circuit to ground through the instrument panel switch. See Figure 10-4.

3. Parking Circuit

Moving the instrument panel switch to the "OFF" position opens both the armature and shunt field circuits to ground through the instrument panel switch. However, both of these circuits are still closed to ground through the parking switch. See Figure 10-5.

NOTE:

The shunt field circuit actually flows via the instrument panel switch back to the wiper parking switch direct to ground which means that the wiper is actually operating in "LO" speed during the parking cycle.

When the cam on the wiper output gear opens the park switch contacts, the wiper is "OFF" and the blades and/or wiper crank arm should be in the park position.

4. Connections to Operate Wiper

Figure 10-6 illustrates the method of connecting leads to the wiper for either bench operation or to run wiper independent of the instrument

panel switch and car wiring when installed in car.

10-3 WASHER PUMP DESCRIPTION AND OPERATION

a. Description

The washer pump used on the non-depressed park wiper motor is a positive displacement type pump employing a small bellows, bellows spring and valve arrangement. The pumping mechanism is actuated by a 4 lobe cam on the end of the wiper motor output shaft. See Figure 10-8. The programming (starting and completion of a wash cycle) is accomplished electrically and mechanically by a relay assembly and ratchet wheel arrangement.

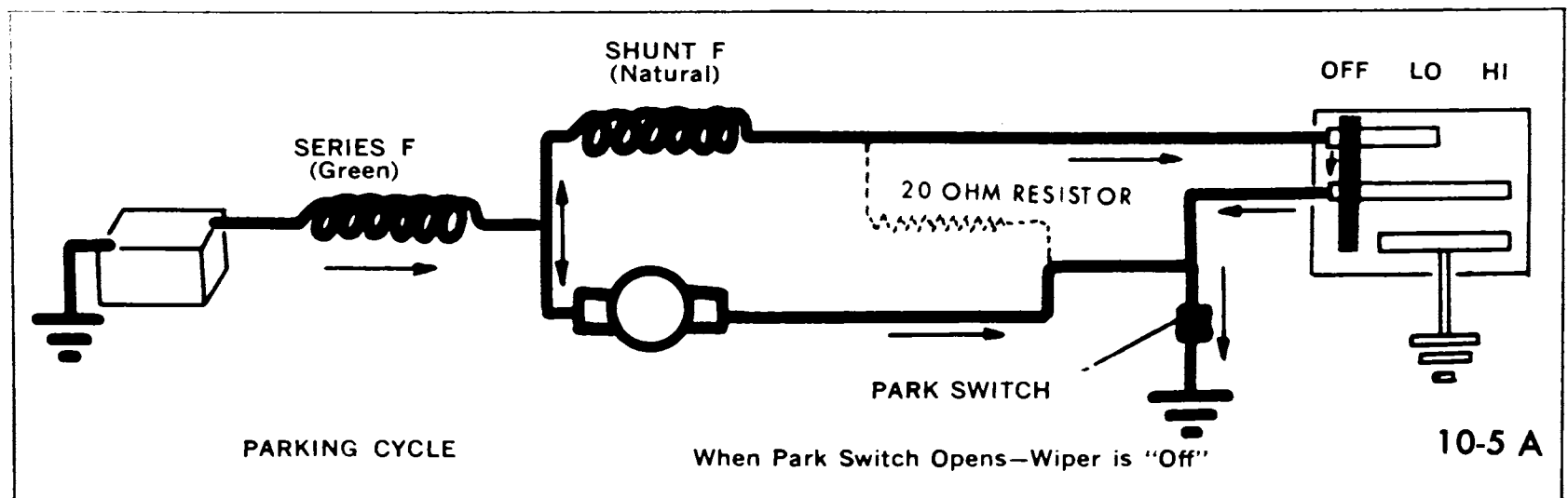


Figure 10-5-Wiring Diagram-Parking Circuit

b. Operation

1. Idling

With the washer pump mounted on the wiper motor, a cam-follower slide on the washer pump engages the 4 lobe cam on the output shaft of the wiper motor driven gear. See Figure 10-8. The cam-follower slide has a post on which is mounted the ratchet pawl and ratchet pawl spring. See Figure 10-9. Thus, with the wiper running, the 4 lobe cam rotates continuously and actuates the slide and ratchet pawl assembly back and forth in a horizontal plane. A pin, attached to the slide and ratchet pawl assembly, extends through a slot in the bellows actuator plate. This pin moves freely back and forth in the slot while the pumping mechanism is in the "lock-out" position and no pumping action occurs.

The pump is in the "lock-out" position when the relay holding contacts are open and a tang on the bellows actuator plate rests against the widest part of an eccentric ramp located on the lower surface of the ratchet wheel. The tang holds the bellows actuator plate in a retracted position (bellows spring compressed) allowing the actuator pin on the cam-follower slide and ratchet pawl assembly (Figure 10-9) to move freely back and forth in the bellows actuator plate slot and thus no pumping action occurs.

The ratchet pawl is spring loaded to hold it away from the ratchet wheel teeth until such time as the washer pump relay is energized by the instrument panel switch.

2. Turning The Washer On

Actuating the instrument panel switch to obtain washer pump operation closes the washer pump relay circuit to ground. See Figure 10-10.

NOTE:

If wiper was "OFF" the wiper switch is mechanically turned to the "ON" position when selecting washer pump operation. With the washer

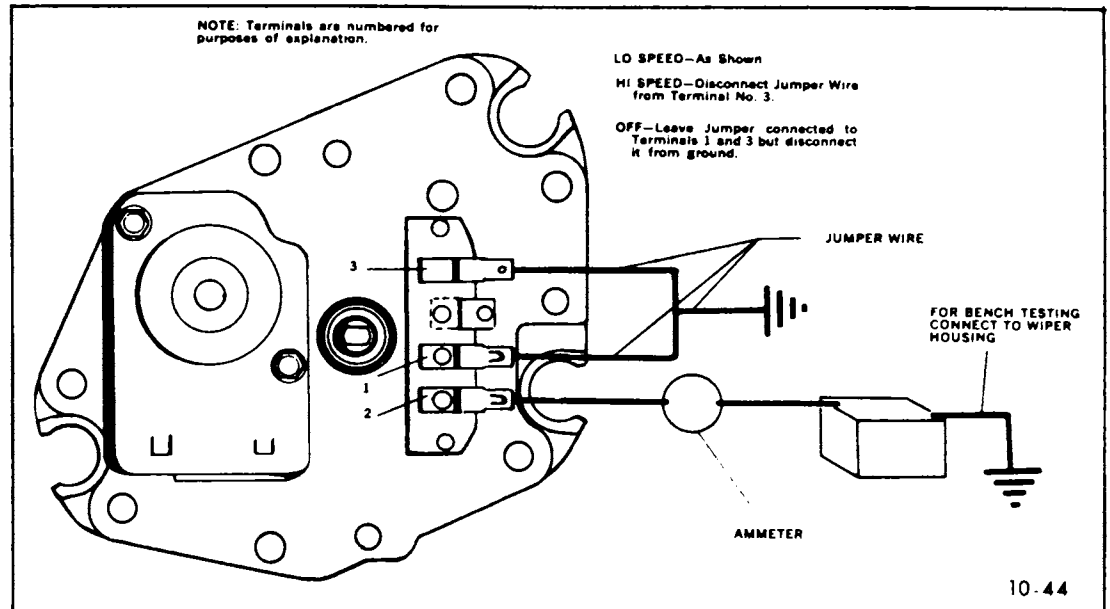


Figure 10-6-Connections to Operate Wiper Motor

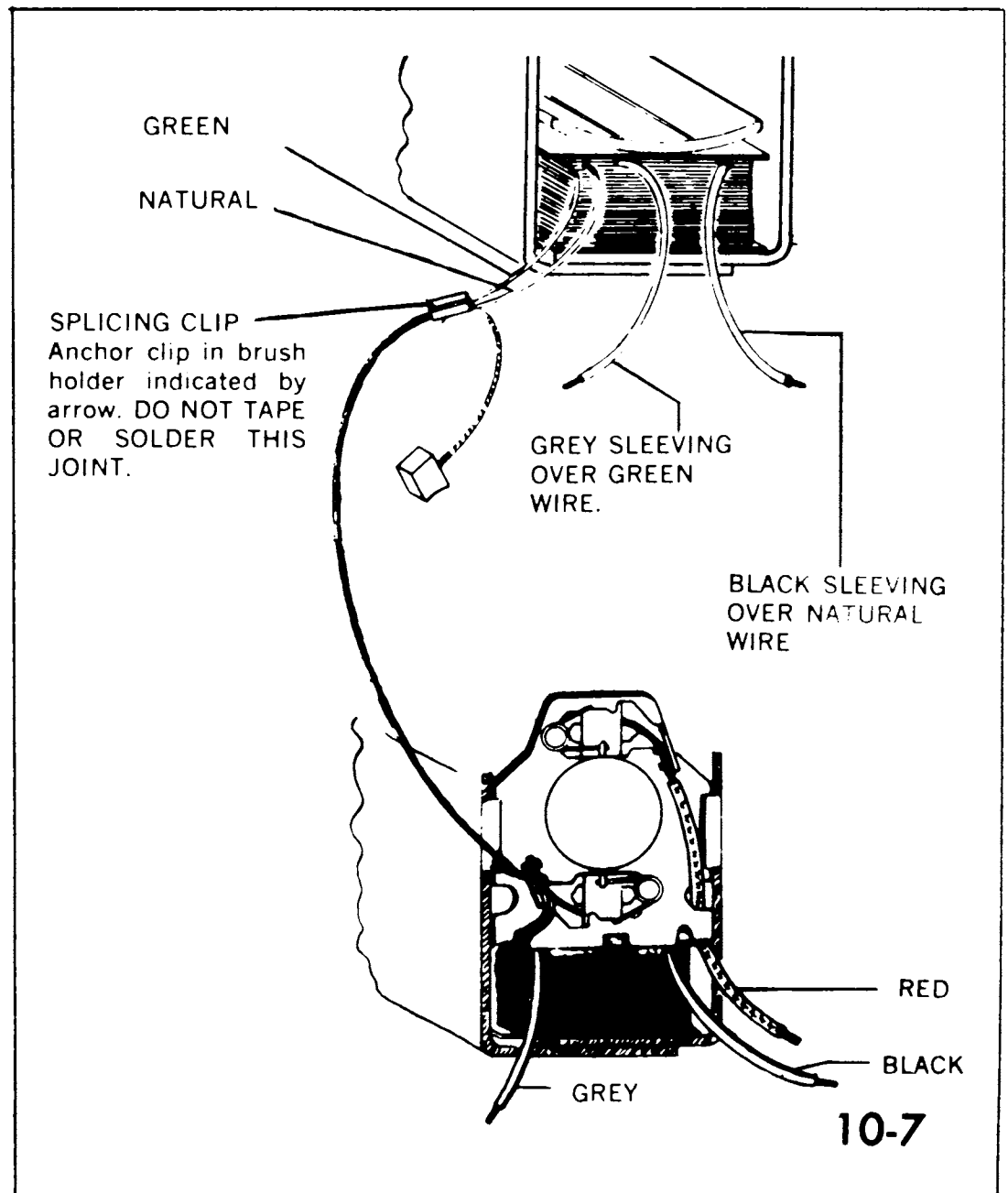


Figure 10-7-Wiper Motor Wiring



Figure 10-8-Washer Pump Drive Cam

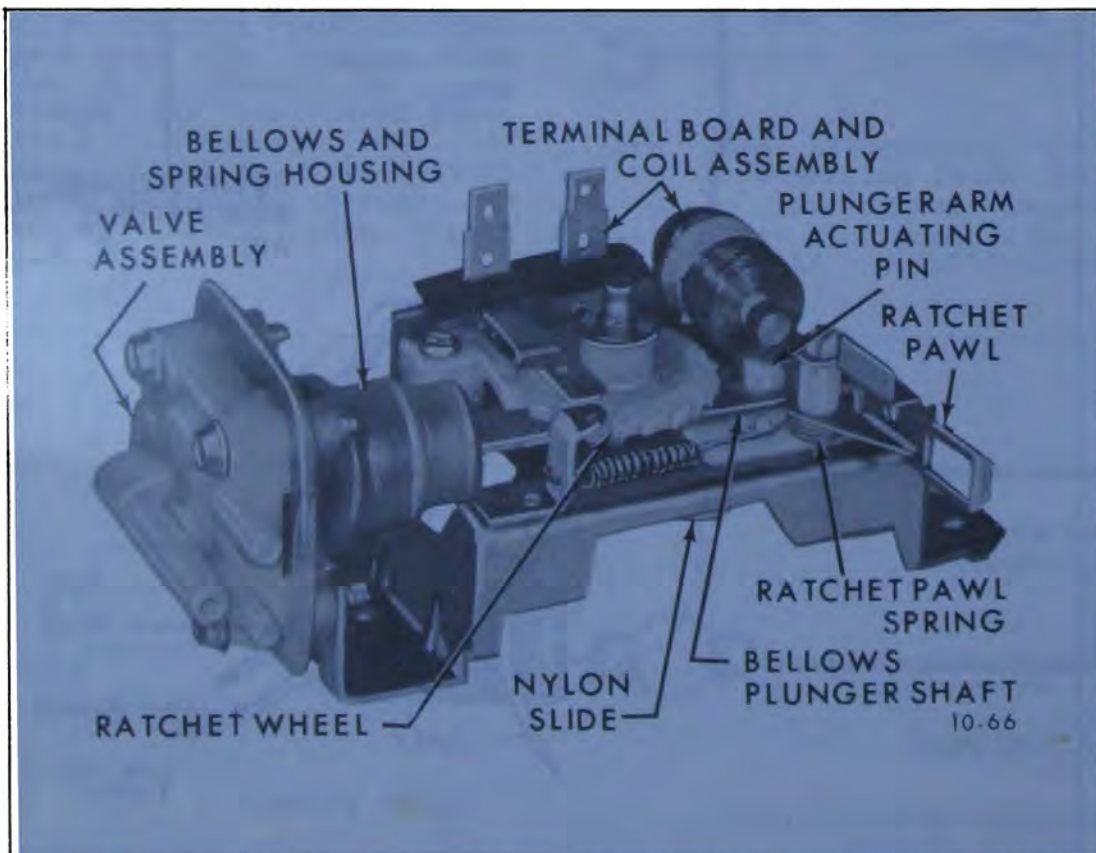


Figure 10-9-Washer Pump-Cover Removed

pump relay coil energized, the ratchet pawl, which is normally held away from the ratchet wheel by a spring, is pulled toward the coil pole and engages the ratchet wheel teeth. The ratchet pawl and plate assembly, which moves back and forth continuously when the wiper is on, now starts to rotate the ratchet wheel. See Figure 10-11.

When the ratchet wheel has been rotated one tooth, two functions occur simultaneously:

1. The eccentric ramp on the ratchet wheel is moved away from the tang, releasing the pumping mechanism from its "lock-out" position.

2. A set of holding contacts close, maintaining the coil circuit to ground. The contacts will stay closed until the ratchet wheel has been turned through 360° or 21 teeth, at which time the ratchet wheel will again open the contacts.

3. Pumping Cycle

a. Exhaust Half of Pump Stroke.

With the pumping mechanism released from its "lock-out" position, the bellows spring expands and collapses the bellows forcing water out two outlet valves. See Figure 10-12. The actuator plate, which is attached to the bellows, is pulled forward with the bellows and the back edge of the actuator plate slot moves up tight against the cam-follower actuator pin. The actuator pin, which was previously moving back and forth freely in the actuator plate slot, will now pull the actuator plate back and compress the bellows spring each time a lobe of the 4 lobe cam actuates the plate and ratchet pawl assembly.

b. Intake Half of Pump Stroke.

Pulling the actuator plate back compresses the bellows spring and water is drawn into the bellows through the intake valve. See Figure 10-13. During the intake of water, the exhaust or outlet valves

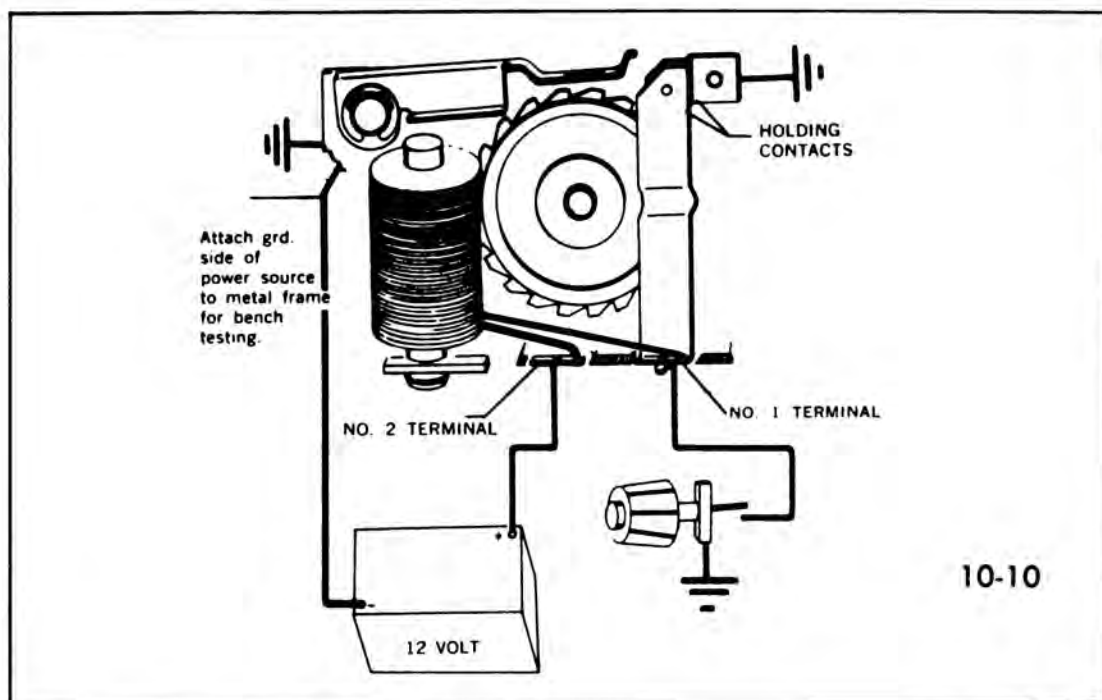


Figure 10-10-Washer Pump Wiring Diagram

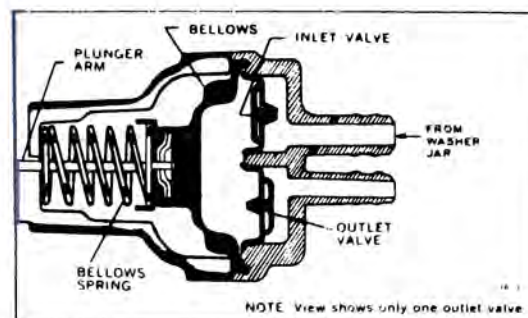


Figure 10-13-Pump Stroke (Intake)

When the ratchet wheel has been rotated through 360° or 21 teeth, the relay coil holding contacts are pushed open by a "hump" on the ratchet wheel. This opens the relay coil circuit and the spring loaded ratchet pawl moves away from the ratchet wheel preventing further rotation of the ratchet wheel.

As the ratchet wheel rotates, the tang on the bellows actuator plate starts to ride up the eccentric ramp on the lower surface of the ratchet wheel. The full "lock-out" position of the pumping mechanism is reached when the tang is up on the widest part of the ramp. The tang reaches the "lock-out" position at the same time the relay coil holding contacts open.

DIVISION III SERVICE PROCEDURES

10-4 DISASSEMBLY AND ASSEMBLY OF WIPER MOTOR

a. Disassembly of Gear Box

1. Remove washer pump drive cam as required. The cam is pressed on the shaft but can be removed using a suitable puller.

2. CLAMP CRANK ARM IN A VISE and remove crank arm retaining nut.

3. Drill out the gear box cover, staking locations using a 9/32" drill, and remove cover.

4. Remove seal cap, retaining ring and end-play washers.

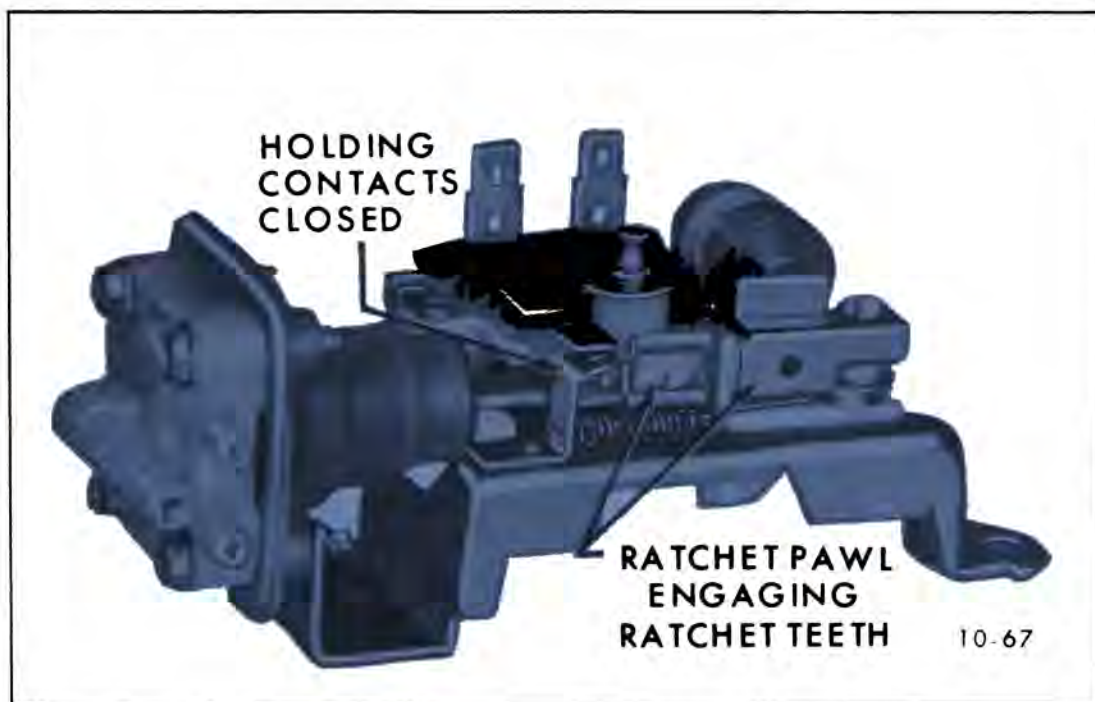


Figure 10-11-Ratchet Pawl Engaging Ratchet Wheel Teeth

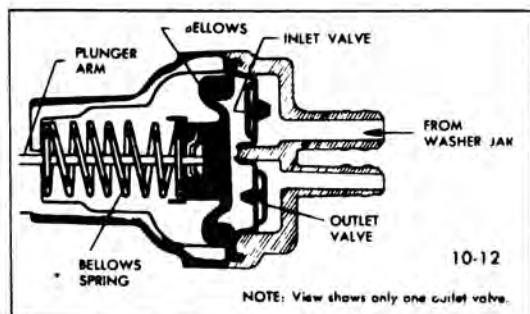


Figure 10-12-Pump Stroke (Exhaust)

are drawn tight against their seats. During each intake stroke of the pumping mechanism, the ratchet wheel is rotated one tooth.

4. Completion of Wash Cycle

The wash cycle is completed when the electrical circuit to the relay coil is opened and the pumping mechanism reaches its "lock-out" position. This is accomplished as follows:

5. Remove output gear and shaft assembly, then slide intermediate gear and pinion assembly off shaft.

6. Remove terminal board-park switch assembly as follows:

(a) Unsolder motor leads from terminals.

(b) Drill out rivets that secure terminal board-park switch ground strap to bearing plate.

NOTE:

Screws, nuts and washers for attaching a replacement terminal board-park switch assembly are included with the replacement assembly.

b. Assembly of Gear Box

1. Install new terminal board-park switch assembly, or gear train as required. See Figure 10-14.

NOTE:

If washer pump operating cam was removed, install output gear and shaft assembly in bearing plate. With threaded end of output shaft supported on a block of wood, tap cam onto shaft until cam bottoms on shaft. See Figure 10-15.

2. Install gear box cover making sure cover is located properly over alignment dimples and ground strap is located between cover and



Figure 10-15 Install Washer Pump Drive Cam

bearing plate. Replacement cover retaining bolts are available under Group 10.150.

3. Install output gear end-play washers, retaining ring and seal cap.

4. Operate wiper motor to park position and install crank arm as shown in Figure 10-16. CLAMP CRANK ARM IN A VISE and tighten retaining nut to 80 lb. in.

NOTE:

Seal cap should be cleaned and repacked with a high melting point, water proof, medium grade grease before reassembly.

c. Disassembly of Motor

1. CLAMP CRANK ARM IN A VISE and remove crank arm retaining nut.

2. Drill out the gear box cover staking locations using a 9/32" drill.

3. Remove seal cap, retaining ring and end-play washers.

4. Unsolder motor leads from terminal board.

5. Remove two end cap and frame retaining tie bolts.

6. Remove end cap and frame-field assembly with armature.

7. Remove brush springs.

8. Move brushes away from armature and slide armature out of frame-field assembly. Remove end cap from armature.

9. Remove armature end-play adjusting washers.

d. Assembly of Motor

1. Install replacement parts as required. See Figure 10-17.

2. Install armature in end cap making sure thrust plug is installed in end of armature.

3. Slide armature and end cap into the frame-field assembly.

4. Install brush springs and armature end-play adjusting washers.

5. Route motor wires through hole in bearing plate while holding previously assembled armature, end cap and frame-field assembly in a vertical position with gear end of armature up.

6. Install tie bolts. Torque to 30 lb. in.

7. Solder motor leads to terminal board.

8. Install gear box cover making sure cover is located properly over alignment dimples and ground strap is located between cover and bearing plate. Replacement

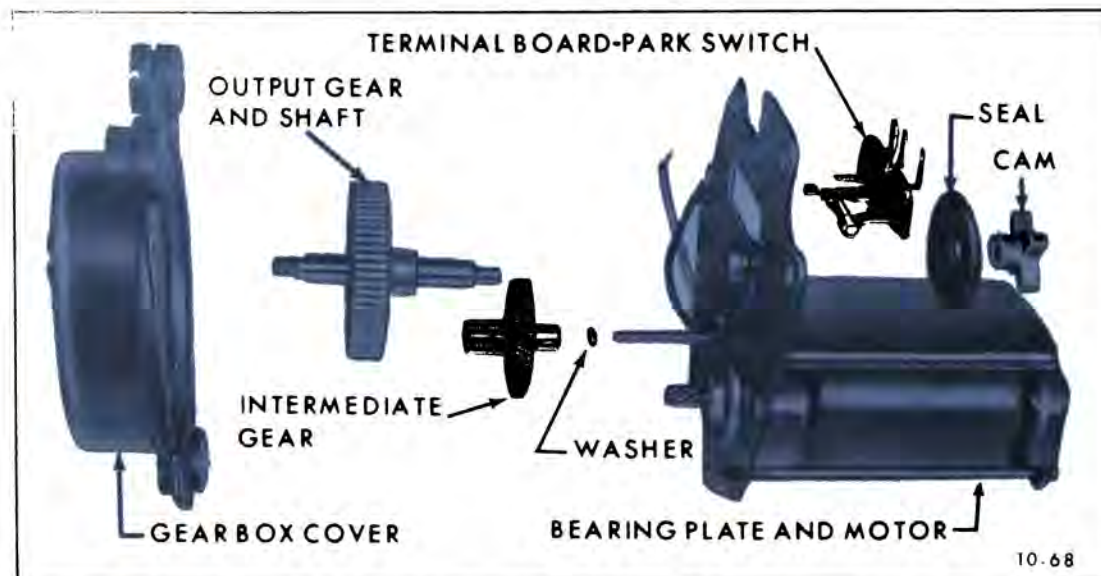


Figure 10-14 Gear Train and Terminal Board - Exploded View



Figure 10-16 Install Crank Arm on Motor

cover retaining bolts are available under Group 10.150.

9. Install output gear end-play washers, retaining ring and seal cap.

NOTE:

Seal cap should be cleaned and repacked with a high melting point, water proof, medium grade grease before reassembly.

10. Operate wiper motor to park position and install crank arm as shown in Figure 10-16. CLAMP CRANK ARM IN A VISE and tighten retaining nut to 80 lb. in.

10-5 DISASSEMBLY AND ASSEMBLY OF WASHER PUMP**a. Removal and Installation of Terminal Board-Coil Assembly**

1. Remove washer pump cover.
2. Remove ratchet dog screw.

See Figure 10-18. Remove terminal board-coil assembly.

3. To install, reverse removal procedure.

b. Removal and Installation of Ratchet Pawl

1. Remove washer pump cover.
2. Pinch ratchet pawl pivot

post together and slide pawl off.

3. To install, reverse removal procedure making sure ratchet pawl spring is properly installed. See Figure 10-9.

c. Removal and Installation of Ratchet Wheel, Bellows or Slide

1. Remove washer pump cover.
2. Remove ratchet dog screw and terminal board-coil assembly.
3. Remove ratchet wheel "E" ring and ratchet wheel.
4. Remove two screws retaining valve and bellows assembly to washer pump frame.
5. Slide valve and bellows assembly out of retaining slot in washer pump frame.
6. Hold bellows actuator plate from moving, then push in against bottom of bellows with thumb and rotate bellows 1/4 turn. This will release bellows and bellows spring.
7. Disengage slide spring and remove slide and spring.
8. To install, reverse removal procedure.

**DIVISION IV
TROUBLE DIAGNOSIS****10-6 WIPER MOTOR TROUBLE DIAGNOSIS****a. Wiper in Car**

Also see "Trouble Chart #1 - Wiper in Car"

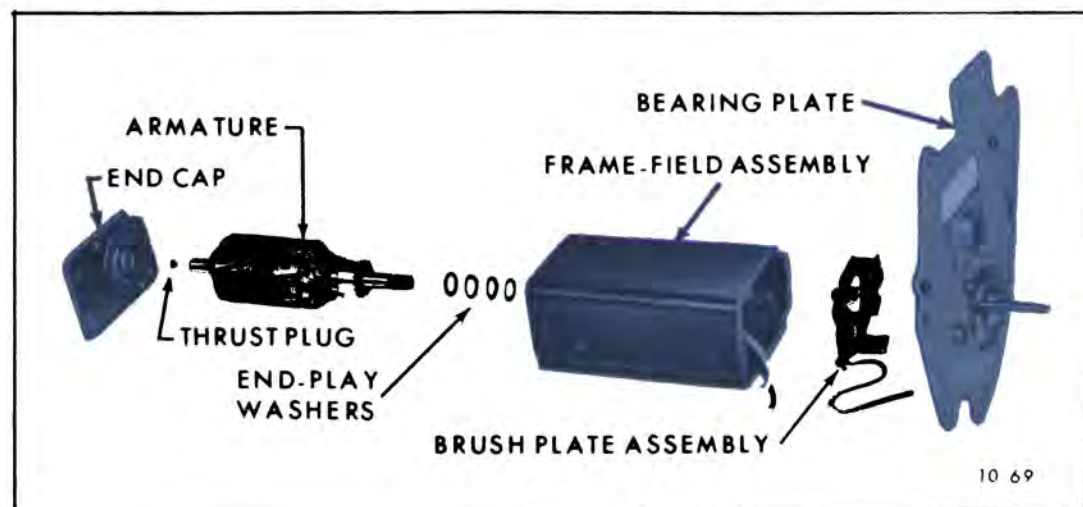


Figure 10-17 Wiper Motor-Exploded View

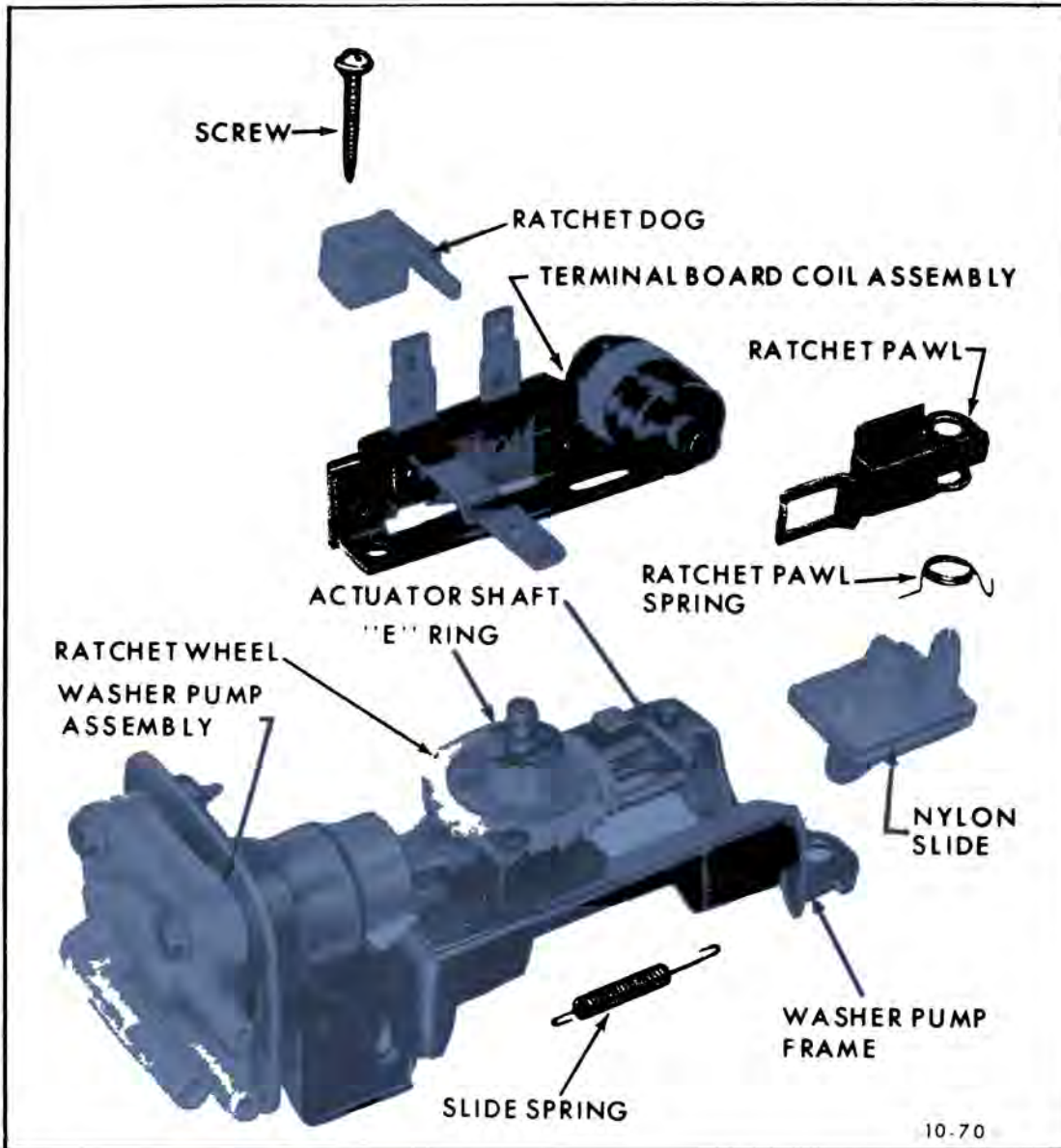


Figure 10-18 Washer Pump-Exploded View

1. Wiper Inoperative

(a) Check that wiring harness is properly connected to wiper and instrument panel switch; wiper ground strap is connected securely to car body; and instrument panel switch is securely mounted.

(b) With ignition switch ON, check for 12 volts at harness terminal that connects to number 2 terminal. See Figure 10-6.

(c) To determine if instrument panel switch or car wiring are at fault, disconnect harness from wiper motor and try operating wiper as shown in Figure 10-6. If wiper fails to operate, remove body parts as required, disconnect transmission from wiper crank arm and recheck wiper operation. If wiper still fails to perform correctly,

remove wiper from car and check wiper according to "Trouble Chart #2 - Wiper Out Of Car".

2. Wiper Will Not Shut Off

(a) Determine if wiper has both "LO" and "HI" speeds, "LO" speed only, or "HI" speed only. (Important - wiper must operate in "LO" speed during parking cycle).

(b) Disconnect wiring harness from wiper motor and try operating wiper independent of instrument panel switch as shown in Figure 10-6. If wiper operates correctly, independent of the instrument panel switch, (i.e. shuts off correctly with crank arm in park position) refer to "Trouble Chart #1 - Wiper in Car" for possible trouble location.

If wiper still fails to operate correctly in Step (b), remove it from car and check wiper according to "Trouble Chart #2 - Wiper Out of Car".

3. Wiper Has One Speed - Fast Check for a defective instrument panel switch or open lead between terminal Number 3 and instrument panel switch.

4. Wiper Has One Speed (Slow) and Shuts "OFF" With Instrument Panel Switch in "HI" Speed Position.

Reverse harness leads that connect to wiper motor terminals 1 and 3.

5. Blades Do Not Return to Park Position When Wiper is Turned "OFF".

(a) Check wiper ground strap connection to car body.

(b) Remove wiper from car and check for dirty, bent or broken park switch contacts.

6. Wiper Speed Normal In "LO" But Too Fast In "HI".

Remove wiper from car and check for an open terminal board resistor.

7. Intermittent Operation.

Check for loose wiper ground connections.

b. Wiper Out-of-Car

Also see "Trouble Charts #2 - Wiper Out of Car"

It is assumed that in many cases there is no information available to the repairman about the original wiper complaint. It is necessary, therefore, that wiper operation be checked according to the instructions shown in Figure 10-6.

IMPORTANT:

Be sure to use an ammeter capable of reading at least 30 amperers in the feed wire circuit.

1. Wiper Inoperative.

Connect wiper to operate in "LO" speed and observe current draw. Current draw ratings

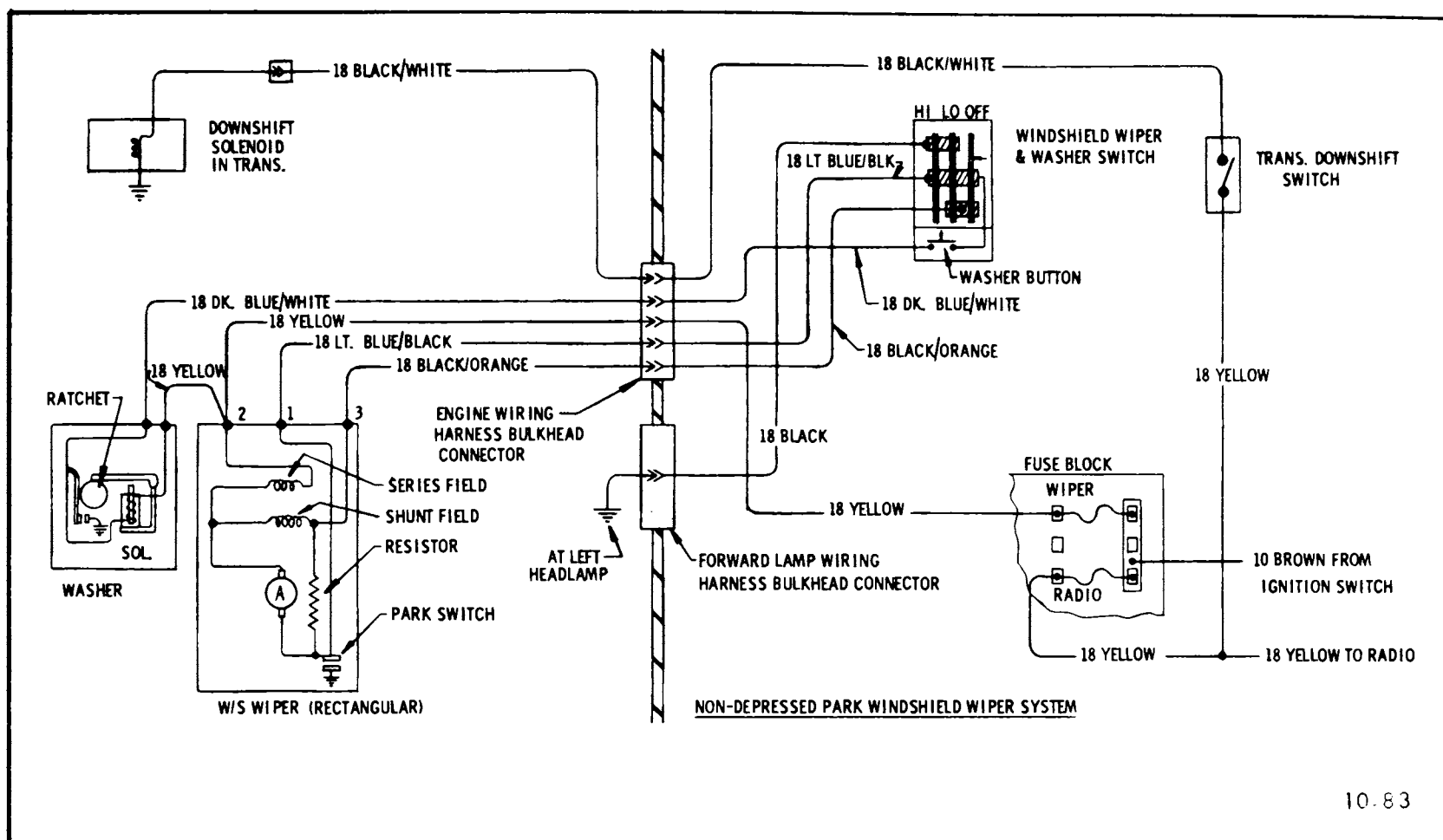


Figure 10-19 Windshield Wiper and Washer Pump Wiring Circuit Diagram

shown in "Trouble Chart #2 Wiper Out of Car" item #1, will provide a hint as to the possible source of trouble.

2. Wiper Has "LO" Speed Only.

See "Trouble Chart #2 - Wiper Out of Car, Item #2.

3. Wiper Has "HI" Speed Only.

See "Trouble Chart #2 - Wiper Out of Car, Item #2.

4. Wiper Crank Arm Does Not Return to Park Position When Wiper is Turned Off.

Park Position is shown in Figure 10-16. Check for dirty, bent or broken park switch contacts.

5. Wiper Speed Normal In "LO" But Too Fast In "HI".

Check for open terminal board resistor.

6. Intermittent Operation.

Check for sticking brushes, loose splice joints, etc.

10-7 WASHER PUMP TROUBLE DIAGNOSIS

a. Washer Pump Installed on Car

1. Check the following items:

(a) Jar has adequate quantity of water solution.

(b) Hoses are not damaged and hose connections are tight.

(c) Screen on end of jar cover hose is not plugged.

(d) Electrical connections to washer pump and instrument panel switch.

(e) Nozzles are not plugged.

2. If all items in Step 1 check properly, start wiper motor only, then operate washer pump switch and listen for "click" as washer pump relay pulls in. If no "click" is heard, check for 12 volts at terminal without tab. No voltage indicates defective wiring. If "click" is heard, proceed to Step 4.

3. If correct voltage was found in Step No. 2, connect a

jumper wire from terminal with tab to ground and operate wiper. If washer relay "click" is heard and pump functions correctly, a defective instrument panel switch or an open circuit between washer pump and instrument panel switch is indicated - No "Click" indicates an open relay coil.

4. If relay "click" is heard in Step 2, listen for the "soft clicking" as the pump ratchet wheel is rotated.

If "soft clicking" is not heard, the pump mechanism is faulty and should be removed from the wiper motor and checked.

If "soft clicking" is heard, but no pumping action occurs, replace the valve assembly and recheck pump.

b. Washer Pump Removed from Car

1. Remove washer pump cover and connect 12 volt power supply to washer pump as shown in Figure 10-10. Connect

10-12 TROUBLE DIAGNOSIS**WINDSHIELD WIPER AND WASHER**

jumper wire from terminal No. 1 to ground. Turn ratchet pawl to the position shown in Figure 10-10. Ratchet pawl should be pulled toward relay coil pole and engage ratchet teeth.

Failure to do as described above indicates an open relay coil.

2. If relay and ratchet pawl perform correctly in Step 1, manually rotate the cam 1 lobe in a clockwise direction (looking at the cam). Observe if relay holding contacts close (Figure 10-11) and the bellows actuator plate is released from its lock-out position.

3. Disconnect jumper wire from terminal No. 1. Relay coil should remain energized and hold ratchet pawl against ratchet wheel. Failure to do so indicates open or dirty holding contacts.

4. If pump performs correctly in Step 3, manually operate cam-follower until ratchet wheel has been turned through 360° or 21 teeth. After ratchet wheel has been rotated 21 teeth, holding contacts should be opened by a "hump" on the ratchet wheel and the bellows actuator plate should be in the "lock-out" position.

c. Checking Valve Assembly

1. Attach a hose to large or intake pipe. You should be able to blow through it but not draw through it.

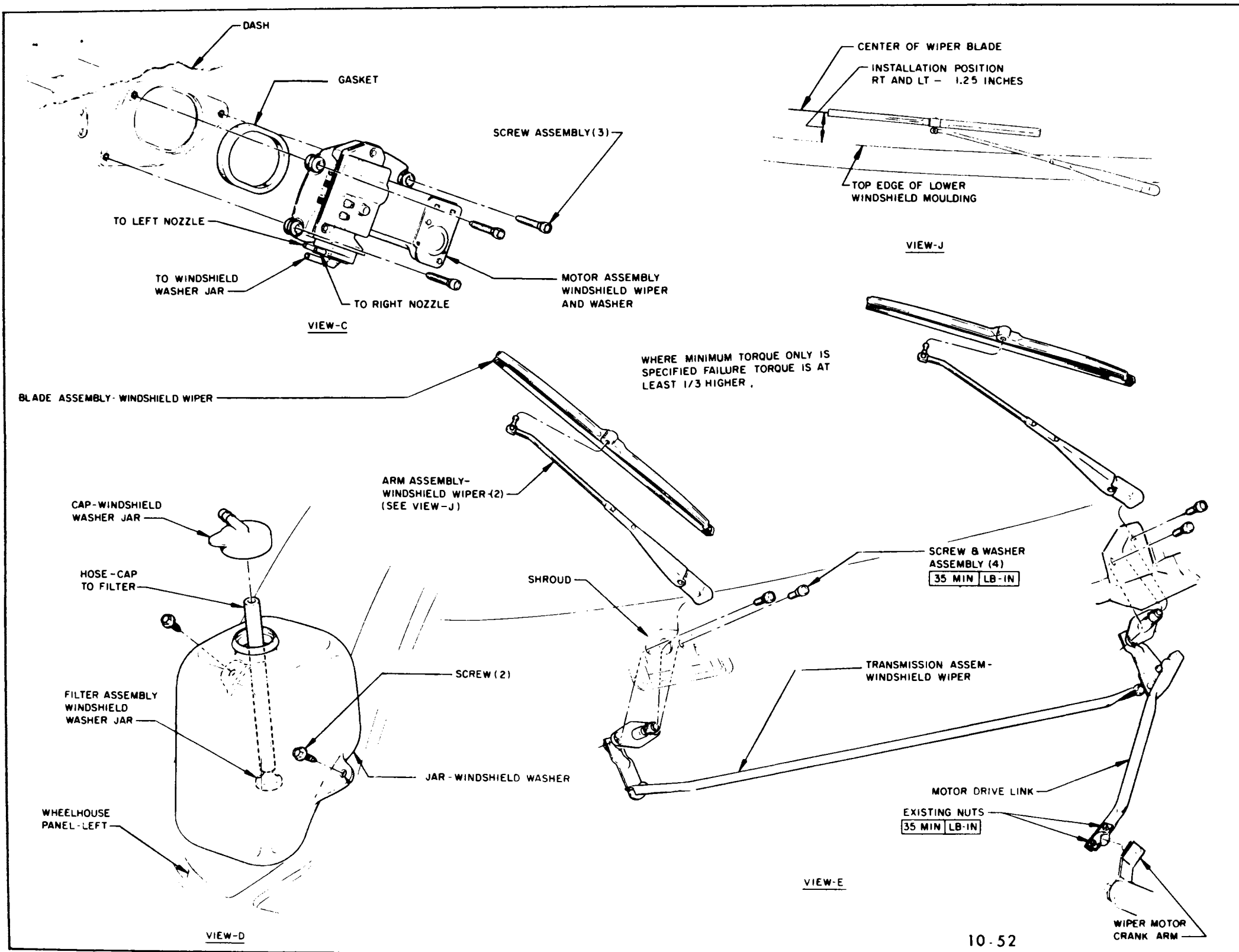
2. Attach a hose individually to each small or exhaust pipe. You should be able to draw through them but not blow through them.

If any of the three valves allow air to pass in both directions, valve assembly is defective and must be cleaned or replaced.

TROUBLE CHART #1 - WIPER IN CAR	
Wiper Will Not Shut Off And:	Possible Trouble
Wiper has both speeds.	(1) Lead between wiper terminal No. 1 and instrument panel switch grounded. (2) Defective instrument panel switch.
Wiper has "Lo" speed only.	(1) Lead between wiper terminal No. 3 and instrument panel switch grounded. (2) Defective instrument panel switch.
Wiper has "Hi" speed only.	(1) Lead between wiper terminal and instrument panel switch open. (2) Defective instrument panel switch.
TROUBLE CHART #2 - WIPER OUT OF CAR	
1. Ammeter Reading (Amps)	Possible Trouble
0	(1) Loose solder connection at wiper terminal No. 2 (2) Loose splice joints or brush lead connections.
1-1.5	(1) Open armature. (2) Brushes sticking. (3) Loose splice joint.
11.0	(1) Broken gear or some other condition that will stall the wiper.
2. Wiper will not shut off and:	Possible Trouble
Wiper has both speeds.	(1) Park switch contacts not opening. (2) Internal wiper motor lead that connects to wiper terminal No. 1 grounded.
Wiper has "Lo" speed only.	(1) Internal wiper motor lead that connects to wiper terminal No. 3 grounded. (2) Shunt field coil grounded.
Wiper has "Hi" speed only.	(1) Internal wiper motor lead that connects to wiper terminal No. 3 open. (2) Shunt field open

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Figure 10-20 Trouble Diagnosis Charts



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Figure 10-21 Windshield Wiper Installation

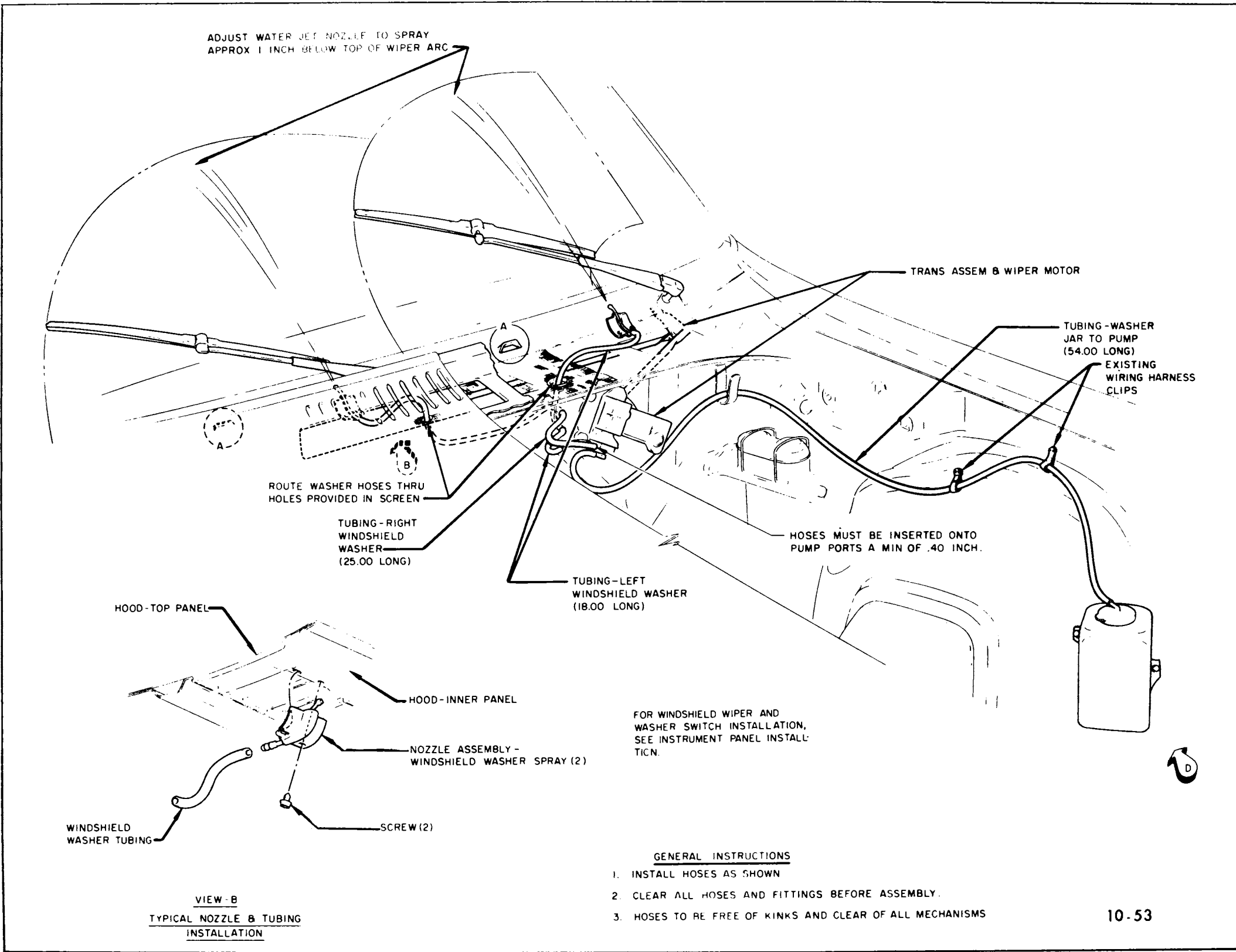


Figure 10-22 Windshield Washer Hose Installation Wiper in Car"