

# SECTION A

## WINDSHIELD WIPER AND WASHER SYSTEM (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. See Figure 10-3.

##### 2. Hi Speed Circuit

Moving the wiper switch to the "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

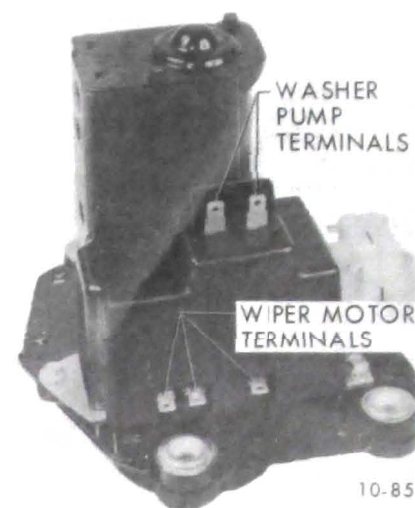


Figure 10-1 - Windshield Wiper Motor and Washer Pump

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.

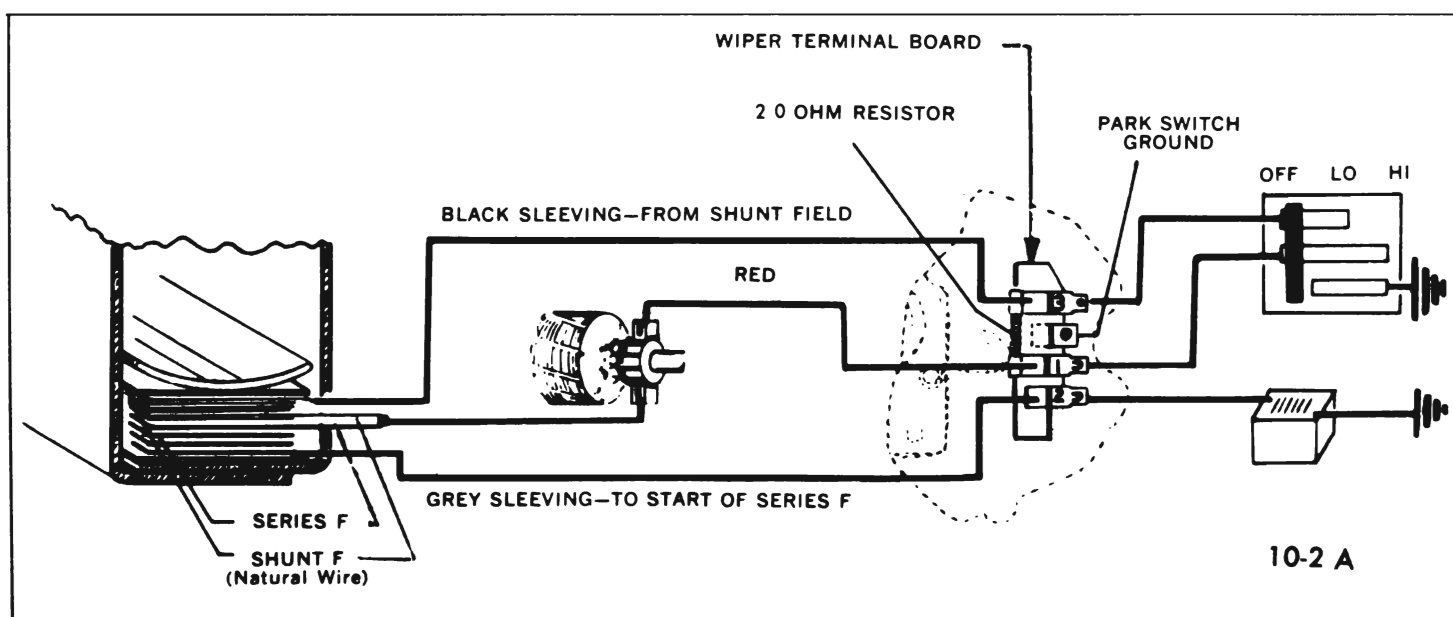


Figure 10-2 - Wiper Motor Wiring Diagram

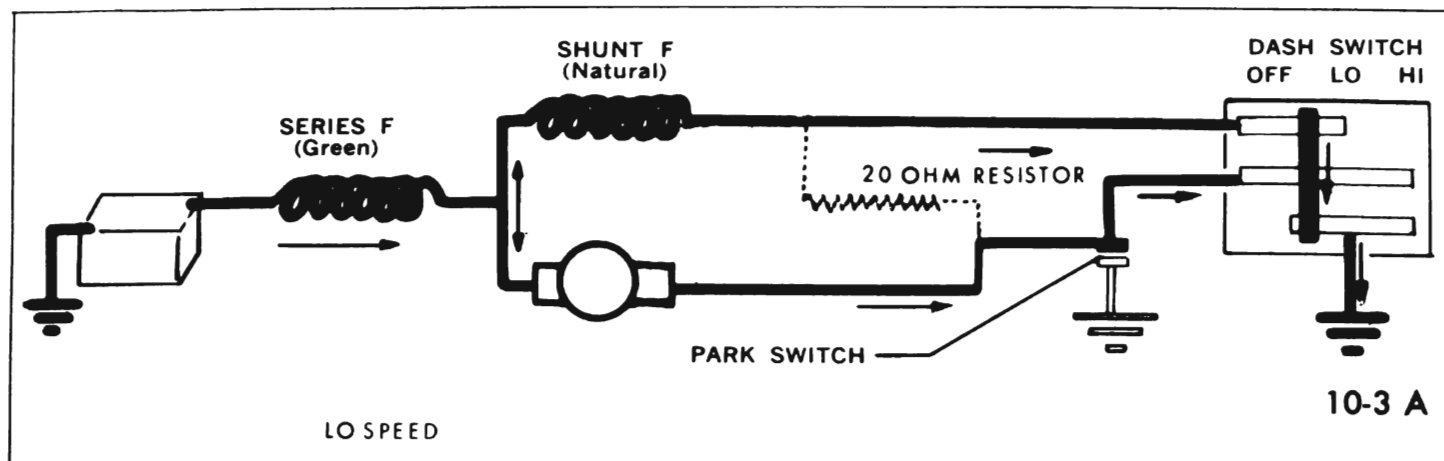


Figure 10-3 - Wiring Diagram - Lo Speed Circuit

### 10-3 WASHER PUMP DESCRIPTION AND OPERATION

#### a. Description

The non-depressed park wiper motor uses a piston type washer pump consisting of a plastic cylinder housing containing a piston. The piston type pump provides high pressure and adequate volume.<sup>9</sup> See Figure 10-6.

#### b. Operation

##### 1. Wiper Motor On - Washer Pump Off

(a) A four lobe nylon cam assembled on the output shaft of the wiper

motor powers the washer pump mechanism. This cam rotates whenever the wiper motor is running. See Figure 10-7.

(b) When the pump is attached to the wiper motor, the four lobe cam actuates a spring loaded cam follower arm and pin assembly (Figure 10-8 has the pump tilted back to show the relationship of cam follower lower pin to four lobe cam.)

(c) The cam follower actually has two pins - an upper and lower. The lower or bottom pin is actuated by the four lobe cam. The upper pin, which extends thru an elongated opening in the piston actuator plate has a ratchet pawl assembled on it. See Figure 10-9.

(d) Thus, whenever the wiper motor is running, the four lobe cam is rotating and in turn actuates the cam follower assembly. However, no pumping action occurs because the washer pump pumping mechanism is held in a "lock-out" position.

##### 2. Pumping Mechanism "Lock-Out" Position

Referring to Figure 10-9, note that the piston actuator plate has a tang that is pushing against a cam on the lower surface of the ratchet wheel. This tang holds the spring loaded piston actuator plate in a retracted position. With the actuator plate held in a retracted position, the cam follower upper pin will merely move back and forth in the actuator plate

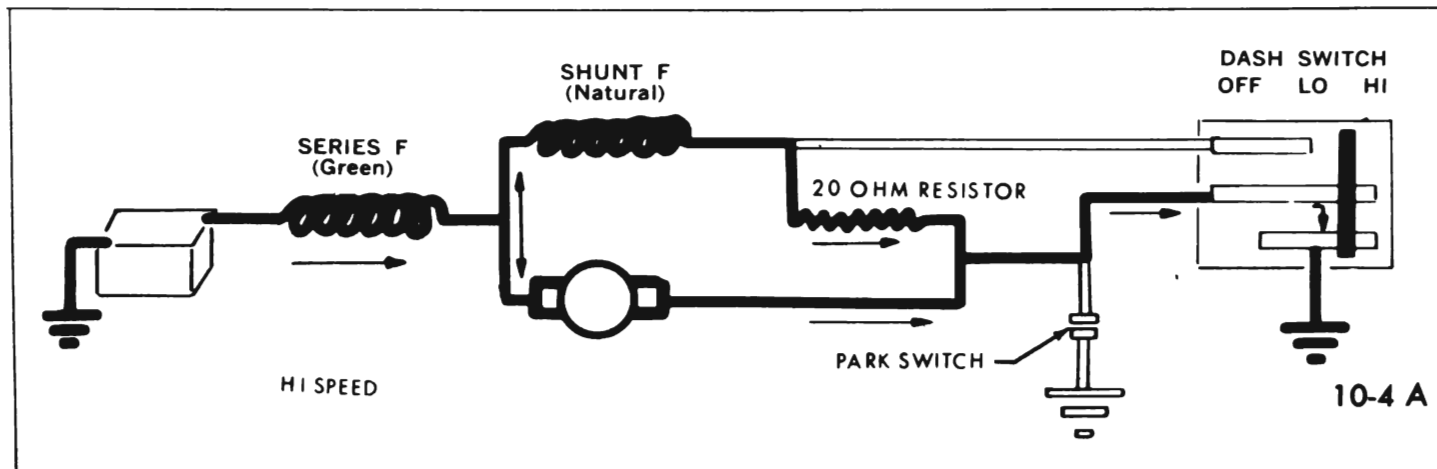


Figure 10-4 - Wiring Diagram - Hi Speed Circuit

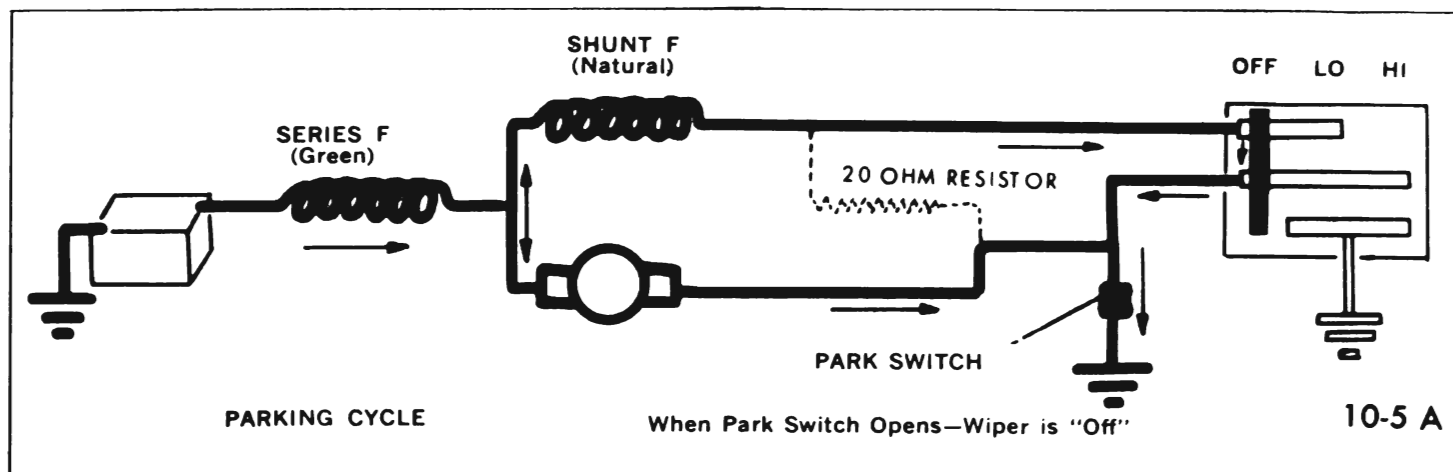


Figure 10-5 - Wiring Diagram -  
Parking Circuit

elongated opening and no pumping action occurs. Note that the ratchet pawl is held away from the ratchet wheel by a spring loaded solenoid plunger.

### 3. Starting The Wash Cycle

Depressing the dash switch washer

button completes the pump solenoid circuit to ground at the dash switch and mechanically actuates the wiper switch to turn the wiper motor on.

With the coil energized, the solenoid plunger is pulled toward the coil and this allows the ratchet pawl to engage the ratchet wheel teeth.

(Keep in mind that the ratchet pawl moves back and forth when the wiper is on).

Thus when the ratchet pawl engages the ratchet wheel teeth, it will start to rotate the ratchet wheel. Each stroke of the ratchet pawl rotates the wheel one tooth.

The first stroke of the ratchet pawl rotates the ratchet wheel one tooth and accomplishes the following functions:

(a) The "lock-out" cam on the lower surface of the ratchet wheel is moved away from the tang on the

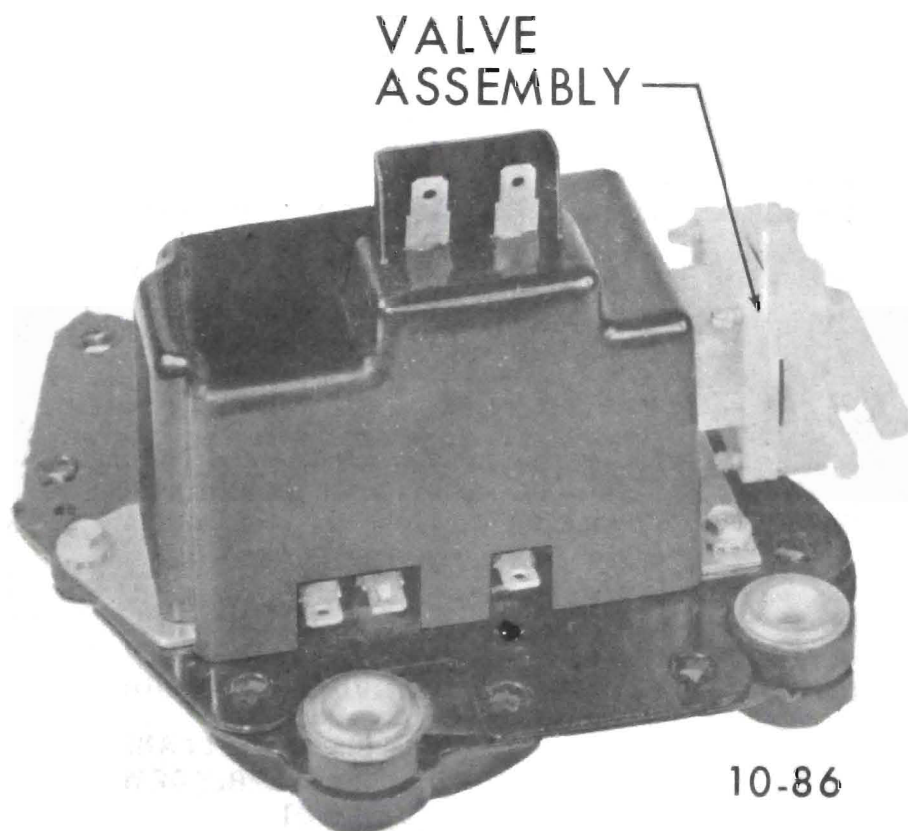


Figure 10-6 - Washer Pump

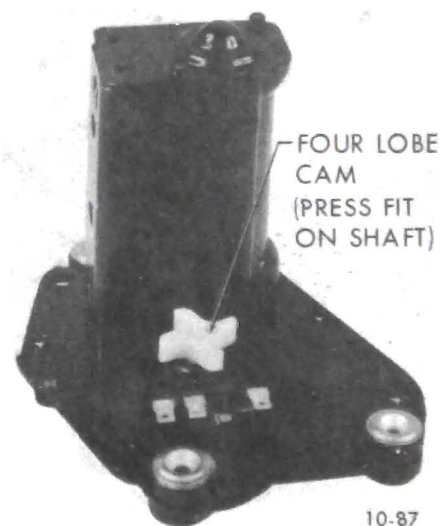


Figure 10-7 - Washer Pump Cam

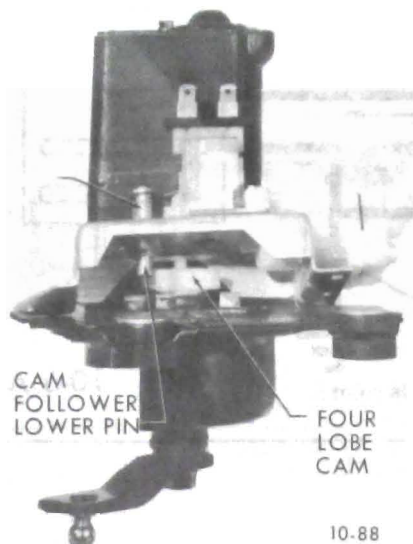


Figure 10-8 - Cam Follower Pin Engaging Cam

piston actuator plate releasing the pumping mechanism from the "lock-out" position.

When the piston actuator plate is released from the "lock-out" position the piston spring, which had

been held in a compressed position, expands pushing the piston toward the valve assembly resulting in the first exhaust stroke. The movement of the piston toward the valve assembly also pulls the piston actuator plate in the same direction causing the back edge of the elongated opening in the actuator plate to move up tight against the upper cam follower pin. Refer to Figure 10-10.

(b) Rotating the ratchet wheel one tooth from the "lock-out" position also maintains the solenoid plunger in the coil energized position. The plunger will be held in this position until the ratchet wheel has been rotated 360° or 12 teeth.

#### 4. Intake Stroke

The continuing rotation of the four lobe cam actuates the pumping mechanism as follows: As each lobe actuates the cam follower, the cam follower in turn moves the piston actuator plate and piston away from the valve assembly compressing the piston spring. The movement of the

piston away from the valve assembly creates a vacuum in the piston cylinder which draws the wash solution into the piston cylinder thru the intake valve. See Figure 10-11.

#### 5. Exhaust Stroke

As the high point of each lobe passes the cam follower lower pin, the piston spring is allowed to expand forcing the piston toward the valves. The movement of the piston toward the valves forces the wash solution out the two exhaust valves to the spray nozzles. See Figure 10-10.

The intake and exhaust strokes occur four times for each revolution of the wiper motor output gear. During each intake stroke the ratchet wheel is rotated one tooth.

#### 6. Completion of the Wash Cycle

The pumping operation is completed automatically when the ratchet wheel has been rotated thru 360° or 12 teeth.

After the ratchet wheel has been rotated thru 12 teeth two simultaneous functions are accomplished.

(a) The spring loaded solenoid plunger pushes thru an opening in the rim of the ratchet wheel. As the plunger moves thru the opening it pushes the ratchet pawl away from the ratchet teeth.

(b) The ramp on the lower surface of the ratchet wheel has moved to a position where it is holding the piston actuator plate in a lock-out position.

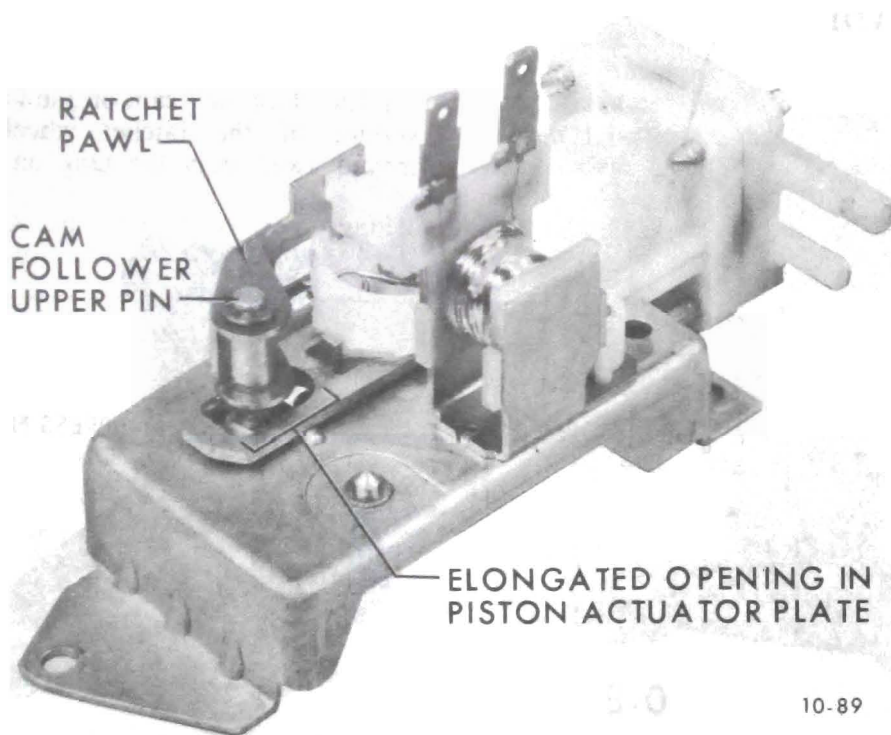


Figure 10-9 - Upper Cam Follower Pin

### DIVISION III

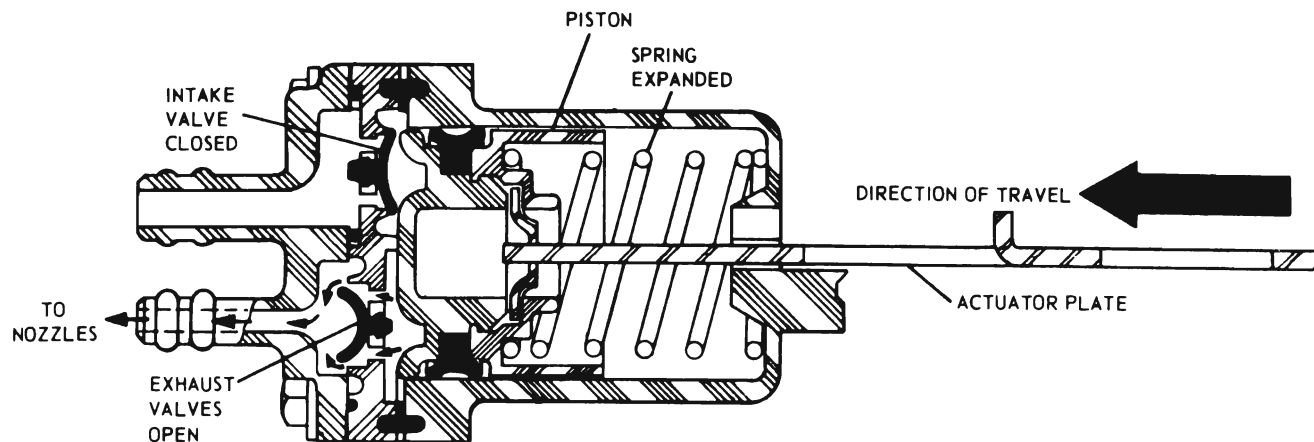
## SERVICE PROCEDURES

### 10-4 DISASSEMBLY AND ASSEMBLY OF WIPER MOTOR

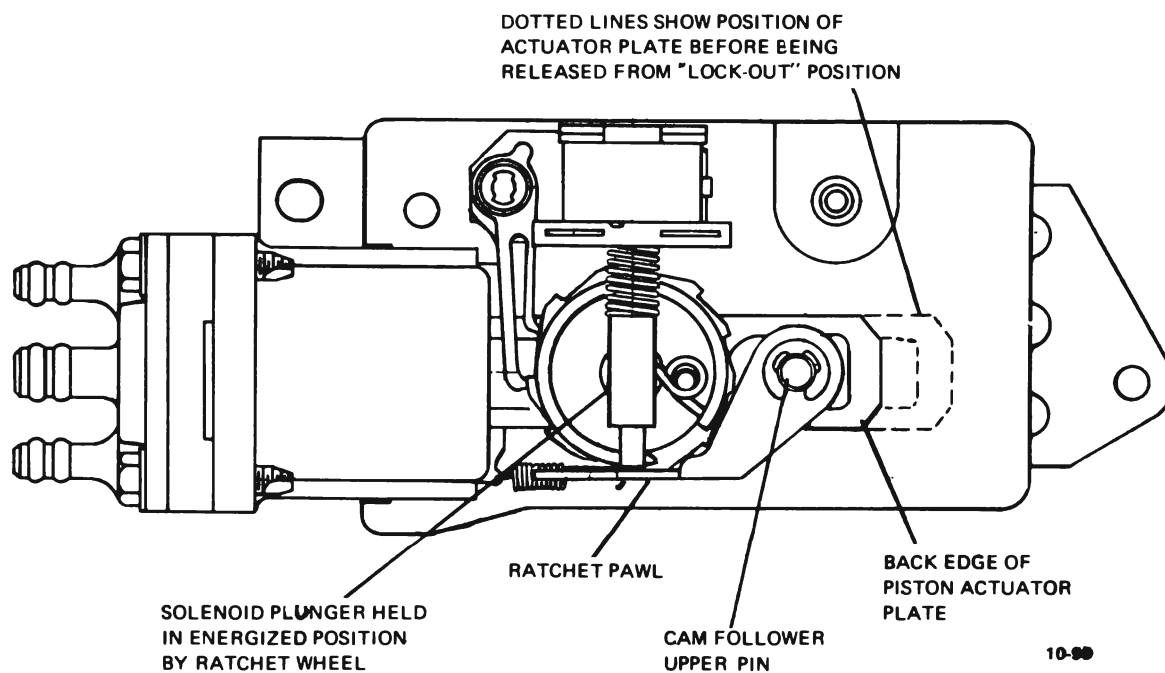
#### a. Disassembly of Gear Box

##### 1. Remove washer pump drive cam



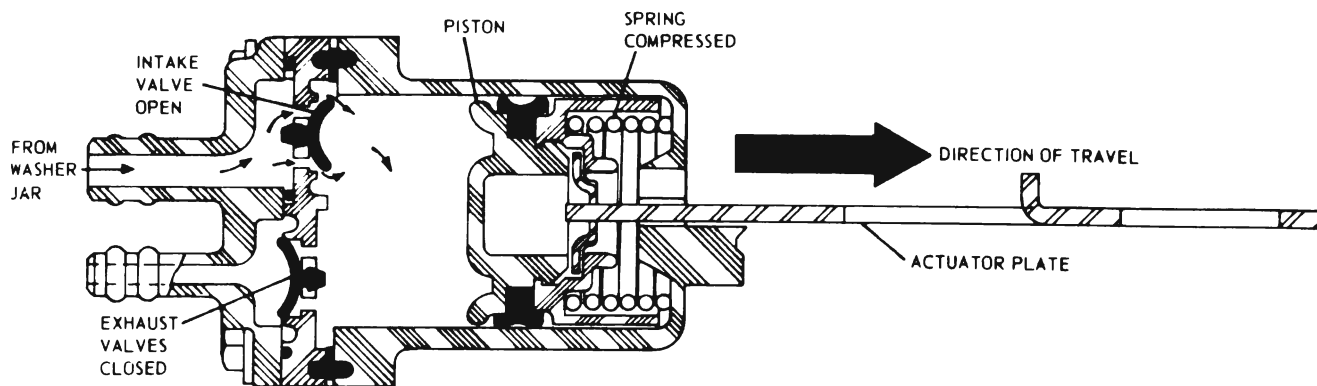


## EXHAUST STROKE



10-90

Figure 10-10 - Exhaust Stroke



## INTAKE STROKE

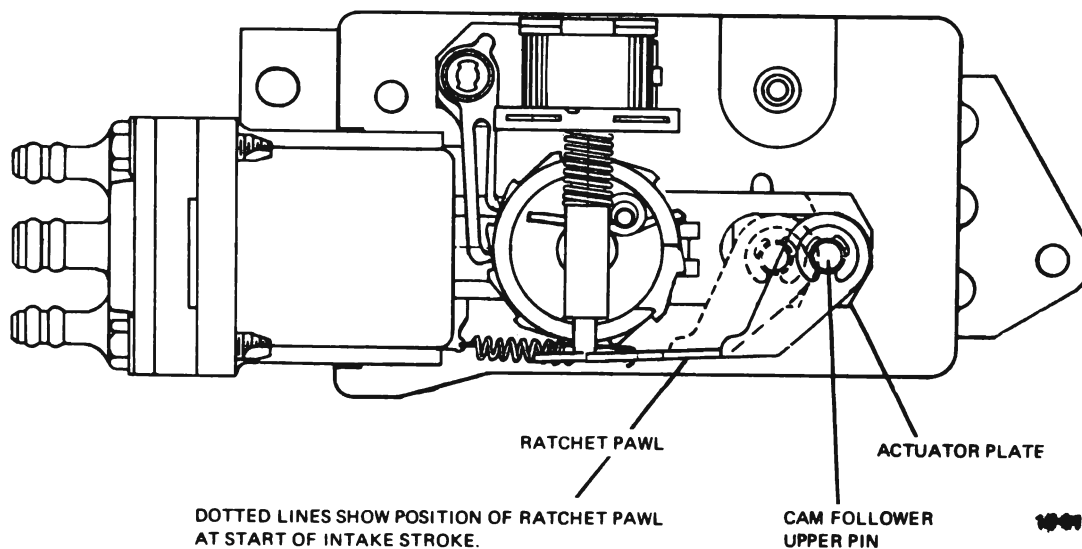


Figure 10-11 - Intake Stroke

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.

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 10-12.

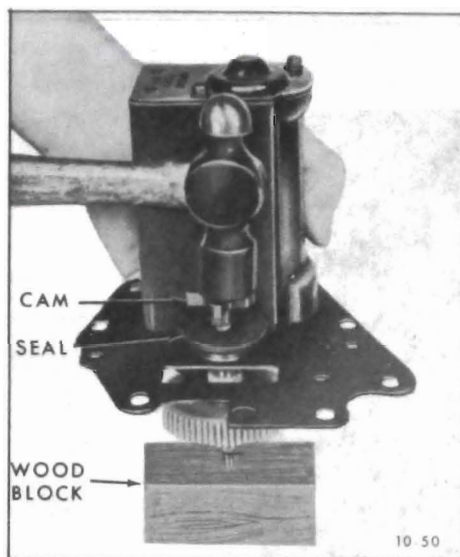


Figure 10-13 - Install Washer Pump Drive Cam

**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 10-13.**

2. Install gear box cover making sure cover is located properly over alignment dimples and ground strap is located between cover and 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 10-14. 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 clamp, retaining ring and end-play washers.

4. Unsolder motor leads from terminal board.

5. Remove two end cap and frame retaining through 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

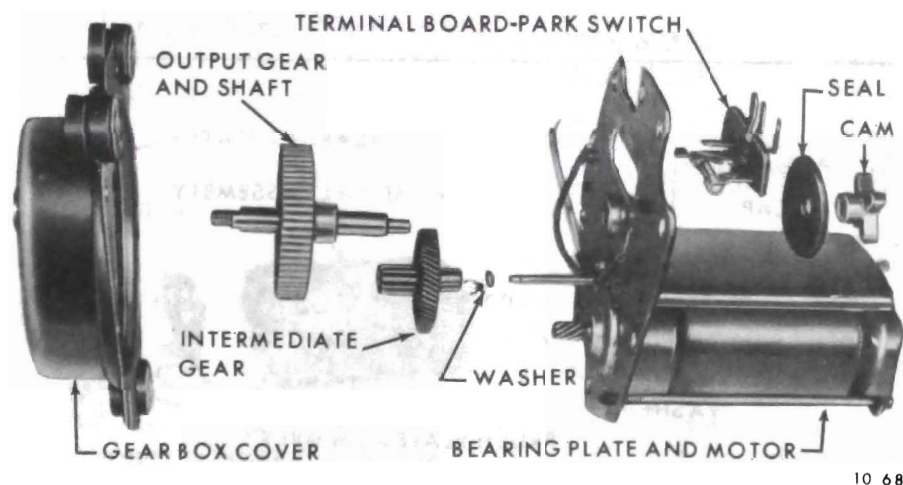


Figure 10-12 - Gear Train and Terminal Board - Exploded View



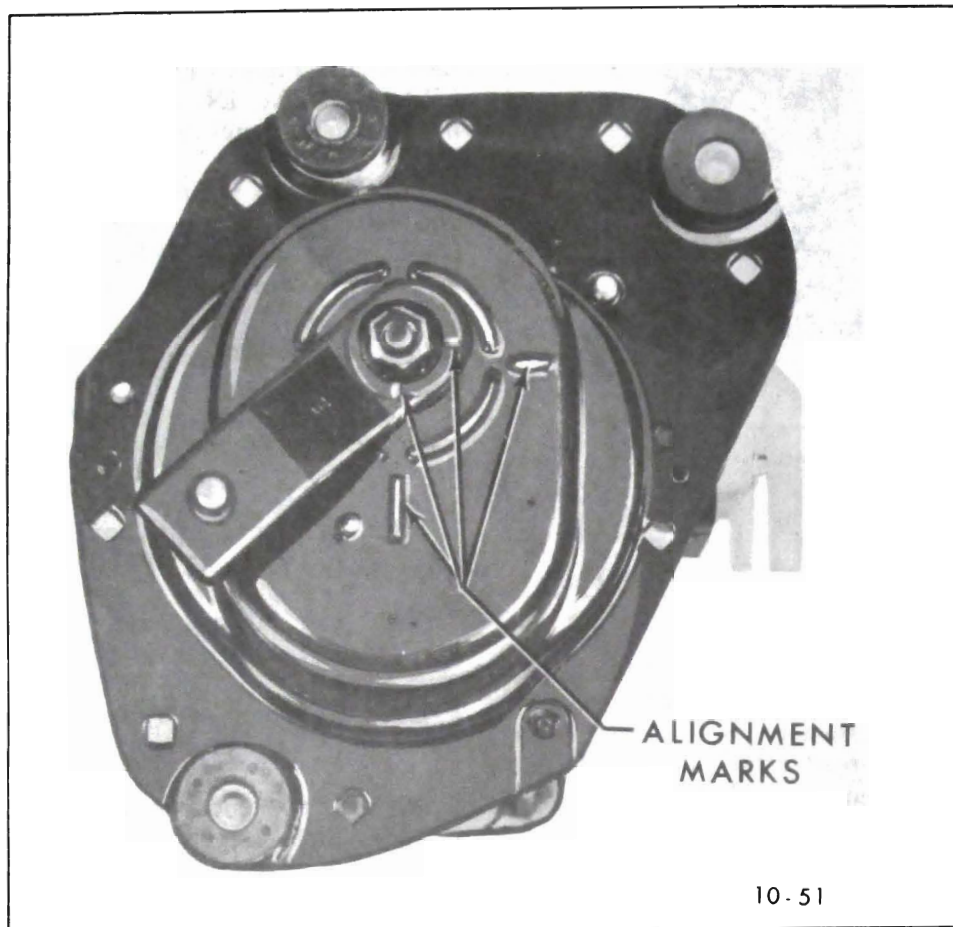


Figure 10-14 - Install Crank Arm on Motor

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 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. Solenoid and Ratchet Dog

1. Remove the ratchet dog retaining screw. Hold the spring loaded solenoid plunger in position and carefully lift the solenoid assembly and ratchet dog off the frame of the pump. See Figure 10-16.

2. Separate the ratchet dog from solenoid mounting plate as required.

### b. Ratchet Pawl

1. Disconnect ratchet pawl spring.

2. Remove ratchet pawl retaining ring and slide ratchet pawl off cam follower shaft.

### c. Ratchet Wheel

1. Follow step 1 under solenoid - ratchet dog disassembly.

2. Move ratchet wheel spring out of shaft groove and slide ratchet wheel off its shaft.

### d. Pump and Actuator Plate

1. Remove solenoid assembly - ratchet dog, ratchet pawl and ratchet wheel as outlined in their respective procedures.

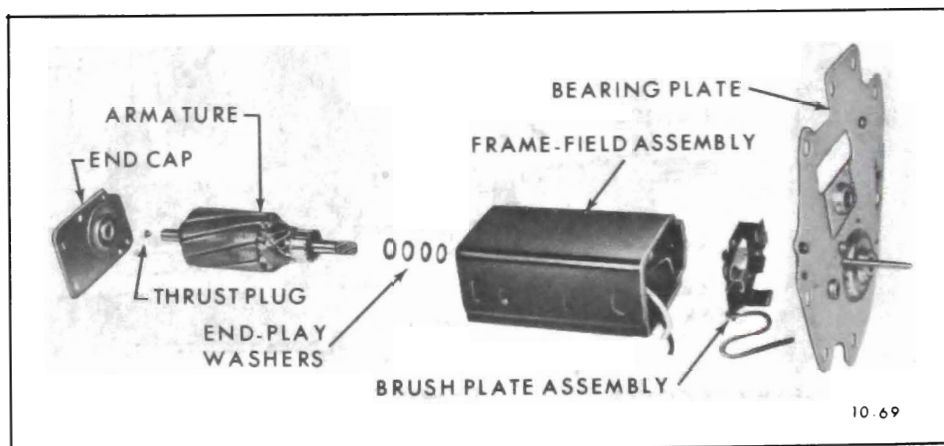


Figure 10-15 - Wiper Motor - Exploded View

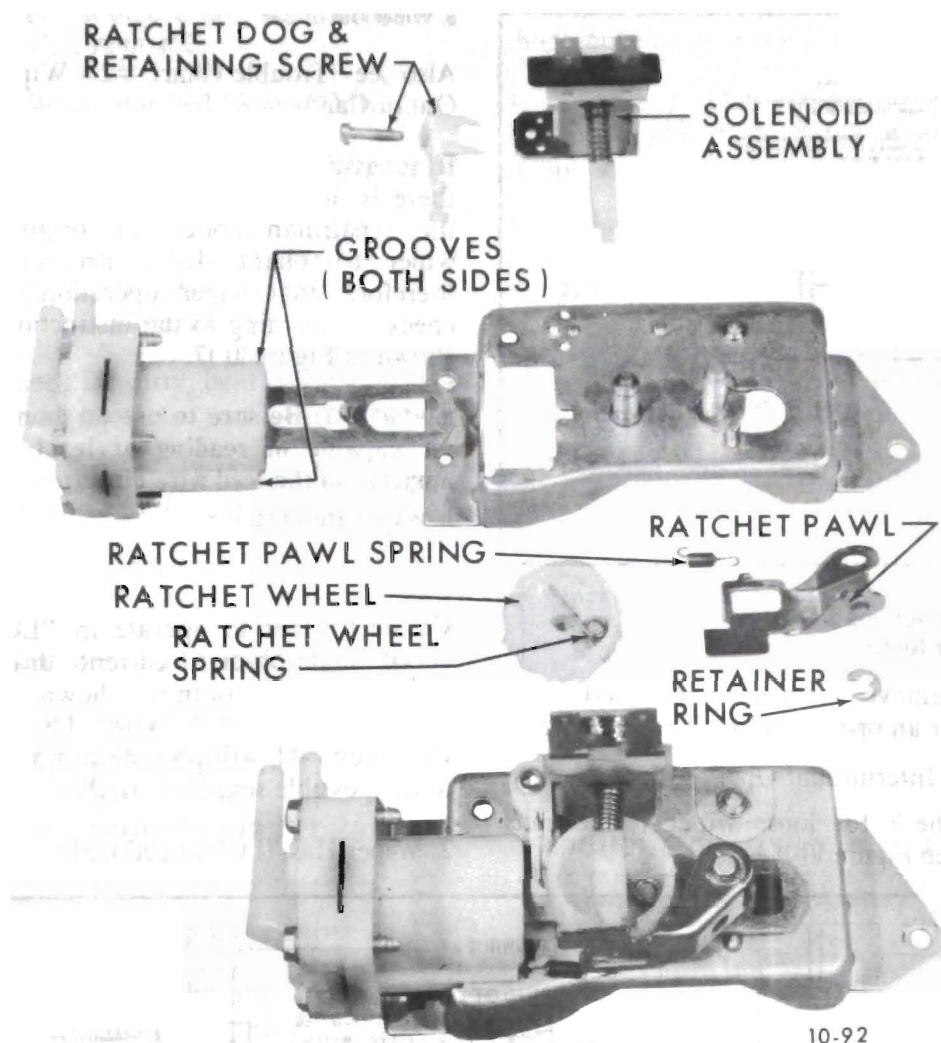


Figure 10-16 - Washer Pump - Exploded

2. To separate the pump and pump actuator plate from the frame, pull the pump housing in the direction of the arrow until the grooves in the housing clear the frame. Then remove the actuator plate from the ratchet wheel and cam follower shafts.

#### e. Valve Assembly

1. Remove the four (4) screws that attach the valve assembly to the pump housing.

**CAUTION:** During re-assembly be sure gasket between housing and valve plate is properly positioned in the housing and valve plate grooves. Also be sure triple "O" ring is properly installed between valve body and pipe assembly.

## DIVISION IV

### TROUBLE DIAGNOSIS

#### 10-6 WIPER MOTOR TROUBLE DIAGNOSIS

##### a. Wiper in Car

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

##### 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 10-17.

(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 10-17. 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 10-17. 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".

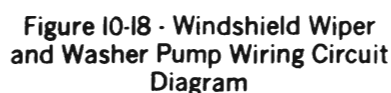
3. Wiper Has One Speed—Fast. Check for a defective instrument panel switch or open lead between terminal Number 3 and instrument panel switch.

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.



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.

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 Inoperative

1. Check the following items: (a) Jar has adequate quantity of washer solution.

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

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

(d) Electrical connections to washer pump and dash switch.

(e) Nozzles are not plugged.

2. If items in step 1 check out, start wiper motor first, then push washer button and listen for "click" as washer solenoid pulls in. If no "click" is heard, check power supply (12 volt) at washer pump wiring connector. No voltage indicates shorted or inoperative car wiring.

3. If correct voltage reading was obtained in step 2, start wiper first, then connect 12 volt supply to one pump terminal and ground other. If

washer solenoid "click" is heard, an inoperative dash switch is indicated.

4. If washer relay "click" is not heard in step 3, a faulty washer pump relay coil is indicated.

5. If relay "click" is heard in steps 2, 3 or 4 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.

5. Washer Pumps Continuously When Wiper Is On

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.
Wiper has "Lo" speed only.	(2) Defective instrument panel switch. (1) Lead between wiper terminal No. 3 and instrument panel switch grounded.
Wiper has "Hi" speed only.	(2) Defective instrument panel switch. (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

Figure 10-19 - Trouble Diagnosis Charts

1. Disconnect wiring from washer pump. If pump shuts off, trouble is located in wiring or switch. 2. If pump fails to shut off in step 1, remove pump assembly from car for further checking.

**c. Washer Pump Detached**

1. Manually actuate the solenoid plunger and check for binding condition.

2. Check relay coil as follows: Connect 12 volt supply to one washer

terminal and ground the other. Observe if solenoid plunger pulls in. Failure of solenoid plunger to pull in indicates an open solenoid coil or poor solder connections.

3. If solenoid plunger pulls in correctly, manually actuate the cam follower lower pin and observe if pump operates as described under "Operation". Binds and other types of malfunction can usually be located in this manner.

**d. 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.



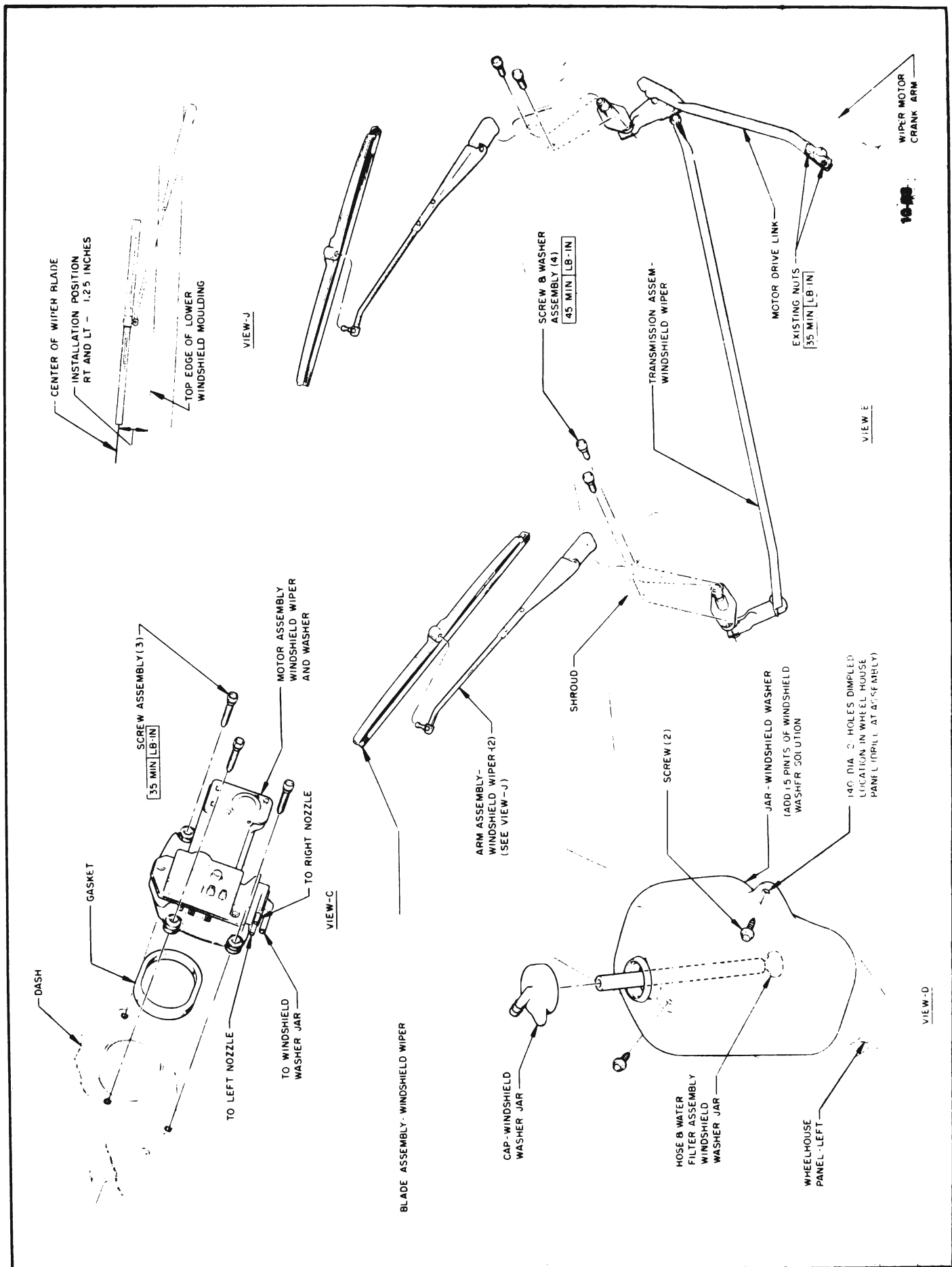


Figure 10-20 - Windshield Wiper Installation

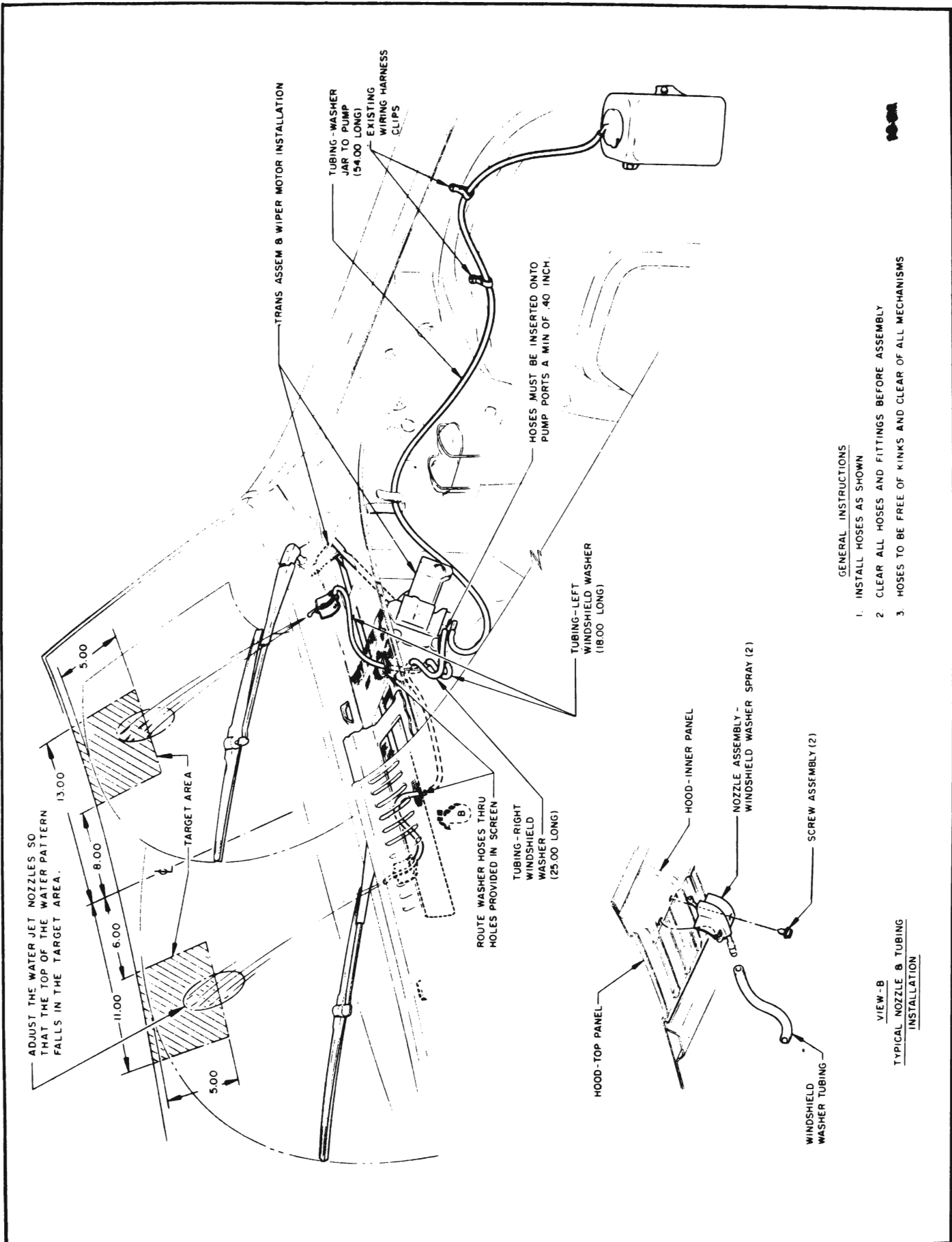


Figure 10-21 - Windshield Washer Hose Installation

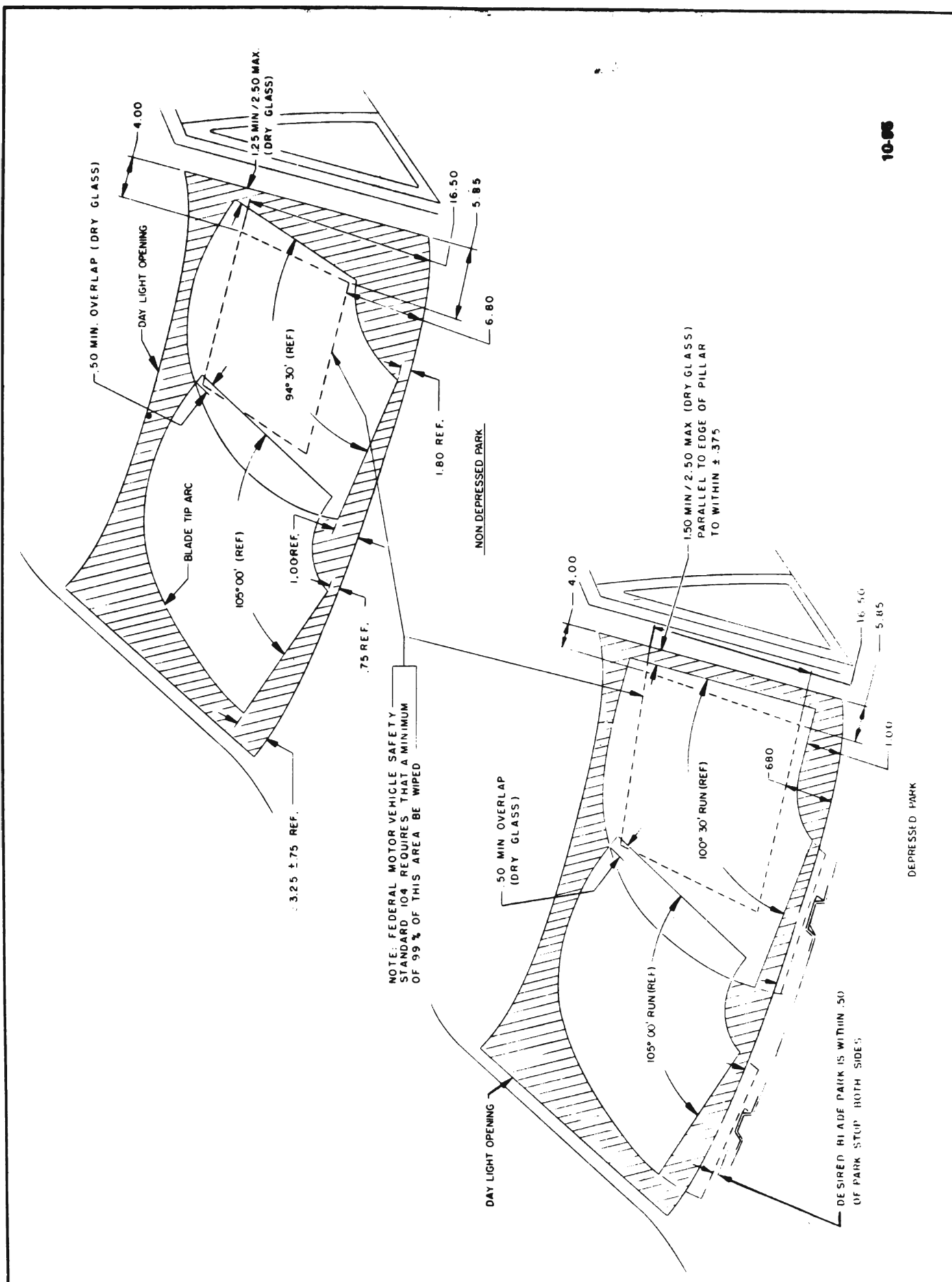


Figure 10-22 Windshield Wipe Pattern