

## SECTION 10-I

### WINDSHIELD WIPER AND WASHER ASSEMBLY

#### CONTENTS OF SECTION 10-I

Paragraph	Subject	Page	Paragraph	Subject	Page
10-54	Description and Operation - Single Speed . . . . .	10-97	10-59	Disassembly and Assembly . . . . .	10-107
10-55	Trouble-Shooting - Single Speed . .	10-98	10-60	Removal and Replacement of Assemblies . . . . .	10-110
10-56	Disassembly and Assembly - Single Speed . . . . .	10-99	10-61	Windshield Washer Description and Operation . . . . .	10-111
10-57	Description and Operation - Two Speed . . . . .	10-101	10-62	Windshield Washer Disassembly and Assembly . . . . .	10-112
10-58	Trouble-Shooting and Testing . . . .	10-104			

### 10-54 DESCRIPTION AND OPERATION—SINGLE SPEED

#### a. General Description

The gear train consists of a helical gear at the end of an armature shaft. The helical gear drives an intermediate gear and pinion assembly, the pinion of which drives an output gear and shaft assembly. See Figure 10-99. The crank arm is attached to the shaft of the output gear and drives the two wiper transmission through connecting link arms. See Figure 10-129 or 131.

There is no circuit breaker in this model wiper motor.

#### b. Principle of Operation

Two switches, a dash switch and

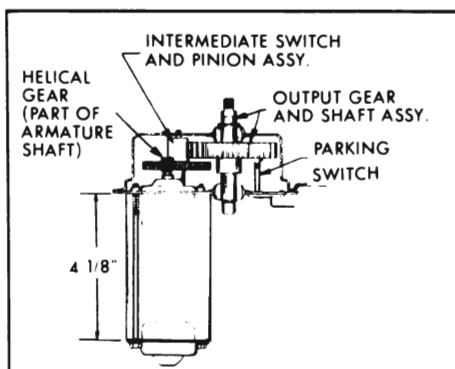


Figure 10-99—Typical View of Gear Train

a park switch control the starting and stopping of the wiper. The switch mounted on the dash controls starting the wiper. The park switch, which is located in the wiper gear box (Figure 10-99), controls stopping the wiper. The operation of the park switch is explained in the following paragraph. (Refer to the wiring diagram in Figure 10-101).

When the car owner shuts the wiper "off" at the dash switch, the motor circuit to ground is opened at the dash. However, the parking switch contacts, which are normally closed, maintain the motor circuit to ground at the wiper. This allows the wiper to keep operating until the blades or wiper crank arm reach the park position (Blades approx. 2" above windshield molding). (Figure 10-100 shows the crank arm in park position.) At the same time the blades reach the park position, a cam on the output gear opens the park switch contacts. This opens the motor circuit to ground, stopping the motor. Thus, the park switch actually controls wiper operation only during that short period of time, after the owner turns the wiper "off" at the dash switch but before the wiper has completely stopped.

Turning the wiper "on" at the dash switch overrides the open park switch contacts and closes

the wiper motor circuit to ground, starting the wiper. (NOTE: Although the park switch contacts are opened once during each revolution of the output gear, the park switch has no control over the wiper until the dash switch is turned "off".)

#### c. Connections to Operate Wiper

Figure 10-102 shows the proper method of connecting jumper leads to the wiper so that it can be operated independently of the dash switch or car wiring for test purposes. (NOTE: Specification table at end of this section lists current draw data.)

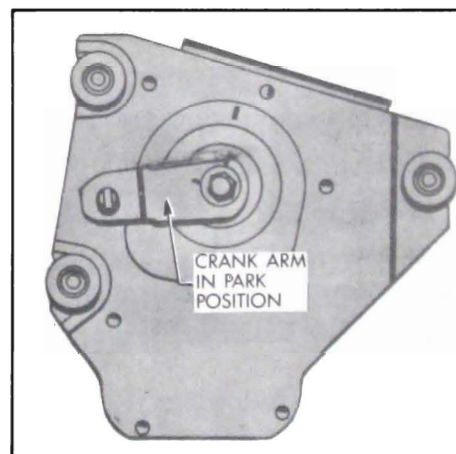


Figure 10-100—Park Position of Crank Arm

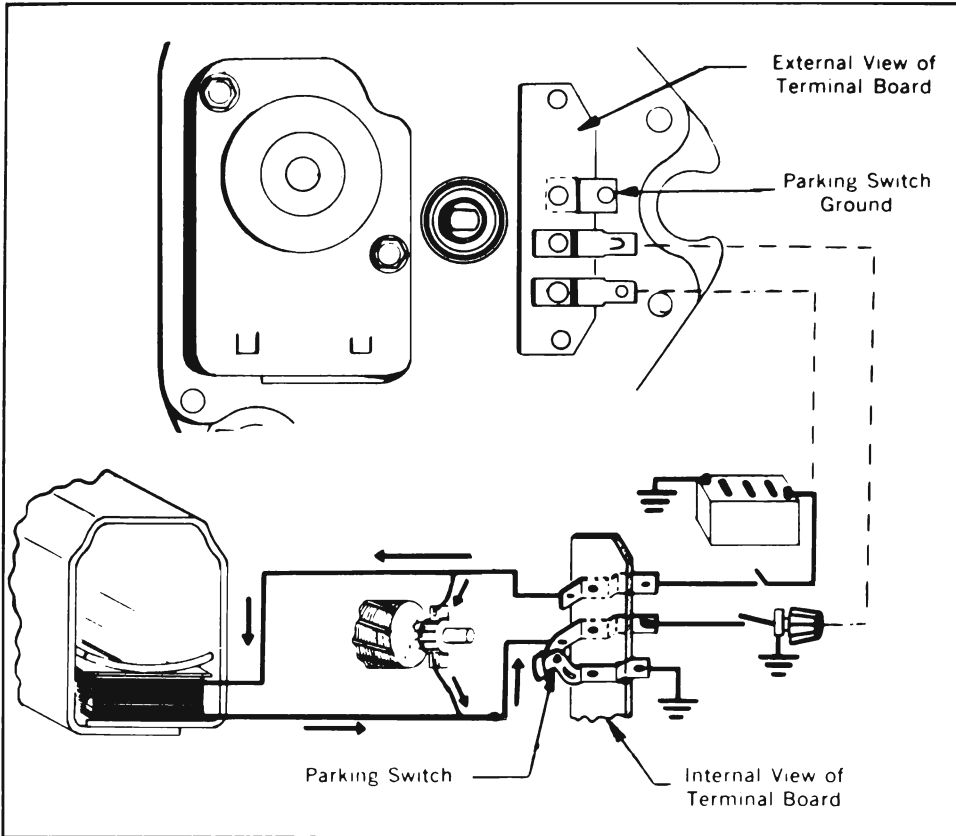


Figure 10-101—Single Speed Wiper Wiring Diagram

**10-55 TROUBLE-SHOOTING—SINGLE SPEED**

**a. Description**

Trouble-shooting procedures are divided into two categories: Wiper in car; wiper out of car.

Typical Trouble Conditions:

1. Inoperative.
2. Will not shut off.
3. Intermittent or slow operation.
4. Wiper will not park.

**b. Wiper in Car**

1. Wiper Inoperative - **IMPORTANT: Ignition switch must be on to make electrical tests.**

(a) Check the following:

- (1) Make sure wiring harness is properly attached to wiper terminals and dash switch. See Figure 10-101.

(2) Make sure wiper ground strap is properly connected to wiper and car body.

(3) Make sure switch is mounted securely in dash.

(4) Check fuse.

(b) If everything checks out in

Step (a) but wiper still fails to operate, disconnect wiring harness from wiper and check for 12 volts at harness terminal that connects to wiper terminal No. 2, Figure 10-102. No voltage indicates defective car wiring. **CAUTION: DO NOT connect hot line to No. 1 terminal.**

(c) Connect 12 volt supply to No. 2 wiper terminal and connect a jumper wire from terminal No. 1 to ground (Figure 10-102). If wiper operates, the dash switch or wiring between dash switch and wiper is defective.

(d) If wiper still fails to operate with jumper wires, remove body parts as required to disconnect wiper transmission from wiper crank arm. Recheck wiper operation with jumper wires. If wiper operates correctly a defective transmission or binding condition exists. If wiper still fails to operate, remove wiper from car and follow instructions under "Trouble-Shooting Wiper Out of Car".

**2. Wiper Will Not Shut Off**

(a) Disconnect wiring from dash switch. If wiper shuts off, a defective dash switch is indicated.

(b) If wiper still operates, disconnect wiring from wiper and connect 12 volt supply direct to

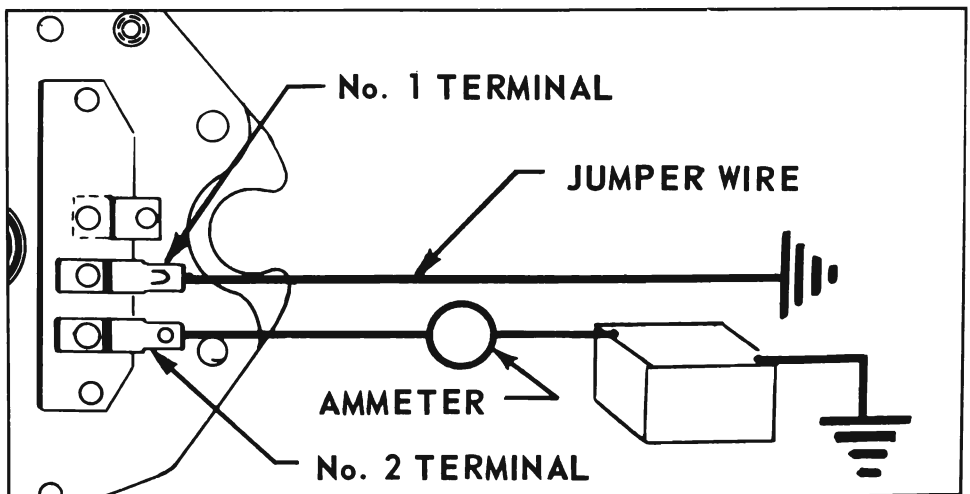


Figure 10-102—Connections to Operate Wiper Out of Car

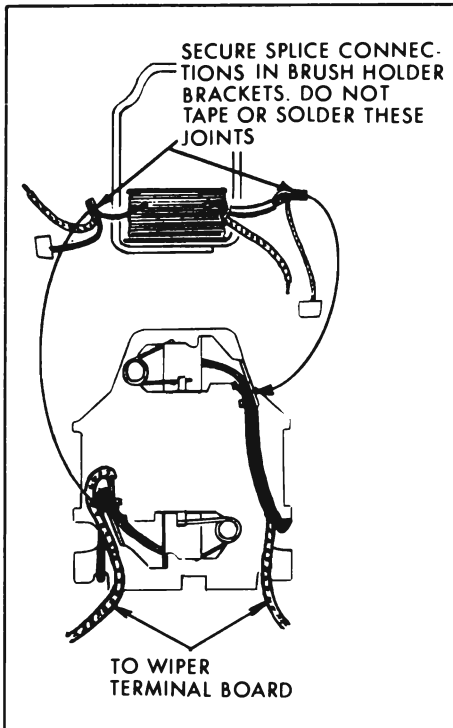


Figure 10-103—Motor Wiring

wiper terminal No. 2 (Figure 10-102). **DO NOT** connect any jumper wire to terminal No. 1.

If wiper now shuts off correctly, check for a ground in lead that extends between wiper terminal No. 1 and dash switch.

If wiper still fails to shut off—remove wiper from car and follow instructions under “Trouble-Shooting Wiper Out of Car”.

### 3. Intermittent or Slow Operation

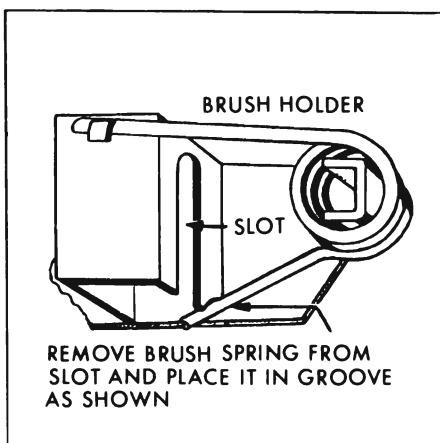


Figure 10-104—Releasing Brush Holder Spring Pressure

(a) Check the following: Loose ground strap, loose dash switch mounting, loose connection.

### 4. Wiper Will Not Park

(a) Remove wiper from car and check for a dirty or broken park switch.

### c. Wiper Out of Car

Connect a 12 volt supply and an ammeter to wiper as shown in Figure 10-102 and observe current draw and wiper operation.

#### 1. Wiper Inoperative

(a) Current Draw - 0.

(1) Check solder connection at terminal board.

(2) Disassemble motor section and check all splice connections (Figure 10-103).

(b) Current Draw - 1-1.5 amps.—Disassemble motor and check for the following items:

(1) Open armature.

(2) Brushes sticking.

(3) Brush springs improperly positioned (See Figure 10-104).

(4) Brush pigtail connections at splice joints (Figure 10-103).

(c) Current Draw - 10-12 amps.

(1) Check for open shunt field circuit.

(2) Check for broken gear.

#### 2. Wiper Will Not Shut Off.

Wiper crank arm fails to stop in park position when jumper wire is removed from wiper terminal No. 1 (Figure 10-102).

(a) Check that park switch contacts are opening.

(b) Check for grounded condition in the internal motor lead that connects to terminal No. 1, Figure 10-102.

#### 3. Intermittent or Slow Operation

(a) Current Draw - 7-9 amps.

(1) Check for binds in gear train.

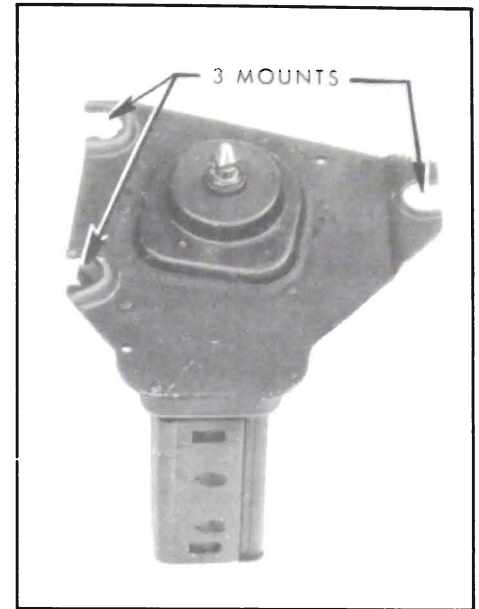


Figure 10-105—Single Speed Wiper

(2) Check for shorted armature. (Armature may be checked on a growler).

#### 4. Wiper Will Not Park.

Wiper crank arm stops rotating immediately when jumper wire is disconnected from wiper terminal No. 1 (Figure 10-102). **NOTE:** Crank arm should continue to rotate until park position is reached (Figure 10-100).

## 10-56 DISASSEMBLY AND ASSEMBLY—SINGLE SPEED

### a. Gear Box Disassembly

1. Remove washer pump drive cam as required (Figure 10-105). The cam is pressed on the shaft but can be wedged off by using two screwdrivers between cam and plate.

2. Clamp crank arm in a vise and loosen crank arm retaining nut.

3. Remove seal cap, retaining ring and end-play washer. **NOTE:** Seal cap should be cleaned and repacked with a waterproof type grease before reassembly.

4. Drill out the gear box cover retaining rivets and remove cover from gear train. **CAUTION: Mark ground strap location for re-assembly purposes.**

5. Remove output gear and shaft assembly, then slide intermediate gear and pinion assembly off shaft. (Figure 10-106).

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

(a) Unsolder motor leads from terminals.

(b) Drill out rivets that secure terminal board and park switch to plate.

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

**b. Gear Box Assembly**

Reverse Steps 1 thru 7 except as noted:

1. Reassembly of Gear Box Cover - Be sure cover is located properly over locating dowel pins and be sure to reinstall ground strap.

2. Reassembly of Crank Arm - Operate wiper to park position (Figure 10-102) and install crank arm on output shaft in the position shown in Figure 10-100. Clamp crank in vise before securing the retaining nut.

**c. Motor Disassembly and Assembly**

1. Follow Steps 1 thru 7(a) under gear box disassembly.

2. Release brush spring pressure against brushes as shown in Figure 10-104.

3. Move brushes away from armature and slide armature out of frame and field assembly. Pull end cap assembly off armature. See Figure 10-107.

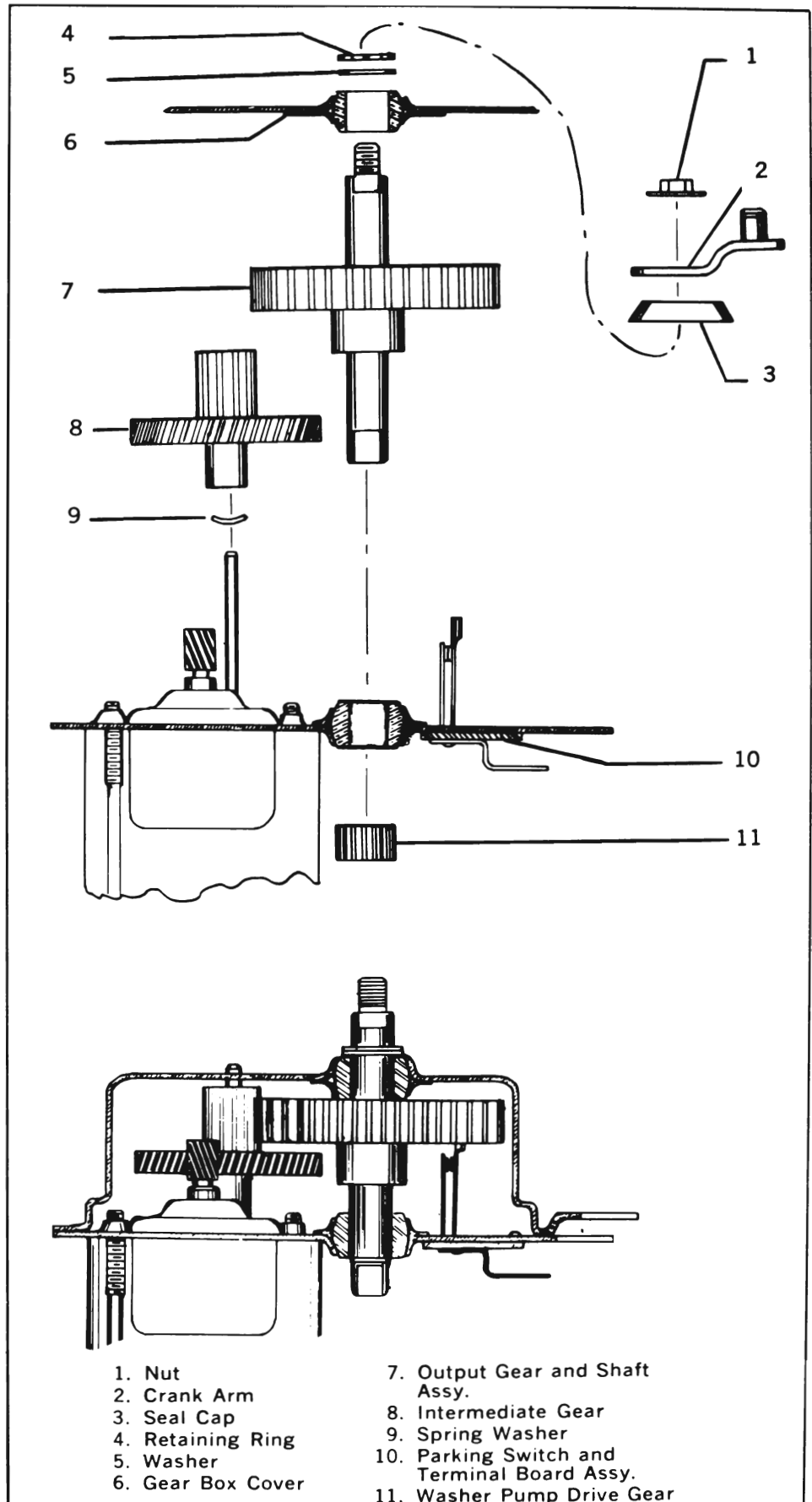


Figure 10-106—Gear Box Assembly

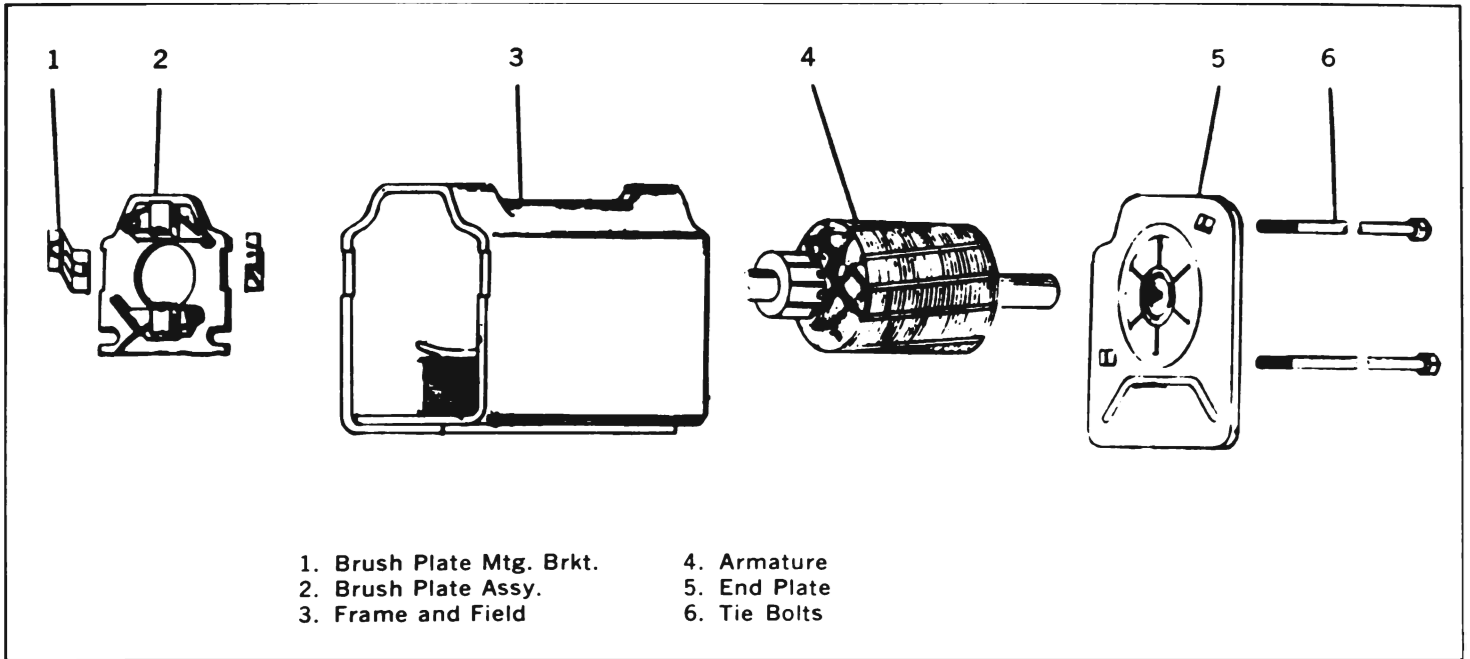


Figure 10-107—Motor Assembly

4. Remove end play adjusting washers.

To reassemble motor, reverse Steps 1 thru 4.

NOTE: Lubrication of armature shafts and bearings should be with light grade machine oil. Gear teeth and cam should be lubricated with Delco gear and cam lubricant.

**d. Wiper Specifications**

Operating Test Voltage . . . . 12

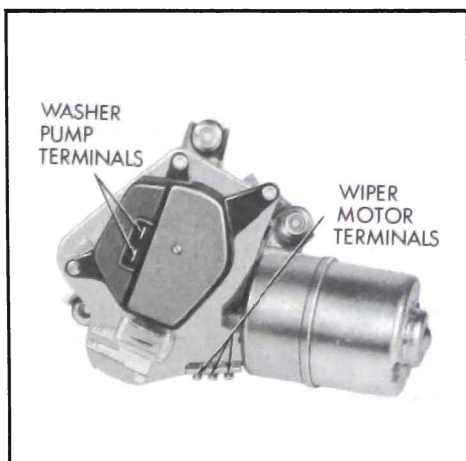


Figure 10-108—Windshield Wiper Motor—Two Speed

Crank Arm Rotation (looking at arm) . . . . . CCW

Current Draw (Amps.)

No load . . . . .	3 Max.
Dry windshield . . . . .	3.5 Max.
Stall . . . . .	11.0 Max.

**10-57 DESCRIPTION AND OPERATION—TWO SPEED**

**a. General Description**

Single speed wipers are standard on 4400 and 4600 Series with two-speed overlapping system available as an option. The two speed overlapping system is standard on 4700 and 4800 Series. Windshield washers are standard on all overlapping systems. The two speed overlap wiper motor is larger and different in design from the single speed motor and is equipped with a washer pump. See Figure 10-108. The pump is bolted to the bottom of the wiper motor assembly and is driven by the motor. The pump is relay actuated by a switch on the instrument panel.

To operate the windshield washer,

the button on the switch must be pushed in or forward. In so doing, the wiper switch knob is mechanically rotated by the button to the slow speed position. After the washer has stopped, the knob must be manually turned back to the off position to stop the wiper blades. The blades always return to the depressed park position when the switch is turned to off. If a faster wiper blade speed is desired, the knob should be turned all the way in a clockwise direction.

The single speed wiper switch has no button and is only a single position switch. When the switch is turned to the off position, the blades do not return to a full park position, but a few inches away from the reveal molding. See Paragraph 10-56 for service procedures on the single speed windshield wiper.

All motors are held to the upper cowl by three bolts. A water deflector is used on the motor shaft and is located under the motor drive crank and arm assembly.

Each wiper transmission is held to the upper cowl by three screws.



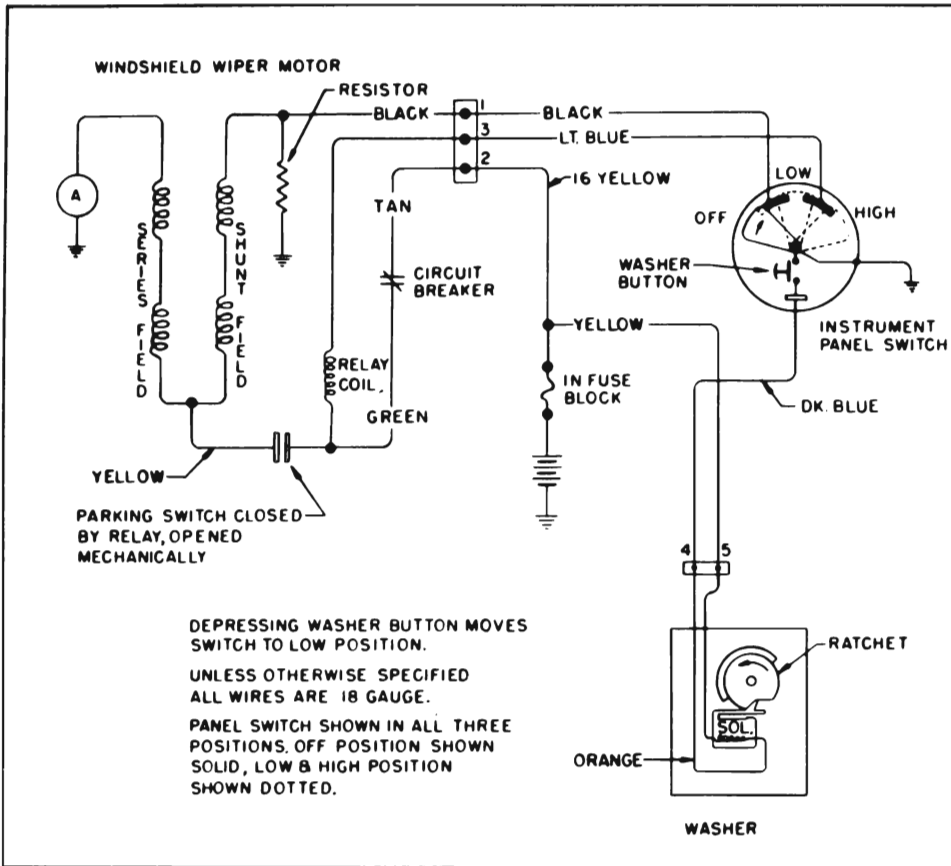


Figure 10-109—Two Speed Windshield Wiper and Washer Wiring Diagram

Although the transmission links may appear to be the same they are different, and right and left transmissions are not interchangeable.

The tubular drive links which are located under the air intake grille attach to the drive crank arm on the motor shaft on one end with the opposite end attached to the

pin plate assembly on the transmission. The linkage used with the "Overlap System" is different from that used on the single speed wipers and cannot be interchanged.

**CAUTION:** It is important that when the wiper arms of "Overlap System" are in the park position, the right arm must be positioned below the left arm. If the arms should be reversed the system will not operate because the left blade will lock into the right blade assembly. The reason for this is that the left wiper transmission has a mechanical advantage such that the speed of the wiper blade on the left arm is faster causing it to move away from the park position more rapidly. Should the blades become bound up for reasons mentioned above, the wiper should be turned off immediately. The blades can be freed only by removing the wiper arms from the wiper transmission or bending the blades to free them.

**b. Wiper Motor Operation**

1. Electrical (See Figure 10-109 for overall wiring diagram.)

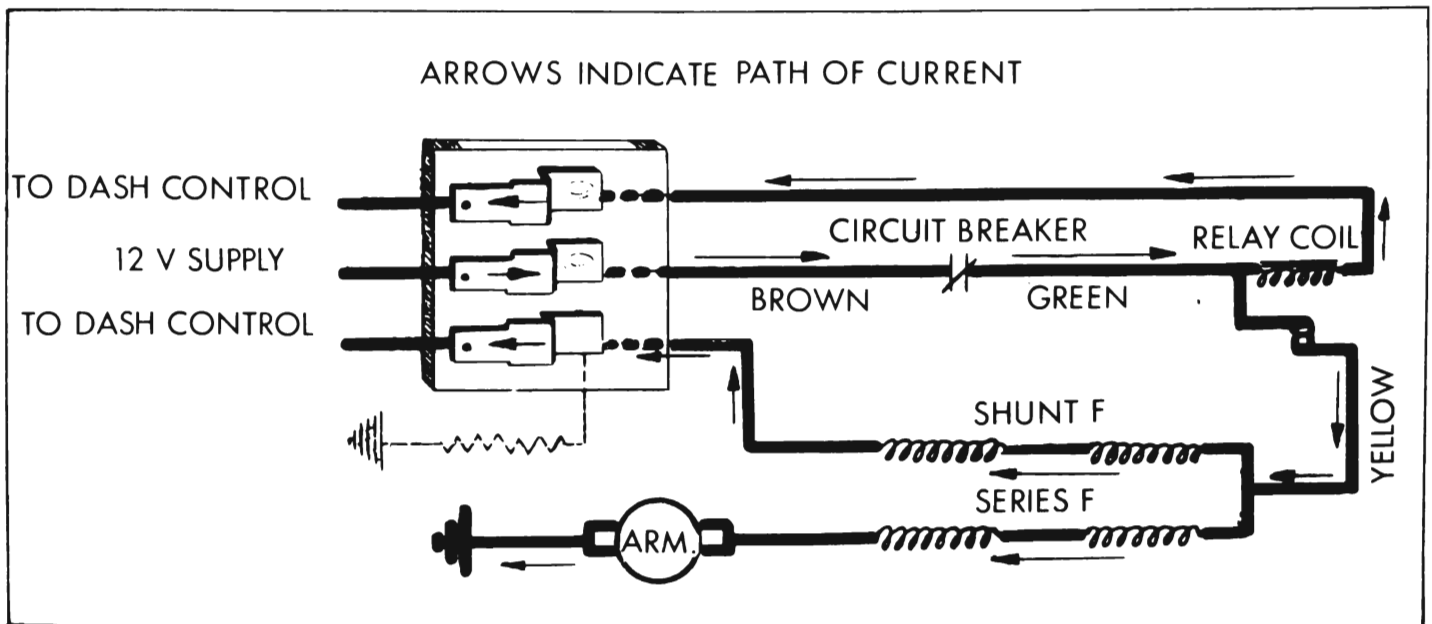


Figure 10-110—"Lo" Speed Operation-Wiring Circuit

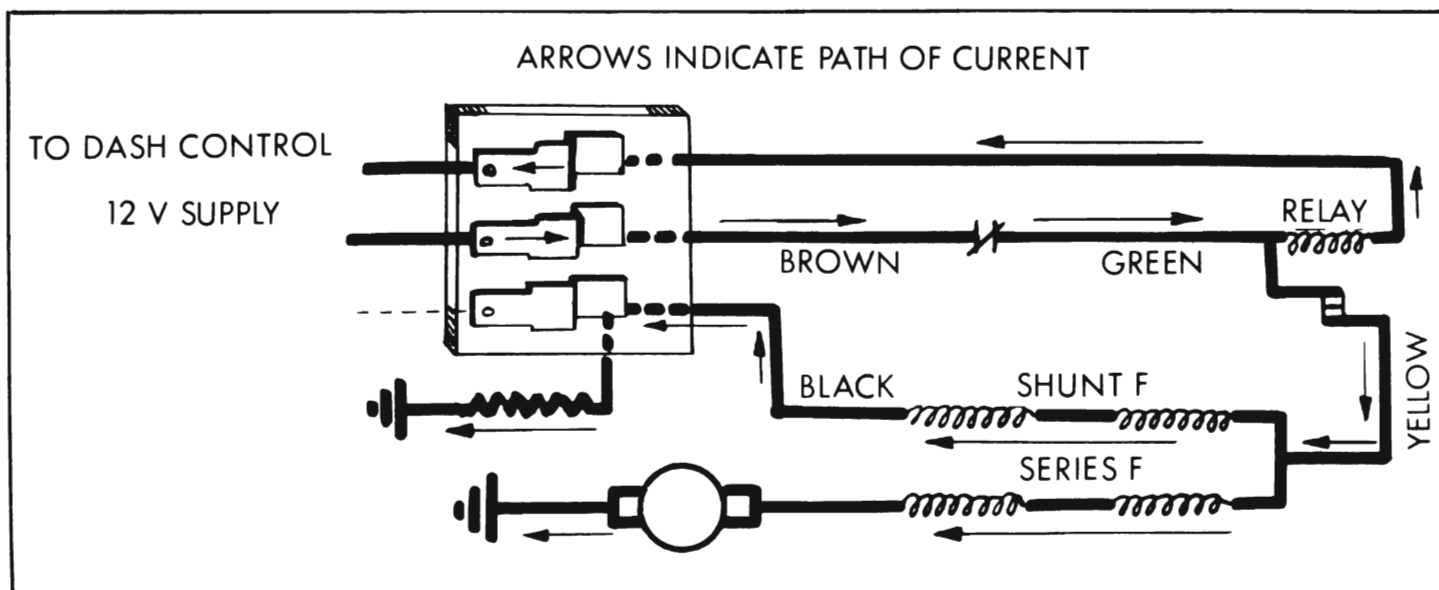


Figure 10-111—"Hi" Speed Operation—Wiring Circuit

(a) "Lo" Speed - When the switch is turned to the "Lo" position current passes from the live feed through the circuit breaker, which is located inside the motor case to the green lead. See Figure 10-110. Current then flows through the relay coil, to the white lead on the terminal connector and to ground through the dash switch to complete the relay circuit. The relay coil is then energized.

As current flows to the relay coil, it also passes through the yellow wire to a split tee type connection. Current divides with some current passing through the black lead to the terminal connector and to ground at the dash switch to ground out the motor shunt field circuit. The remaining current passes through the motor series field circuit, to the motor armature and to ground. The current flow through the switch to ground is greater than the amount through the armature. Therefore, the motor operates at a reduced speed.

(b) "Hi" Speed - When the switch is turned to "Hi" position, the motor shunt field circuit is no longer grounded due to the switch

position. See Figure 10-111. The majority of current then passes through the motor series field circuit, to motor armature and to ground. Some current does pass through the shunt field windings and to ground through a resistor located between the terminal board #3 terminal and ground. However, less resistance is offered to current flow through the series field circuit. Therefore, the greater flow of current through the armature increases wiper motor speed.

(c) "Hi" or "Lo" to Off - When the dash switch is turned to the off position, only the relay coil circuit is opened, stopping current flow through the relay. The motor circuit remains in operation until the relay switch control tab is mechanically opened by the drive pawl as the pawl contacts the stop arm. The relay switch control then opens the motor circuit and the motor stops with the wiper blades positioned in park. The wiper should move to the park position at "Lo" speed.

## 2. Mechanical

(a) Motor Switch Turned to "Lo" or "Hi" - Previous to the switch being turned to either "Lo" or

"Hi", the drive pawl is in contact with the stop arm. See Figure 10-112. As the switch is turned on, the relay coil is energized. This moves the armature into the relay and the latch arm out of the path of the drive pawl. At the same time, the motor circuit is also completed.

As the motor begins rotating, only the nylon gear and eccentric shaft start to turn. The drive plate is prevented from turning by the drive pawl which is held against the stop pawl. When the nylon gear and shaft have turned approximately 180 degrees, guide pins on the drive pawl and lock pawl drop into their respective pockets in the nylon gear. This action moves the drive pawl away from the stop arm as well as locking the entire drive assembly together. The drive plate, drive pawl, lock pawl, nylon gear and eccentric shaft then turn as a unit. See Figure 10-113.

(b) Motor Switch Turned to Off - As the switch is turned to the off position, the relay circuit is opened with the motor circuit remaining closed. The spring loaded latch arm moves out into the path of the drive pawl since the relay

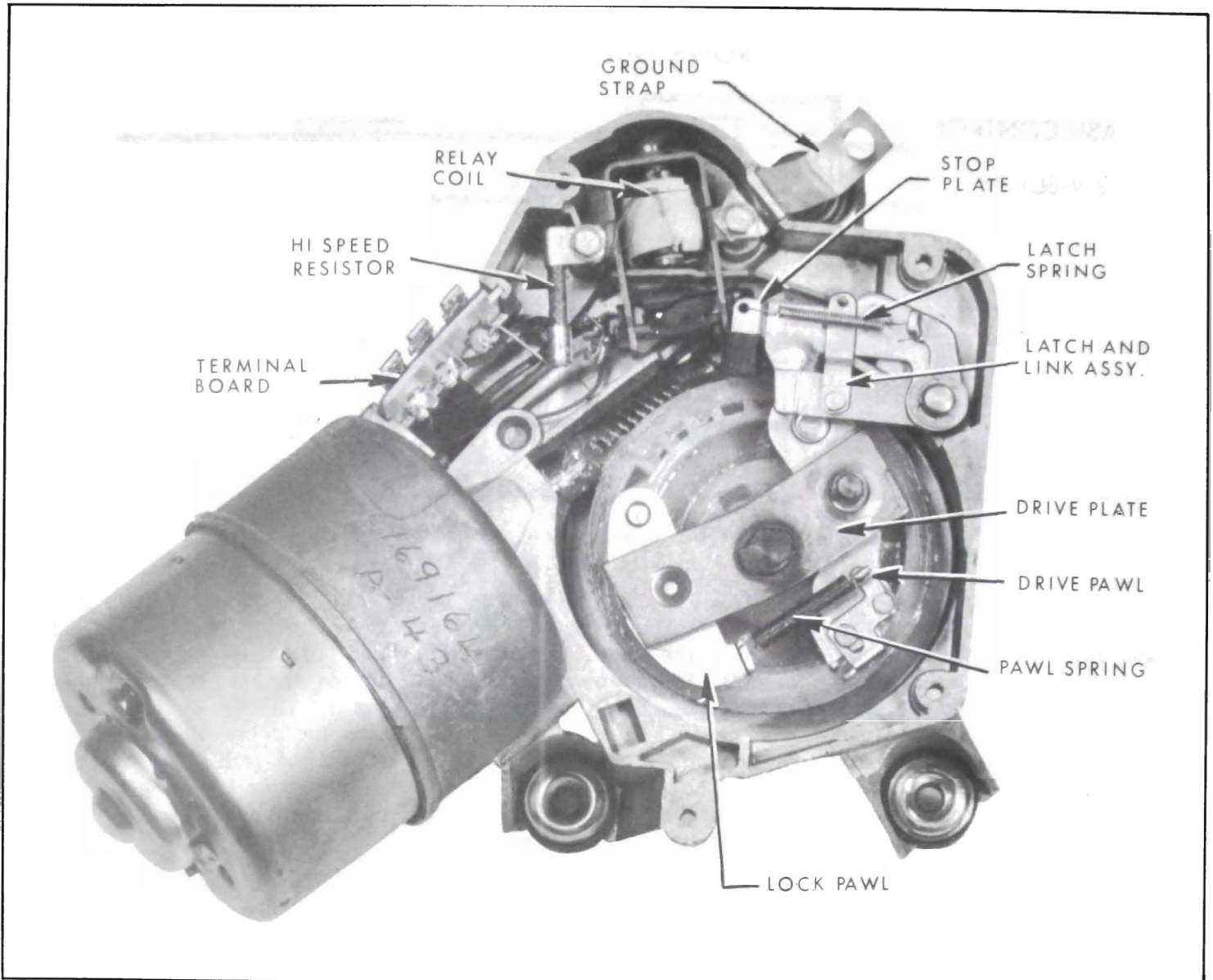


Figure 10-112—Wiper Motor in Off Position—Typical View

is no longer energized. When the drive pawl contacts the latch arm, the drive plate, drive pawl and lock pawl are held from rotating with the nylon gear and eccentric shaft continuing to rotate. See Figure 10-114. The guide pins in the drive pawl and lock pawl have been forced out of their pockets in the nylon gear.

The cam type action between the eccentric shaft and drive plate shaft makes the drive plate and related parts move outward toward the relay control switch as the nylon gear and shaft turn. The drive pawl then pushes

against the relay control switch tab and opens the circuit to the motor. See Figure 10-112.

### 10-58 TROUBLE-SHOOTING AND TESTING

Testing is divided into two testing sections. The first section is testing to be done with the wiper motor in the car. The second section covers testing with motor out of the car. See the diagnosis chart, Figure 10-115.

#### a. Wiper in Car

Testing with motor installed con-

sists of checking the wiring, switch and wiper linkage.

#### 1. Wiring

(a) Make sure wiring is properly connected to the wiper unit and switch.

(b) Check that wiper unit ground strap is securely connected to body.

(c) With ignition switch turned on, check for 12 Volts at center or No. 2 terminal of wiper unit terminal board. See Figure 10-116. Check also for 12 Volts at the brown lead terminal which connects to washer pump.



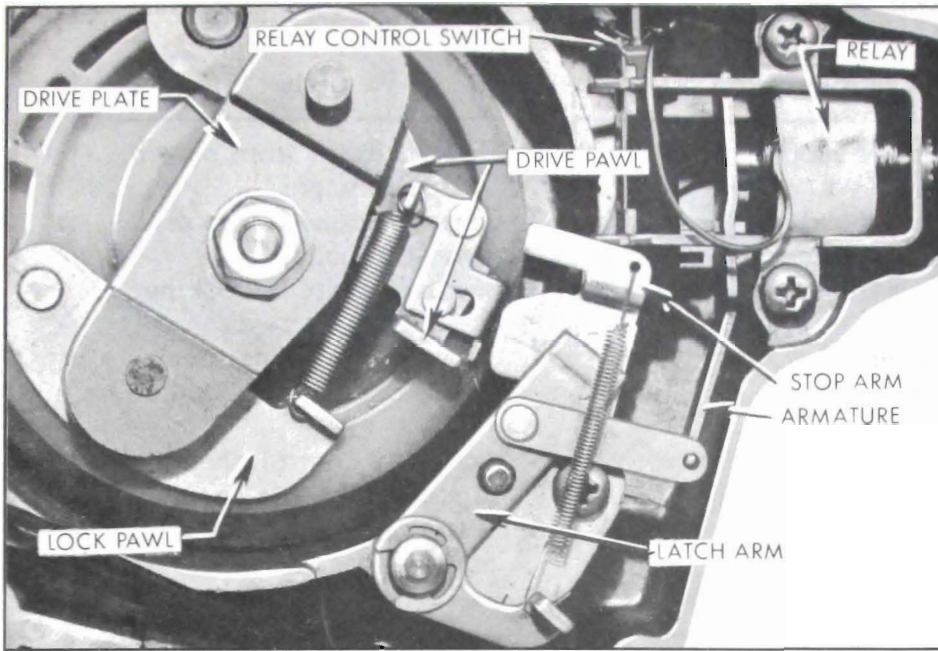


Figure 10-113—Wiper Motor in Operation—Typical View

## 2. Switch

(a) Check switch mounting. Loose mounting can cause an intermittent operation condition when using the wiper.

(b) To determine if switch or wiper is defective try operating wiper independently of switch as follows:

Connect 12 Volt supply to center or No. 2 terminal of wiper terminal board and connect a jumper wire from terminal No. 1 to ground. Wiper should operate in "Hi" speed.

To check "Lo" speed operation connect an additional jumper wire from terminal No. 3 to ground.

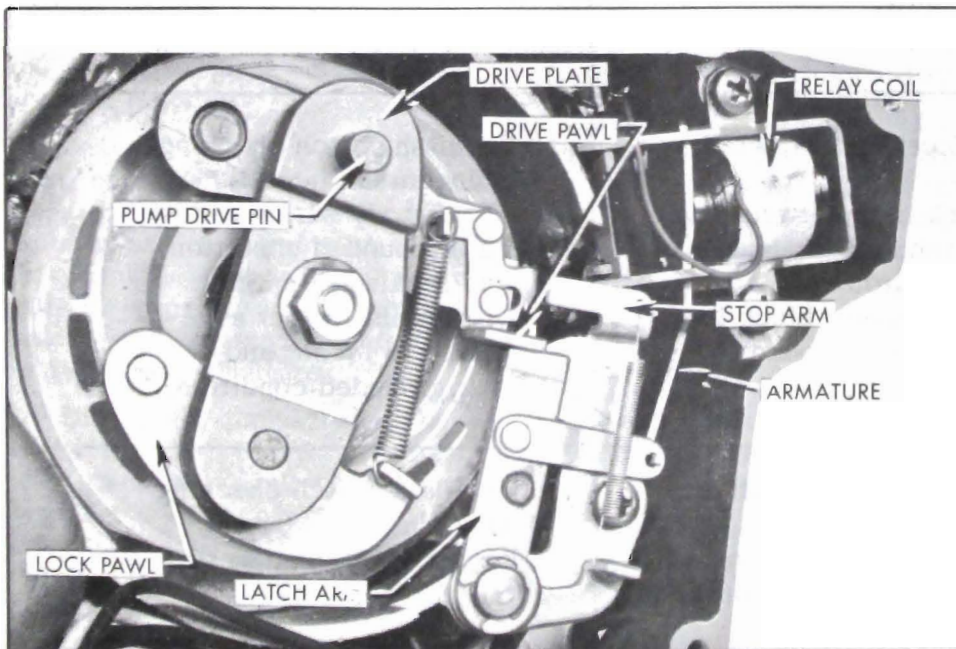


Figure 10-114—Drive Plate Stopped—Motor Running—Typical View

(c) To determine if washer pump unit or the washer button switch is defective operate washer pump independently of washer switch as follows:

Operate wiper unit as explained in Step (b) above and connect 12 Volts to either of the washer pump terminals. Connect a jumper wire from the other terminal to ground.

## 3. Wiper Linkage

(a) Remove necessary body parts to gain access to wiper unit crank arm and drive links. Disconnect drive links from the crank arm and manually operate each wiper transmission. The test should determine if transmissions or linkages are binding or damaged.

## b. Wiper Out of Car

Testing with the motor removed consists of bench testing the relay control-latch mechanism and the motor. Remove gear box and washer pump. Disconnect the yellow lead from the relay control switch.

### 1. Relay Control and Latch Mechanism.

(a) Manually operate the relay armature to check for a binding or hanging-up in the latch arm and attaching parts.

(b) Circuit to Relay Coil - Connect 12 Volt supply to wiper as follows: (+) to center or No. 2 terminal and (-) to housing. See Figure 10-116. Check for 12 Volts at switch terminal to which the green lead is attached. No voltage indicates an open circuit breaker or a broken brown or green lead.

(c) Relay Coil - If circuit to relay coil checks out, leave 12 Volt supply connected as explained in Step (b) above and connect a jumper wire from terminal No. 1 to housing. Failure of relay armature to pull in indicates a weak or open relay coil. (Recheck for

DIAGNOSIS CHART <span style="float: right; font-size: small;">PH2872</span>		
Condition	Possible Cause	Remedy
Wiper Inoperative	<ol style="list-style-type: none"> <li>1. No power supply (12V) at wiper.</li> <li>2. Wiper ground strap loose or disconnected.</li> <li>3. Defective dash switch.</li> <li>4. Wiper unit latching mechanism binding.</li> <li>5. Defective relay control.</li> <li>6. Defective wiper motor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check circuit from power source to wiper.</li> <li>2. Connect ground strap securely to body.</li> <li>3. See dash switch checking procedure.</li> <li>4. See wiper latching mechanism checking procedure.</li> <li>5. See relay control checking procedure.</li> <li>6. See wiper motor checking procedure.</li> </ol>
Wiper Will Not Shut Off	<ol style="list-style-type: none"> <li>1. Wiper unit latching mechanism binding.</li> <li>2. Relay control switch defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Free up latching mechanism and lubricate as required.</li> <li>2. See relay control checking procedure.</li> </ol>
Excessive Speed in "Hi" speed range but operates normal in "Lo" speed.	Resistor on wiper terminal board open.	Replace terminal board assembly.
Wiper operates in "Lo" speed only.	<ol style="list-style-type: none"> <li>1. Defective dash switch.</li> <li>2. Black lead between dash switch and wiper terminal board grounded.</li> <li>3. Wiper motor black lead internally grounded.</li> </ol>	<ol style="list-style-type: none"> <li>1. See dash switch checking procedure.</li> <li>2. Check body wiring to locate grounded condition and repair as required.</li> <li>3. Disassemble wiper as required to locate and repair grounded condition.</li> </ol>
Wiper operates in "Hi" speed only.	<ol style="list-style-type: none"> <li>1. Dash switch defective.</li> <li>2. Black lead between dash switch and wiper unit open.</li> </ol>	<ol style="list-style-type: none"> <li>1. See dash switch checking procedure.</li> <li>2. Repair black lead as required.</li> </ol>

Figure 10-115—Wiper Motor Trouble Diagnosis Chart

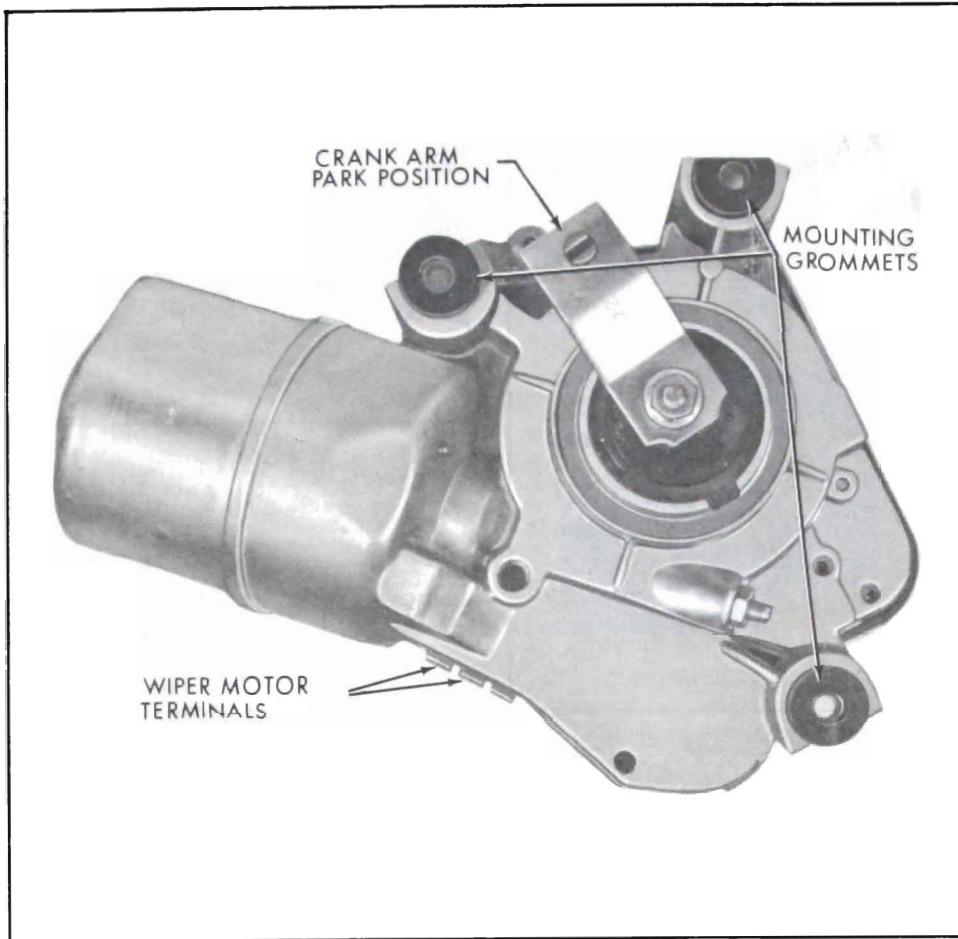


Figure 10-116—Wiper Motor Connections

a binding condition in the latching mechanism.)

(d) Relay Switch - If Steps (b) and (c) above check out correctly proceed as follows:

(1) Leave battery and jumper wire connected as described in Steps (b) and (c) and check for 12 Volts at switch terminal to which the yellow lead attaches. If relay pulls in properly and no voltage reading is obtained a defective relay switch is indicated.

(2) Disconnect jumper wire between terminal No. 1 to ground and check that relay armature moves away from coil pole. (NOTE: If wiper gear mechanism is in full park position, disconnect the coil spring that connects between the gear assembly drive and lock pawls to release the pressure of the drive pawl switch

actuator against the switch tab.) Check for 12 Volts at switch terminal to which yellow lead attaches. No voltage reading indicates a defective relay switch.

(3) Leave voltmeter connected as described in Step No. 2 above and manually push the switch stop tab toward the relay coil. If voltage reading is still obtained a defective switch is indicated.

## 2. Motor Testing.

Disassemble the motor but leave the field coil assembly in the housing.

(a) Check armature for open or short circuit with the use of a growler.

(b) Use a growler test light to test for grounded commutator bars.

(c) Inspect the case and brush assembly for worn or defective brushes and brush springs, loose solder connections and dirty or defective circuit breaker contacts.

(d) Disconnect yellow lead from relay control switch and connect and ohmmeter between the yellow lead and the brush holder to which the internal field lead connects. No reading indicates an open series field.

Next connect the ohmmeter between the yellow lead and the terminal to which the black motor lead attaches. No reading indicates an open shunt field.

(e) Disconnect yellow lead from relay control switch. Be sure steel case and brass ground strap are not touching the housing. Then check between the yellow lead and field lamina with a test light. If bulb lights, field is grounded.

(f) Bench test motor after assembling in the following manner. Be sure brass ground strap is connected to wiper housing.

(1) "Lo" Speed - Connect 12 volt supply to center, or No. 2 terminal, and ground housing. Connect jumper wires from No. 1 and No. 3 terminals to ground.

(2) "Hi" Speed - Disconnect jumper wire from No. 3 terminal.

(3) Stop - Disconnect jumper wires from No. 1 and No. 3 terminals.

## 10-59 DISASSEMBLY AND ASSEMBLY

### a. Disassembly of Motor

1. Remove the two motor tie bolts. See Figure 10-117.

2. Remove the armature end-play adjusting screw.

3. Strike the steel case lightly with a mallet to partially loosen



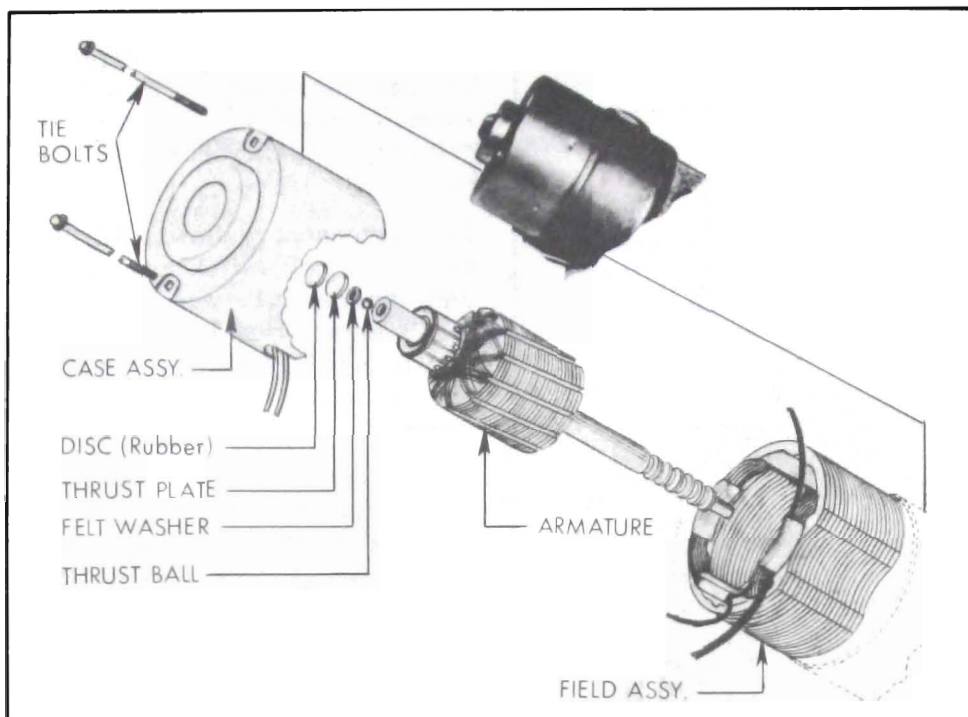


Figure 10-117—Motor Disassembly

it from the die cast housing and motor field.

4. Insert a tool through the armature adjusting screw opening and push against the end of the armature shaft to back off the case. This will retain the armature commutator in position between the brushes until ready to separate the armature from the case.

5. To separate armature from case while still retaining the brush springs and brushes in place, bend a wire as shown in Figure 10-118 and insert behind the brush leads as shown.

6. Pull the armature out of the case and install Brush Retaining Spring J-7890 as shown in Figure 10-119.

7. Remove the felt washer, thrust plate, and rubber thrust disc from the case assembly bearing as required. Refer to Figure 10-117.

8. The field assembly is pressed in the housing under light pressure and should be carefully checked prior to removal. To

remove the field, proceed as follows:

(a) Cut the black and yellow leads that extend through the case assembly rubber grommet in a location convenient for splicing.

(b) Cut the internal field leads enclosed in black plastic tubing approximately two inches from the brush holder to which they are attached.

(c) Scribe a reference line along the side of the housing and field for reassembly purposes.

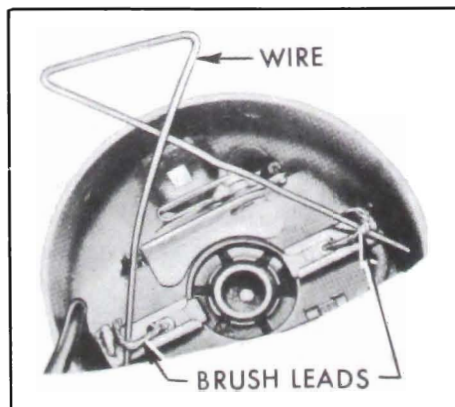


Figure 10-118—Holding Brush Leads

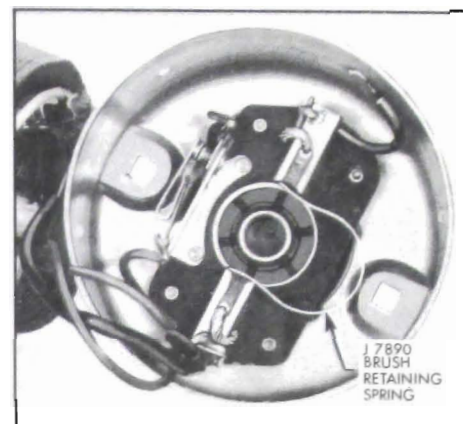


Figure 10-119—Installing Brush Retaining Spring

(d) Refer to Figure 10-120 and remove field from housing as shown.

## b. Assembly of Motor

1. Install field assembly as follows:

(a) Shorten as required and splice the replacement field leads to those leads cut in Steps 8 (a) and 8 (b) under motor disassembly.

(b) Scribe a reference line on the replacement field in the approximate same location as the one scribed on the original field (Step 8 (c) under motor disassembly).

(c) Align the field and housing according to the reference lines and start the field in the housing. A further check to insure alignment is shown in Figure 10-121.

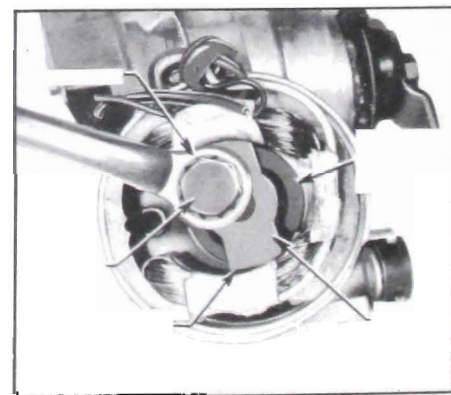


Figure 10-120—Removing Field Coils

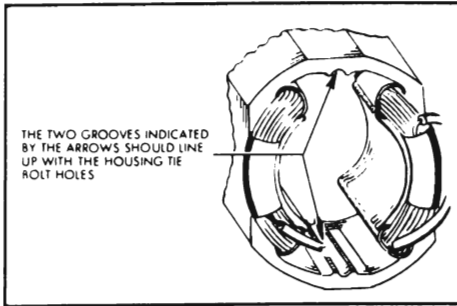


Figure 10-121—Aligning Field Coils

(d) Push the field in the housing until it bottoms against the machined ridge.

2. Assemble the rubber thrust disc, steel thrust plate and felt washer in the order indicated. Refer to Figure 10-117.

3. Be sure steel thrust ball is located in the commutator end of armature shaft, lubricate armature shafts and thrust ball with a high melting point grease and install armature shaft in case assembly bearing.

4. Remove the brush retainer spring.

5. Maintaining the armature in its assembled position in the case, start the armature worm shaft through the field and housing bearing until it starts to mesh with the worm gear.

**NOTE:** It may be necessary at this point to rotate the armature slightly before the worm will engage with the worm gear.

6. Rotate the case as required to align the holes in the case with those in the housing.

7. Being very careful not to pinch any of the motor leads between the case and edge of the field, push the case onto the field until it butts against the housing.

8. Secure the case to the housing with the two tie bolts.

9. Install end-play adjusting screw and locknut and adjust end-play as described in the adjustment section.

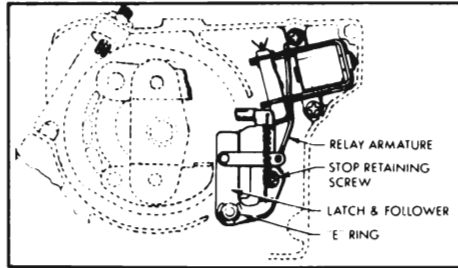


Figure 10-122—Disassembly of Relay and Latch

### c. Disassembly of Relay Control and Latching Mechanism

1. Remove the four screws which secure the gear box cover or washer pump assembly to the gear box.

2. Disconnect coil spring, remove "E" ring and lift the latch and follower assembly off the pivot pin and relay armature. See Figure 10-122.

3. Remove the stop assembly retaining screw. This will permit the stop assembly to be moved as necessary to allow clearance for removing the relay control assembly.

4. Remove the two screws that secure the relay control assembly.

5. Lift the relay control assembly out of the gear box and unsolder leads as required.

### d. Assembly of Relay Control and Latching Mechanism

Solder existing green and yellow wiper leads to relay control switch and solder the relay coil lead to the wiper unit terminal board as shown in Figure 10-123.

### e. Disassembly of Drive Gear Mechanism

1. Remove the crank arm retaining nut. See Figure 10-124.

2. Remove crank arm and rubber seal.

3. Remove the retaining ring, end play washers, shield and spacer washer.

4. Follow Steps 1 through 3 under relay control and latch mechanism disassembly.

5. Remove gear mechanism from the gear box and slide spacer washer off the gear assembly eccentric shaft.

6. Slide the drive plate and shaft assembly out of the gear assembly, remove the lock and drive pawls and remove the coil spring.

### f. Assembly of Drive Gear Mechanism

1. Assemble lock and drive pawls

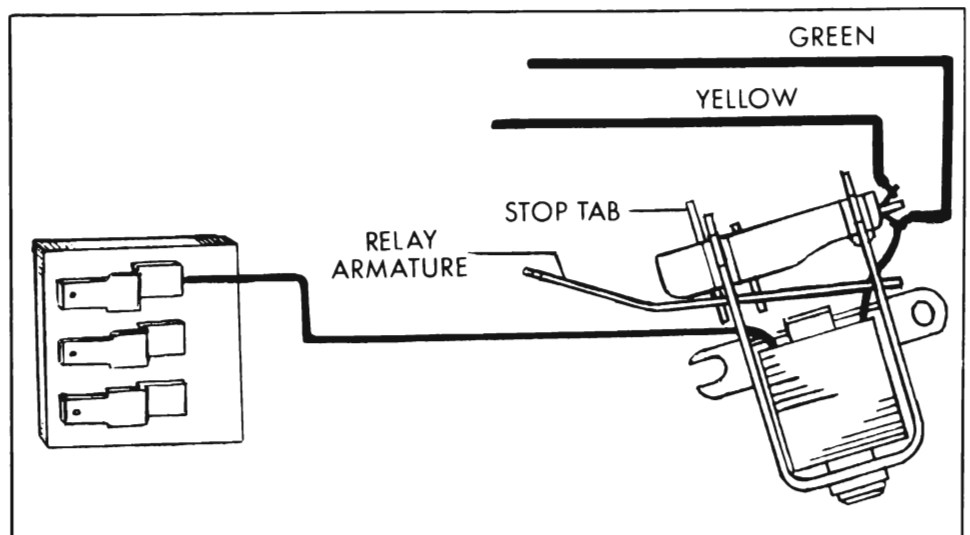


Figure 10-123—Relay Coil Wiring



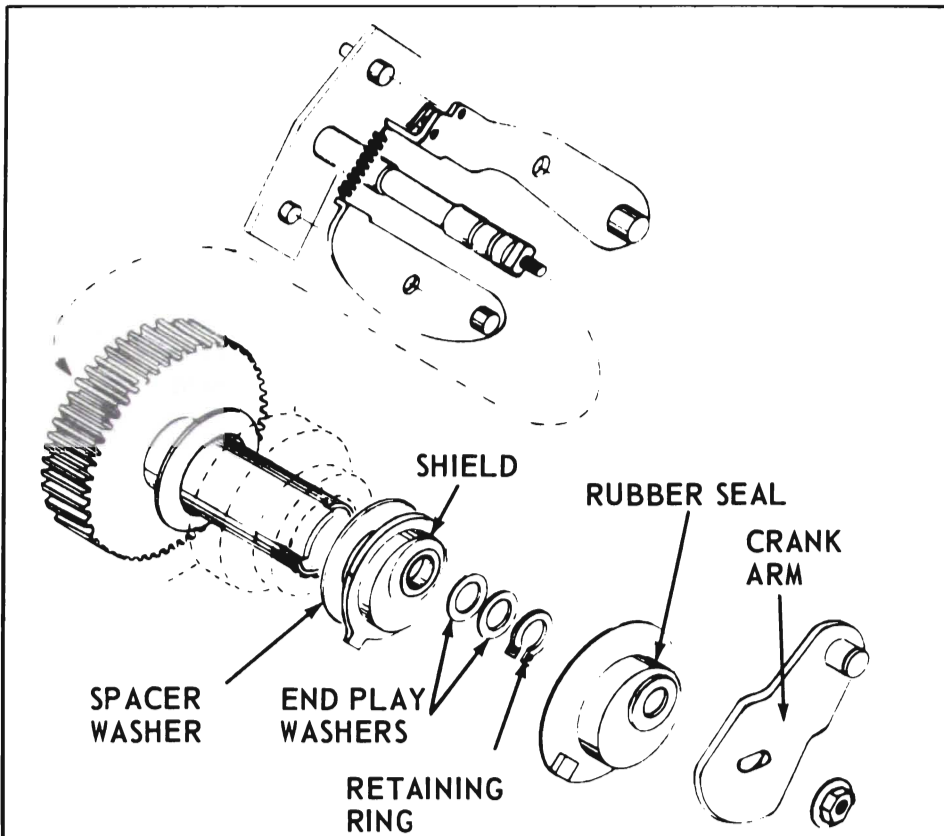


Figure 10-124—Drive Gear Mechanism

to the shaft and drive plate assembly as shown in Figure 10-125.

2. Install the assembled parts from Step 1 in the gear and eccentric shaft.
3. Connect the coil tension spring between the lock and drive pawls.

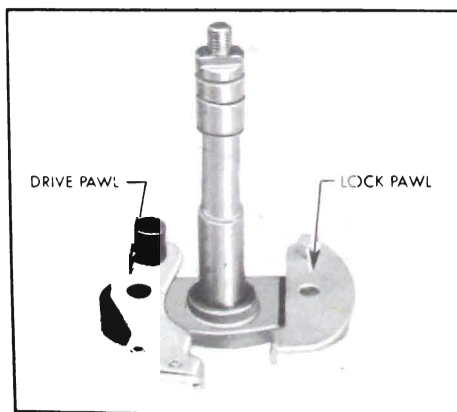


Figure 10-125—Lock and Drive Pawl Assembly

4. Reinstall spacer washer on the eccentric shaft of the gear.
5. Reinstall gear mechanism in the housing.
6. Reassemble the parts removed in Steps 1 through 4 under drive gear disassembly.

**g. Adjusting Armature End-Play**

1. Loosen adjusting screw locknut and tighten the adjusting screw until finger tight.
2. Back off set screw 1/4 turn and tighten locknut.

**h. Adjusting Gear Assembly End-Play**

1. Gear assembly end-play is controlled by end-play washers located between the seal cap and shield. See Figure 10-124. End-play should be .006.

**i. Wiper Specifications**

Operating Test Voltage . . . . .	12
Crank Arm Rotation (looking at arm) . . . . .	CCW
Current Draw (Amps.)	
No Load . . . . .	3 to 4.5
Wet Windshield . . . . .	3.5 to 5
Blade Wipes per Minute	
Low Speed . . . . .	35 to 45
High Speed . . . . .	70 to 85

**10-60 REMOVAL AND REPLACEMENT OF ASSEMBLIES**

**a. Wiper Motor Assembly**

1. Removal
  - (a) Disconnect wire connectors from motor and pump.
  - (b) Pull washer hoses loose from pump.
  - (c) Remove left side air intake grille.
  - (d) Remove spring retainer clip from wiper motor shaft lever.
  - (e) Lift transmission drive links off motor shaft lever.
  - (f) Remove three wiper motor bolts.

2. Replacement
 

Reverse Steps (f) through (a).

**b. Wiper Transmission**

1. Removal
  - (a) Remove wiper blade and arm, shaft and escutcheon retaining escutcheon retaining nuts and escutcheon from transmission shaft.
  - (b) Remove air intake grille retaining screws. Slide grille out from under reveal molding.
  - (c) Remove spring retainer clip from wiper motor shaft. Lift drive links off motor shaft.
  - (d) Remove the three transmission retaining screws.

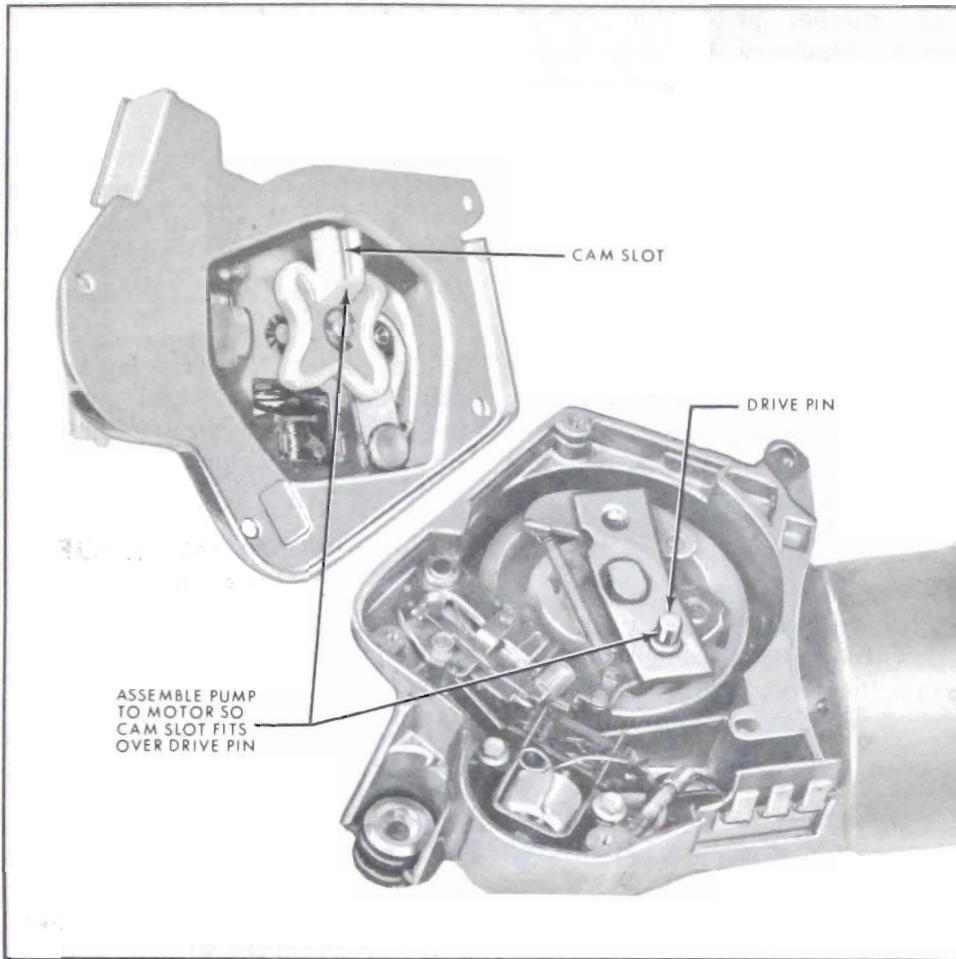


Figure 10-126—Assembling Washer Pump to Wiper

(e) Slide transmission and drive link toward opposite side of car. Lift transmission up at opening and remove.

## 2. Replacement

Reverse Steps (e) through (a).

## 10-61 WINDSHIELD WASHER DESCRIPTION AND OPERATION

### a. Description

Any time that the motor is turning, a drive pin on the motor drive plate assembly turns a four lobe shaped nylon cam follower in the pump assembly. The cam follower contacts a roller on the ratchet pawl lever. See Figure 10-125. A torsion spring on the ratchet pawl lever pivot shaft makes the

lever and roller follow the nylon cam follower and also puts the ratchet pawl under spring tension.

Two other shafts are located on the ratchet pawl lever, on the side opposite the roller. One of the shafts supports the ratchet pawl, while the shorter shaft actuates the pump slide lever. The pump slide lever is slotted at one end to receive the short shaft. The other end of the pump slide lever is fitted with a rubber cup type pump diaphragm and a coil spring. See Figure 10-127.

The ratchet pawl is slotted on the end opposite the pivot shaft. The slotted end contacts a nylon ratchet wheel which has 21 teeth. During pump operation, the slot in the ratchet pawl slips over one tooth on the ratchet wheel and rotates the wheel one tooth at a time until the ratchet wheel

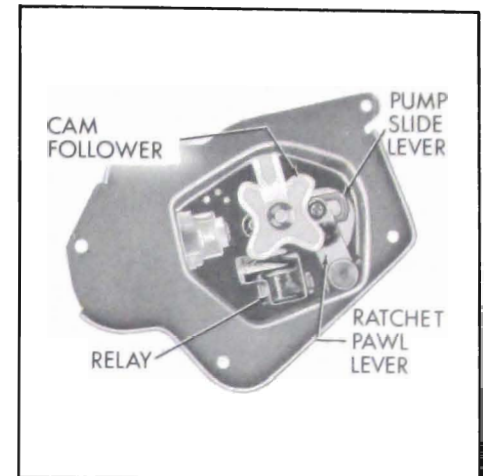


Figure 10-127—Washer Pump—Motor Side

has been rotated through all 21 teeth or one complete revolution.

The nylon ratchet wheel has a ramp on the side down toward the pump slide lever and also a notch on the top side. The ramp has two functions. First, as the ratchet wheel rotates, the ramp makes contact with a relay armature hair spring to move the spring from under the armature and allow it to drop toward the ratchet pawl. Secondly, it contacts a tang on the pump slide lever which allows the tang to climb up on the ramp and stop the pumping action.

A tang on the pump relay armature falls into the notch on the

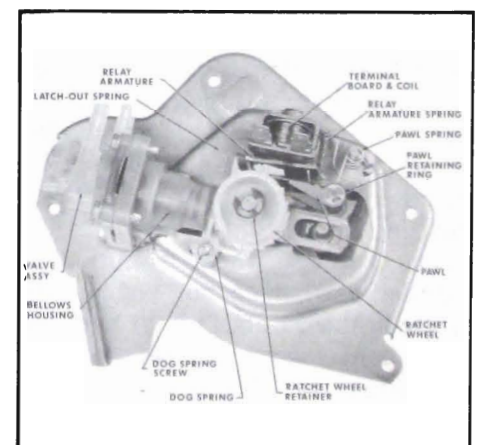


Figure 10-128—Washer Pump—Cover Side

nylon ratchet wheel when the wheel has made one revolution. This allows the ratchet pawl to slide into a wide slot in the armature, lifting the ratchet pawl away from the teeth of the nylon ratchet wheel.

A relay within the pump housing is energized anytime the washer button is depressed. See Figure 10-128. When energized, the armature is pulled up against the relay to release the ratchet pawl from the armature, allowing the ratchet pawl to engage the ratchet wheel teeth. At the same time, the relay armature hair spring trips to a position under the armature, holding it away from the ratchet wheel and ratchet pawl.

### b. Operation

Pump action remains the same regardless of whether wiper motor is on when washer button is depressed or if button is depressed to start washer and motor at the same time.

#### 1. Idling.

With wiper motor turning, the elliptical cam follower is rotated by the guide pin on the ratchet pawl lever. The tang on the pump slide lever is on the high portion of the ratchet wheel ramp, leaving the pump in a cocked position. The pump slide lever is spring loaded by a coil spring next to the rubber cup diaphragm.

With the wiper motor turning, the elliptical cam follower is rotated by the guide pin of the motor drive plate. The pump slide lever is held from pumping by the tang resting on the high portion of the nylon ratchet wheel ramp. The ratchet pawl does not engage the teeth of the ratchet wheel because it is held away from the wheel by the armature. The armature tang is engaged in the slot of the ratchet wheel. The rotating cam follower contacts the roller and moves the ratchet pawl lever back and forth.

The ratchet pawl also moves, being connected to the ratchet pawl lever, but no ratchet wheel rotation takes place. The pump is idling.

#### 2. Pumping

When the washer button is depressed, the relay energizes. The armature tang moves out of the ratchet wheel slot and the armature hair spring trips under the armature. As the armature moves toward the relay, the ratchet pawl falls free of the armature and engages a ratchet wheel tooth, rotating the wheel one tooth. The distance moved is sufficient for the pump slide lever tang to fall off the ratchet wheel ramp and allow the spring loaded pump to pump the first stroke. The pump completes one pumping stroke for each ratchet wheel tooth movement. After the wheel has rotated approximately 1/2 turn the ramp engages the armature hair spring and moves it out from under the armature. The armature drops and the tang contacts the ratchet wheel but does not affect the ratchet pawl action. After another 1/8 to 1/4 turn of the ratchet wheel, the pump slide lever tang contacts the ramp with a resulting shorter pump stroke. Each succeeding stroke becomes shorter until the nylon ratchet wheel has made one complete revolution and returned to the starting position. At that point, the armature tang drops into the ratchet wheel slot, with the ratchet pawl entering the large slot in the armature and lifting away from the ratchet wheel teeth. The pump is then returned to idling and has completed one pumping cycle.

## 10-62 WINDSHIELD WASHER DIS-ASSEMBLY AND ASSEMBLY

### a. Removal and Replacement of Relay and Terminal Board

1. Remove washer pump cover. See Figure 10-128.

2. Rotate nylon rotor cam to free ratchet arm from relay armature and lift out relay coil assembly.

**CAUTION:** Whenever it is necessary to solder connection on either the wiper or the pump, rosin core solder should be used. Do not use acid core solder.

3. To reinstall, hold relay armature in against the coil pole and position the relay mounting stud in the slot provided in the pump body casting.

4. Install spring clip on relay mounting stud.

5. Assemble terminal insulator over terminals and position terminal board.

6. Manually rotate washer pump through a complete cycle to check if pump is operating properly.

### b. Removal and Replacement of Valve Assembly

1. Remove four screws attaching valve to pump body.

2. Carefully remove valve assembly.

3. To install reverse removal procedure.

**NOTE:** Be certain that bellows is positioned properly when valve assembly is installed.

### c. Removal and Replacement of Bellows

1. Remove valve assembly.

2. To release bellows unit from pump plunger, hold end of pump slide lever, push in against bottom of bellows and turn bellows approximately 1/4 turn.

3. To install, reverse removal procedure.

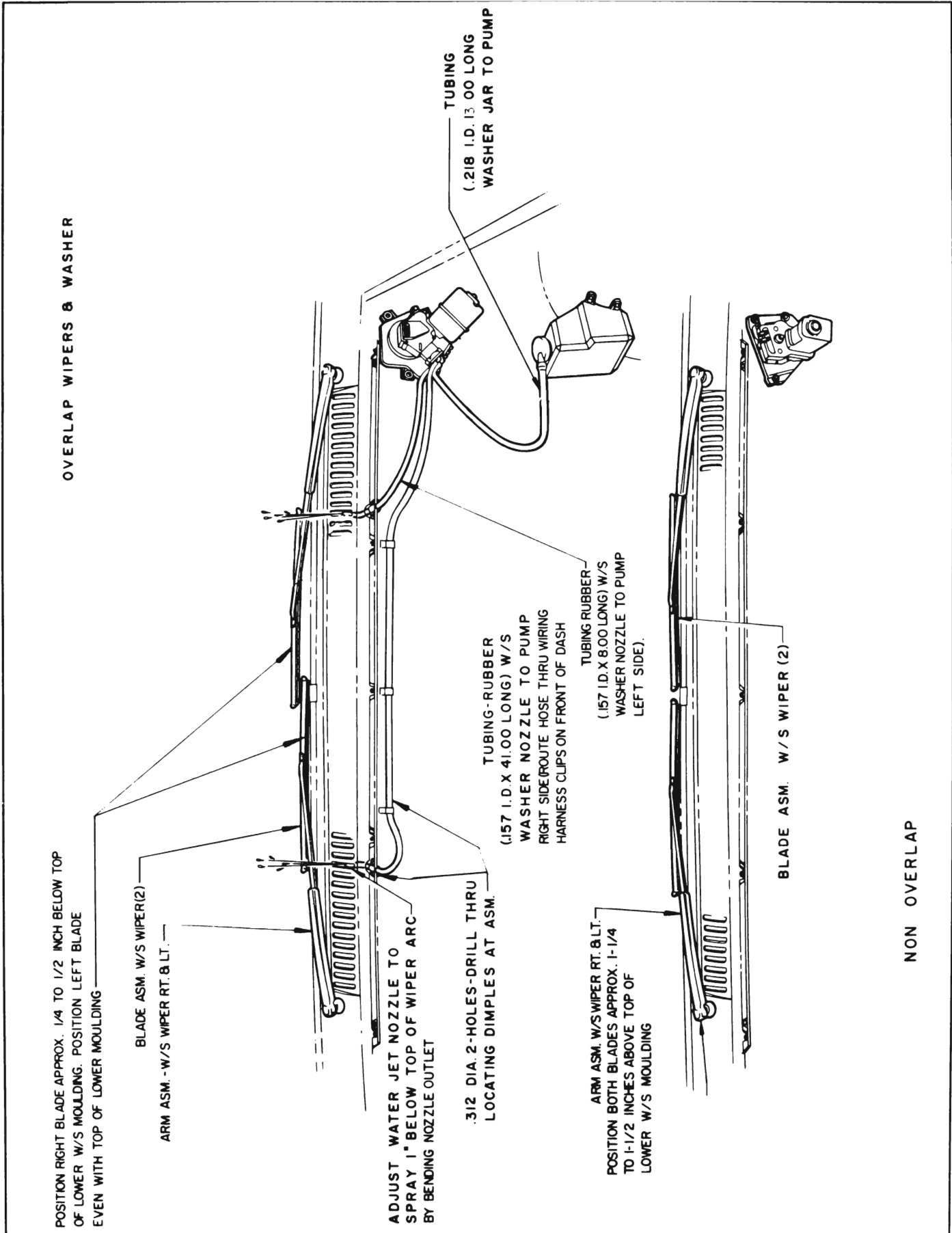


Figure 10-129—Washer Nozzle Aiming and Wiper Arm Installation

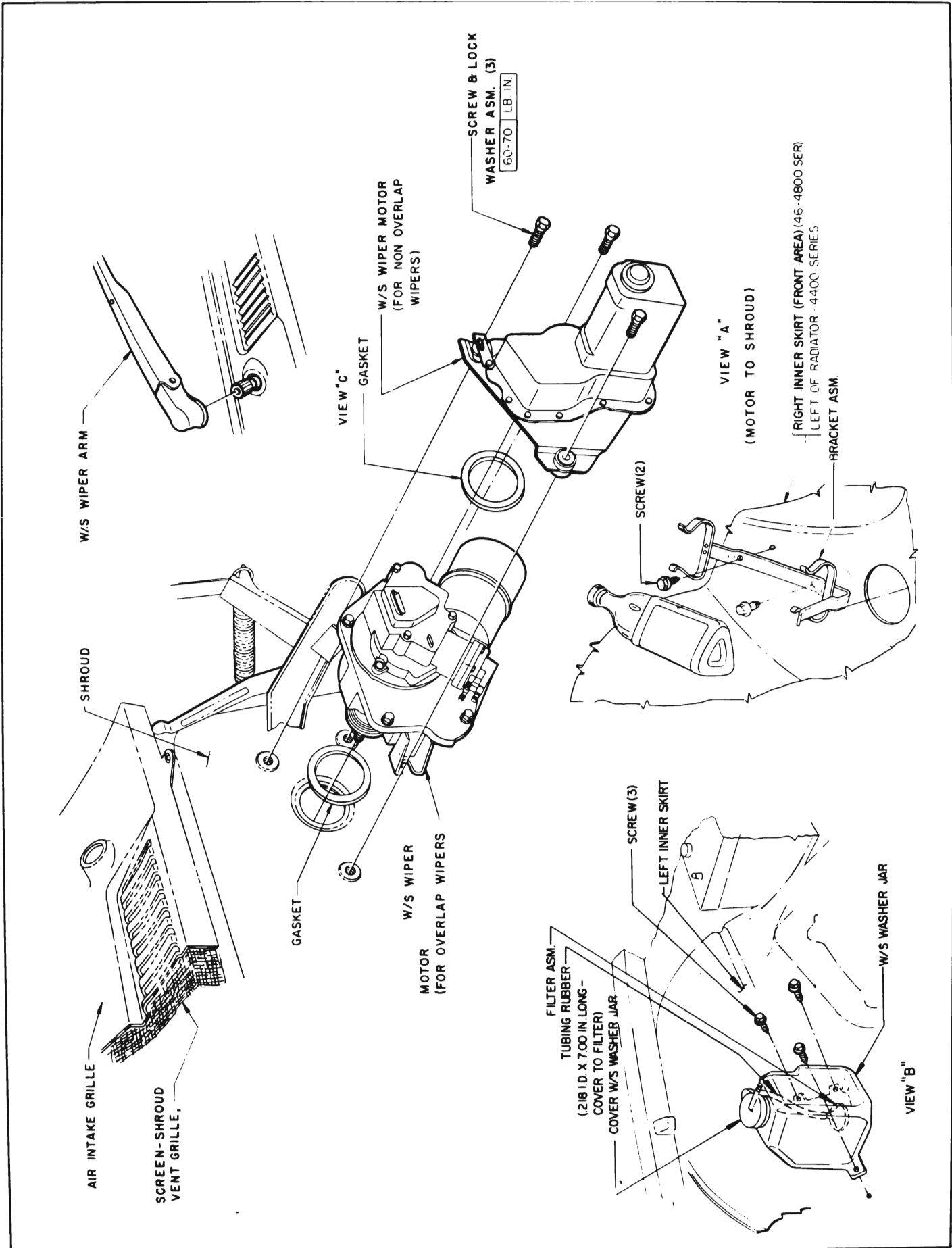


Figure 10-130—Windshield Wiper and Washer Installation



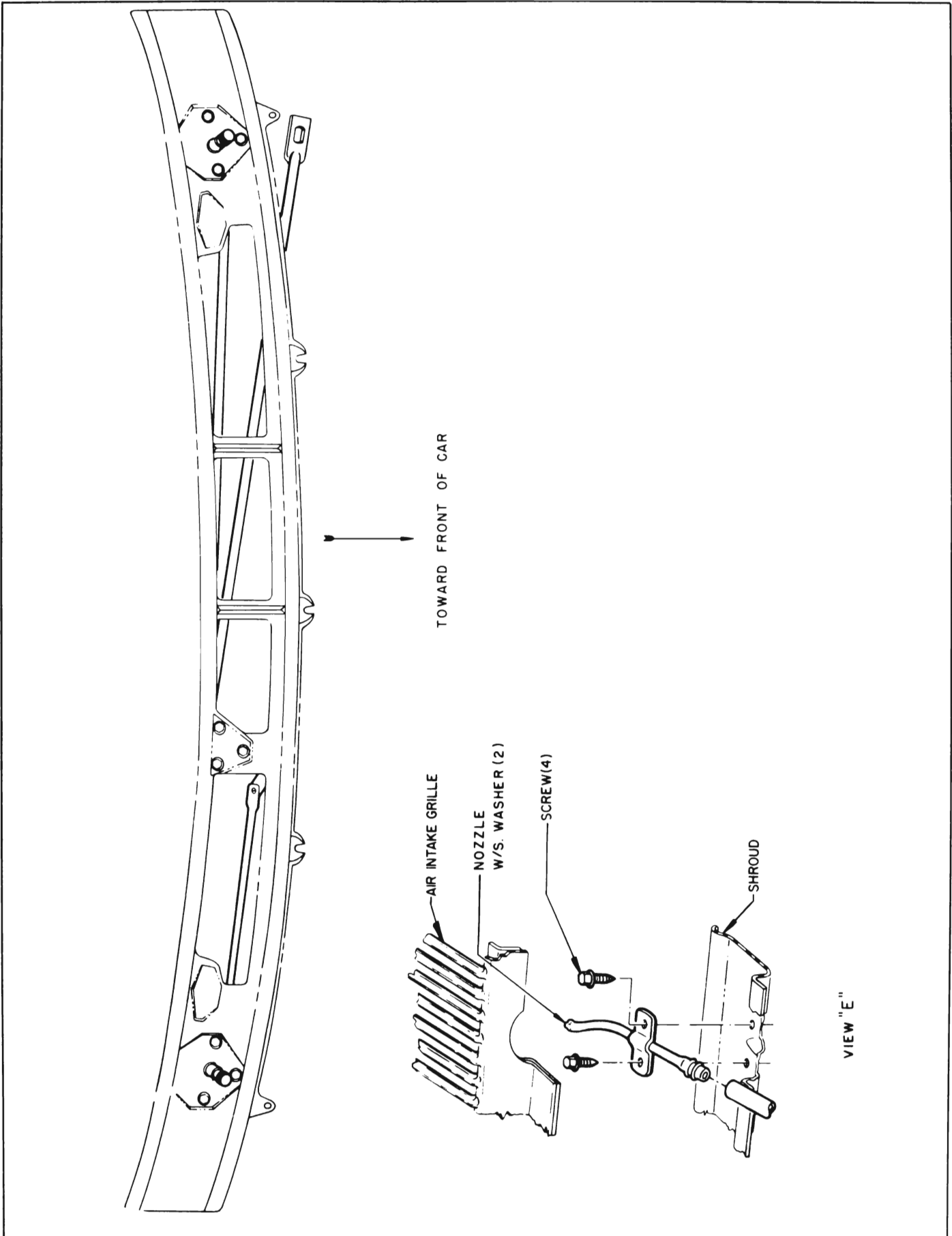


Figure 10-131—Windshield Wiper Linkage and Washer Nozzle Mounting

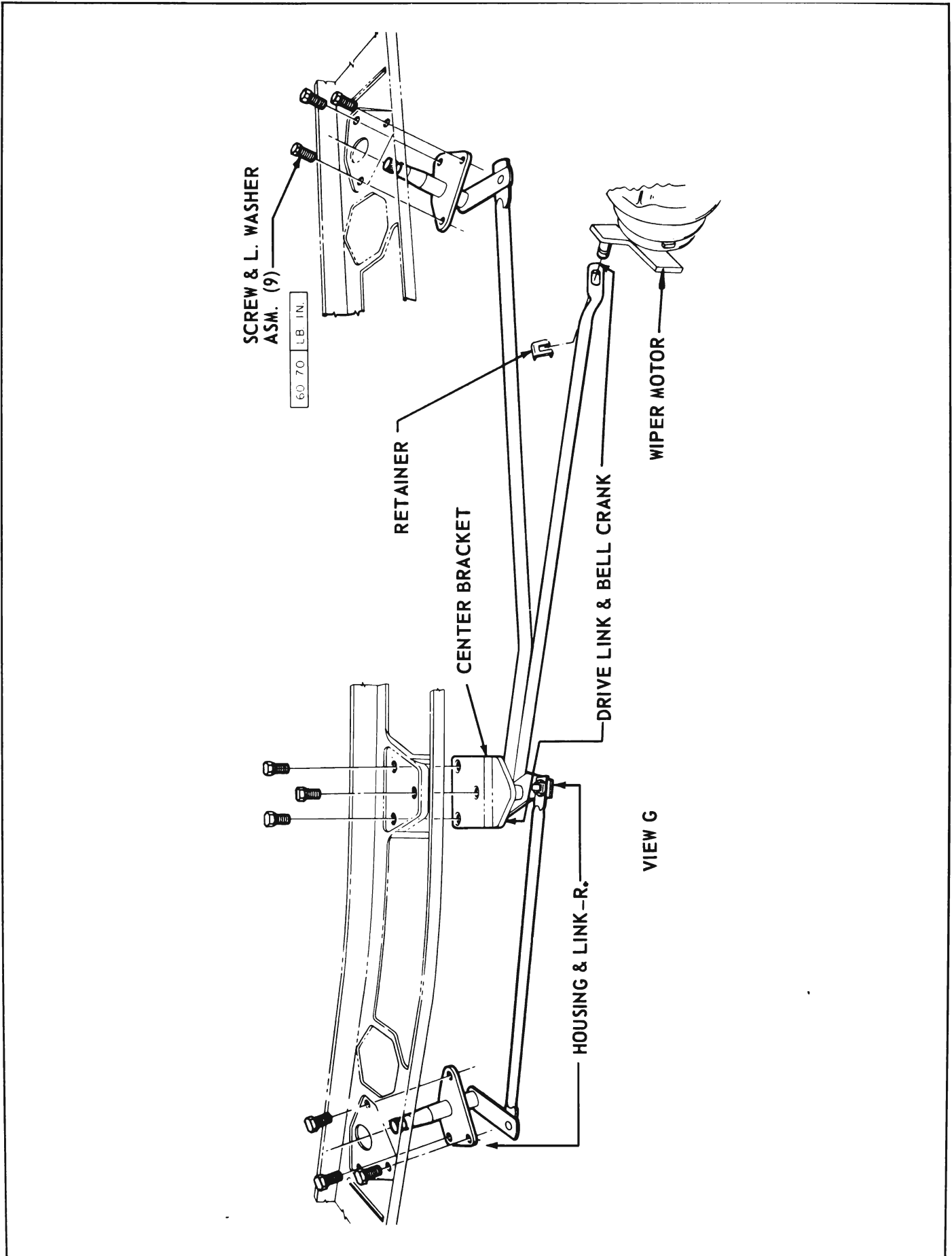


Figure 10-132—Windshield Wiper Linkage Installation



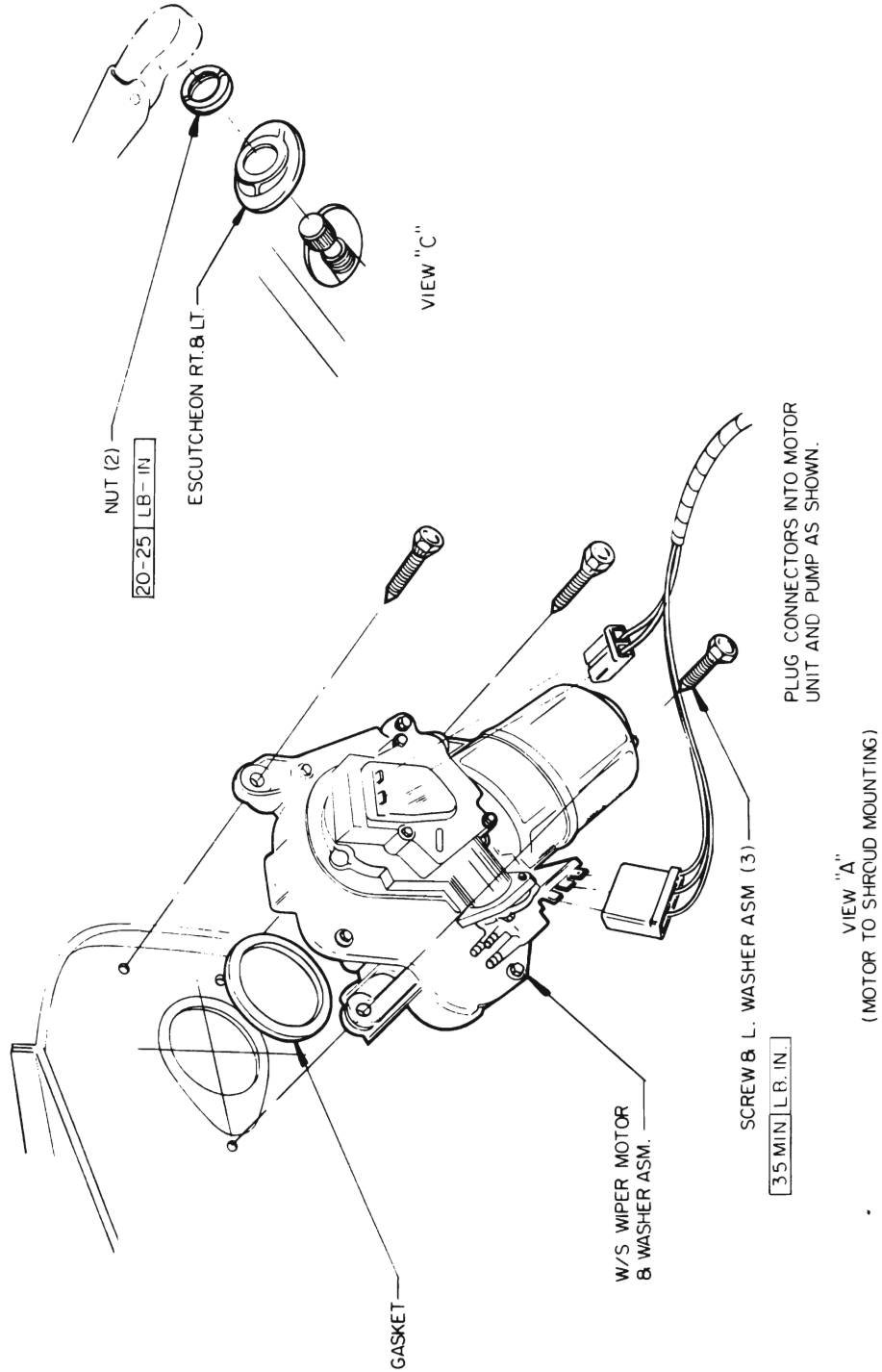


Figure 10-134—Windshield Wiper Motor Installation—Riviera

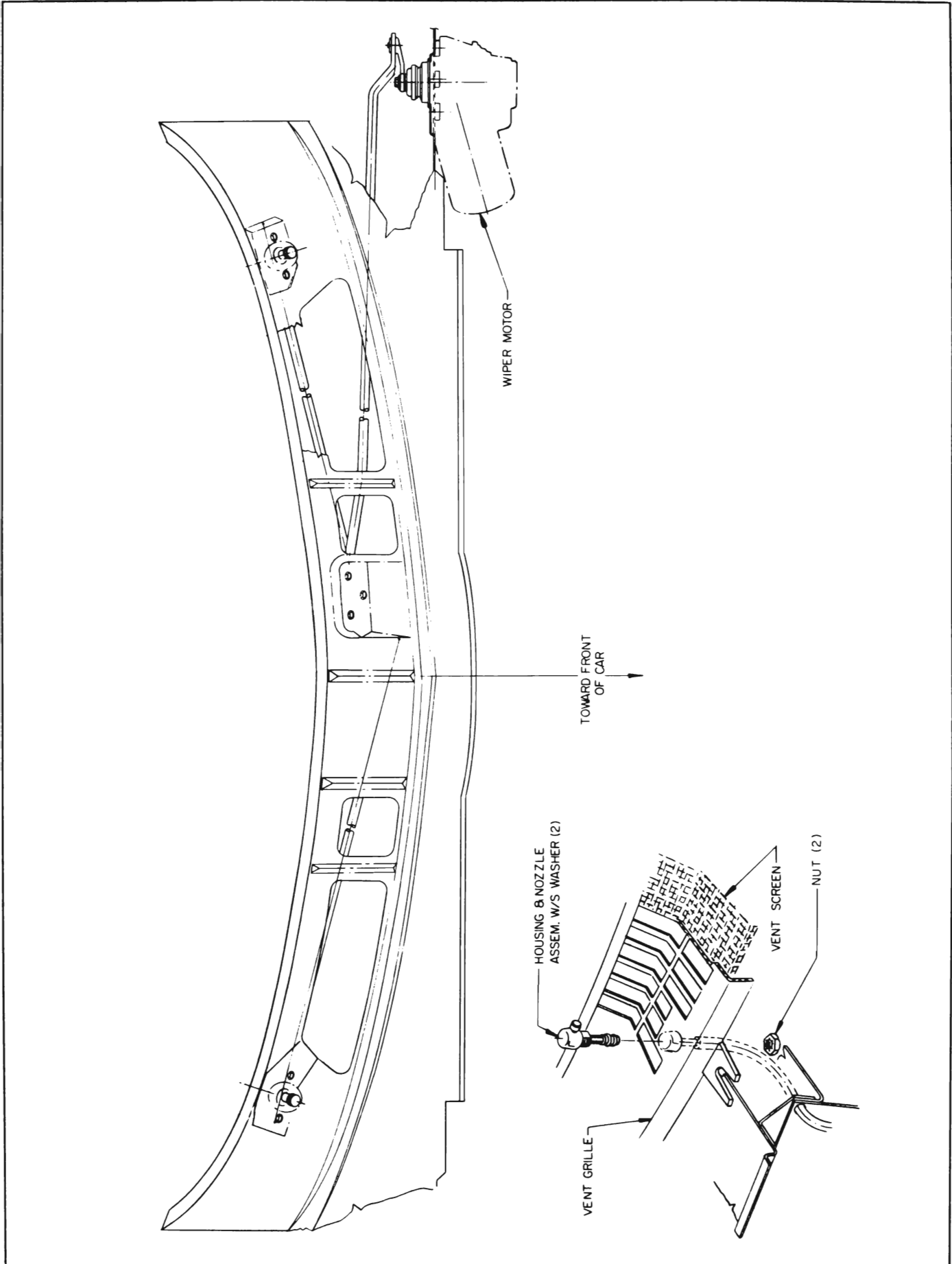


Figure 10-135—Windshield Wiper Linkage and Washer Nozzle Mounting—Riviera



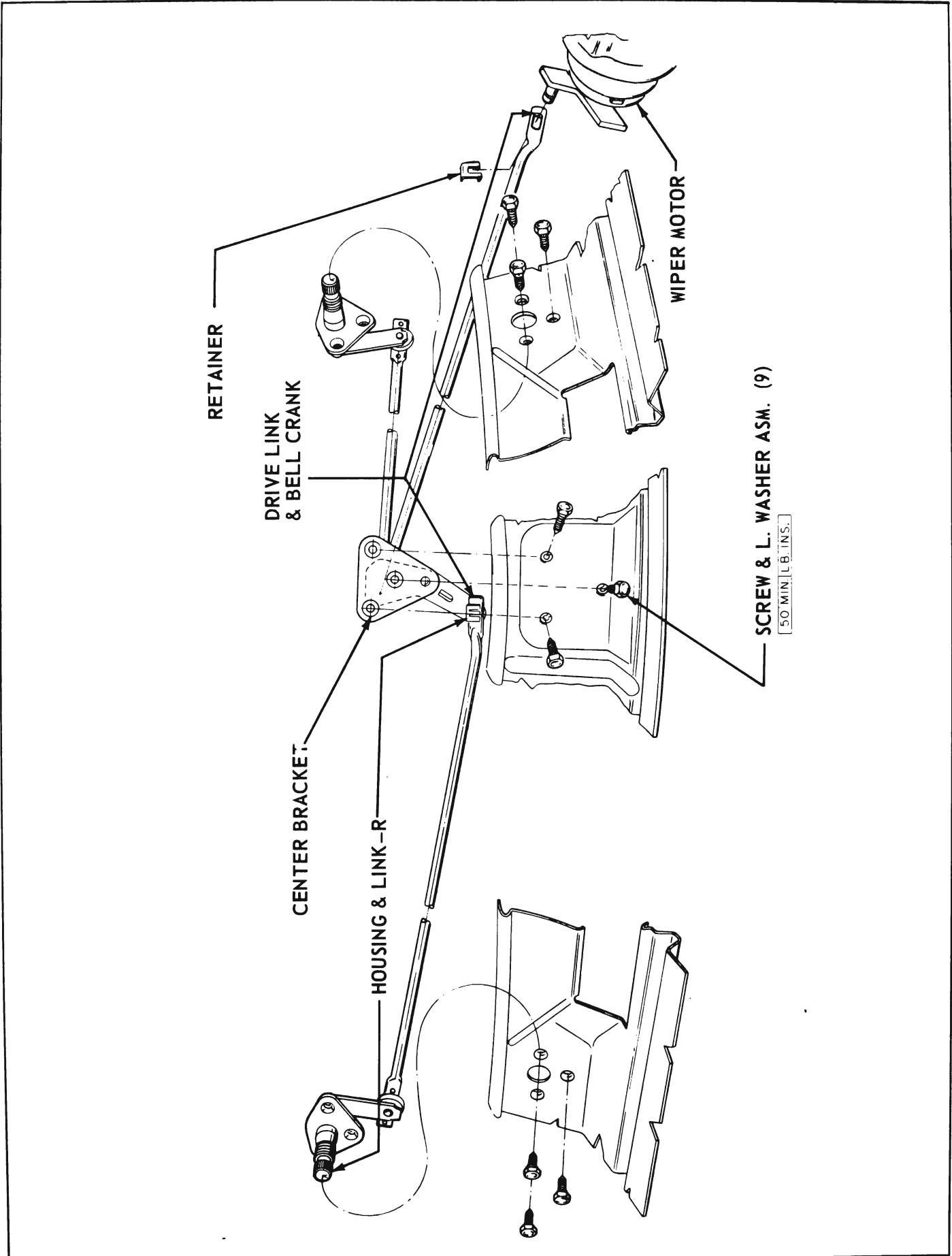


Figure 10-136—Windshield Wiper Linkage Installation—Riviera



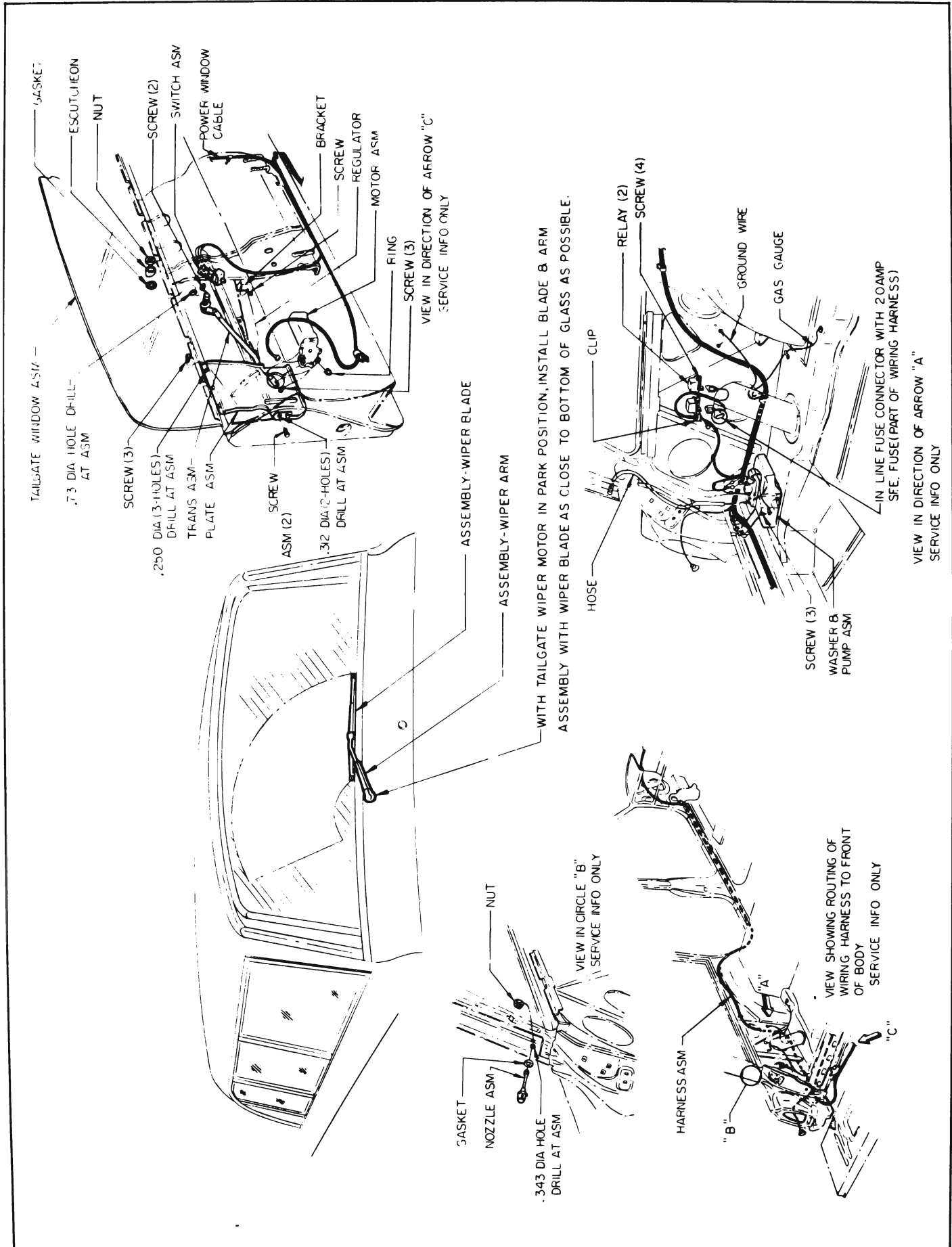


Figure 10-138—Tailgate Window Wiper and Washer

