SECTION 10-I

WINDSHIELD WIPER AND WASHER ASSEMBLY

CONTENTS OF SECTION 10-I

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 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".)

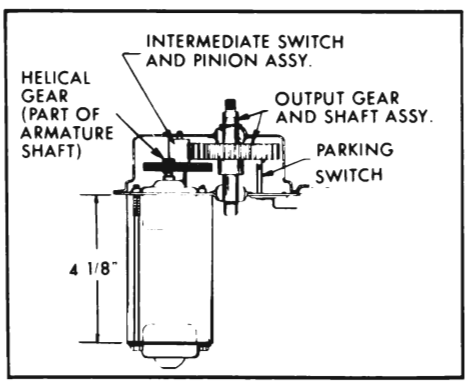


Figure 10-96—Typical View of Gear Train

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.)

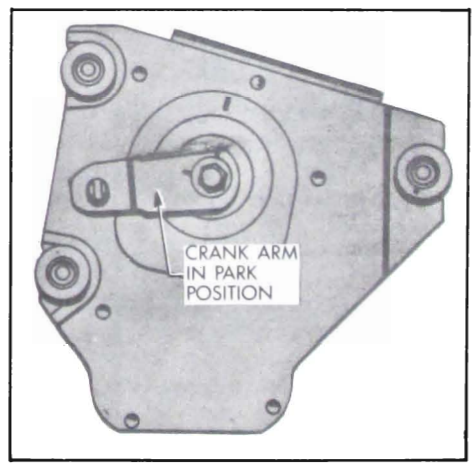


Figure 10-97—Park Position of Crank Arm

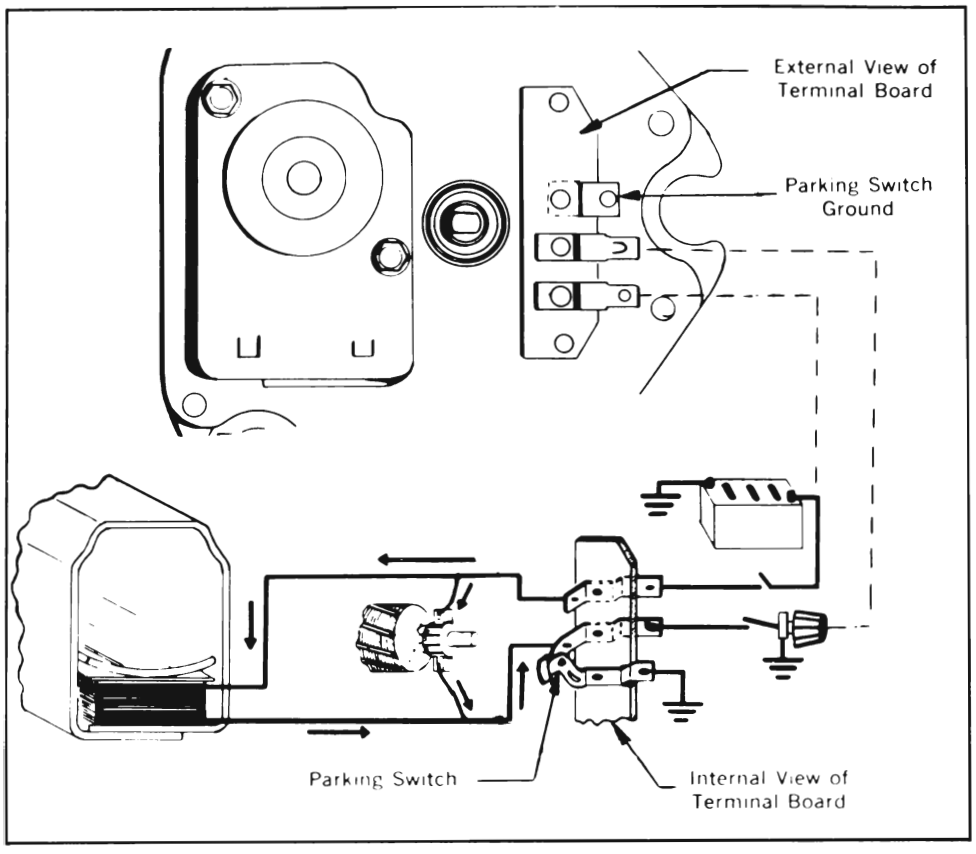


Figure 10-98—Single Speed Wiper Wiring Diagram

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

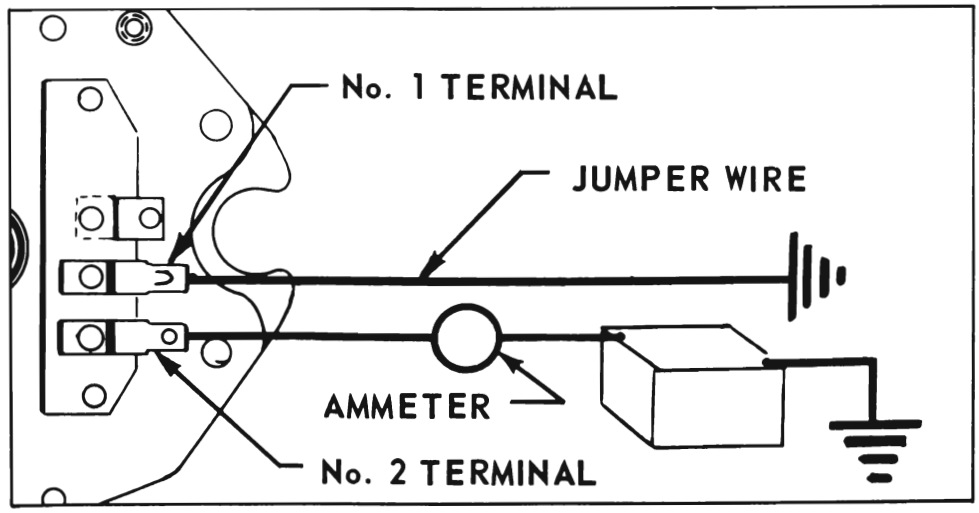


Figure 10-99—Connections to Operate Wiper Out of Car

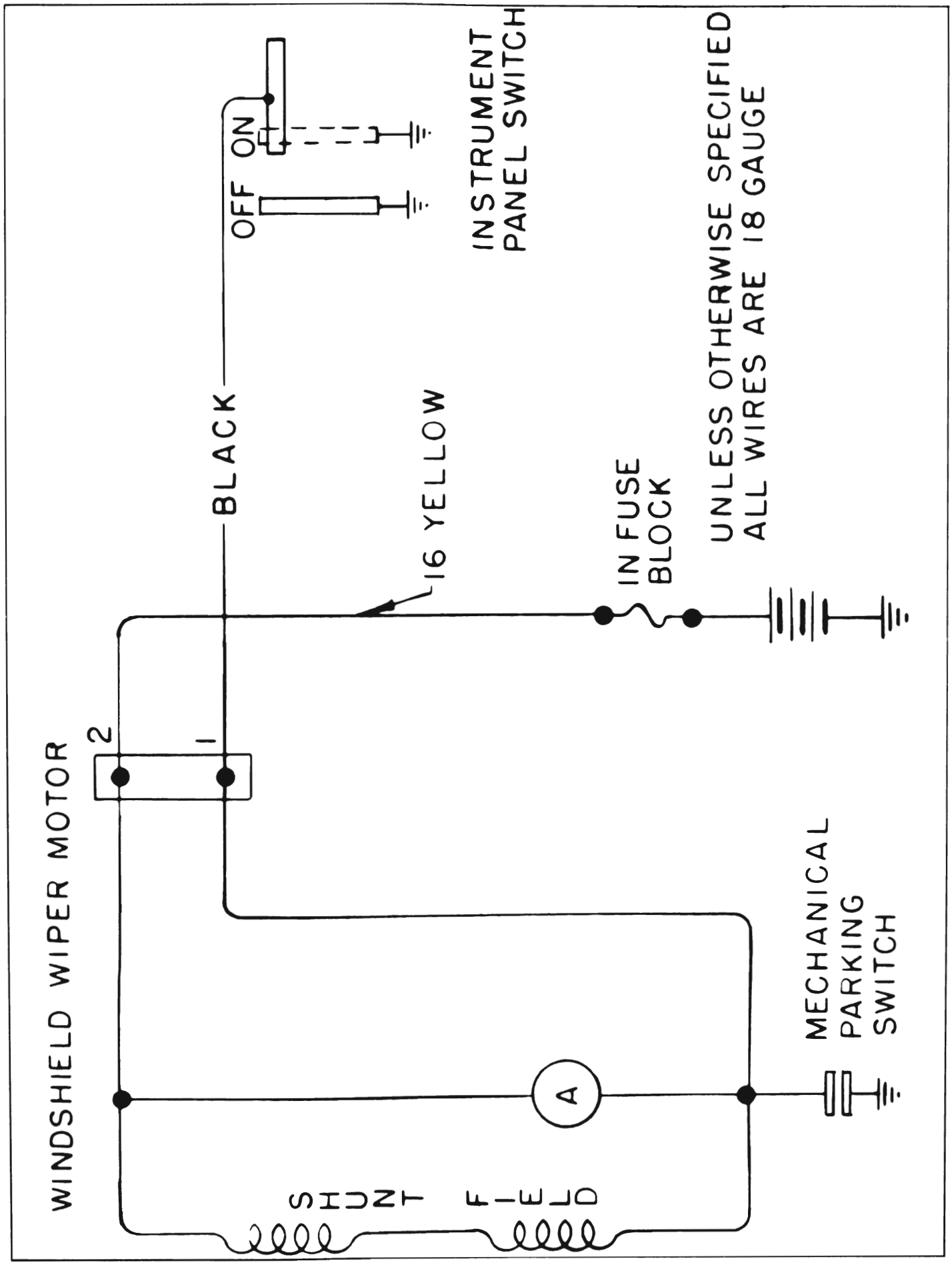


Figure 10-100—Windshield Wiper Schematic Diagram - Single Speed

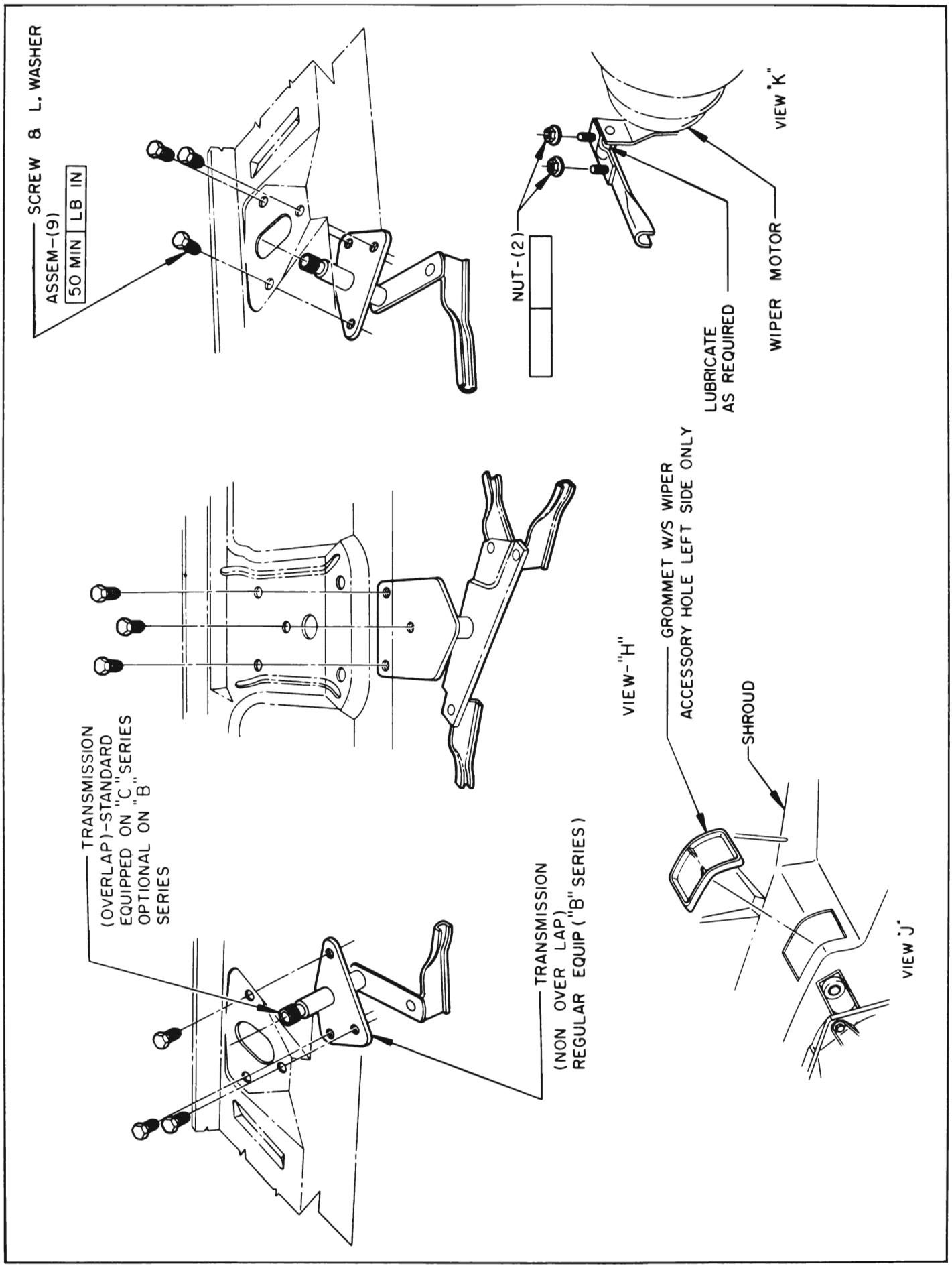


Figure 10-101—Wiper Linkage Installation

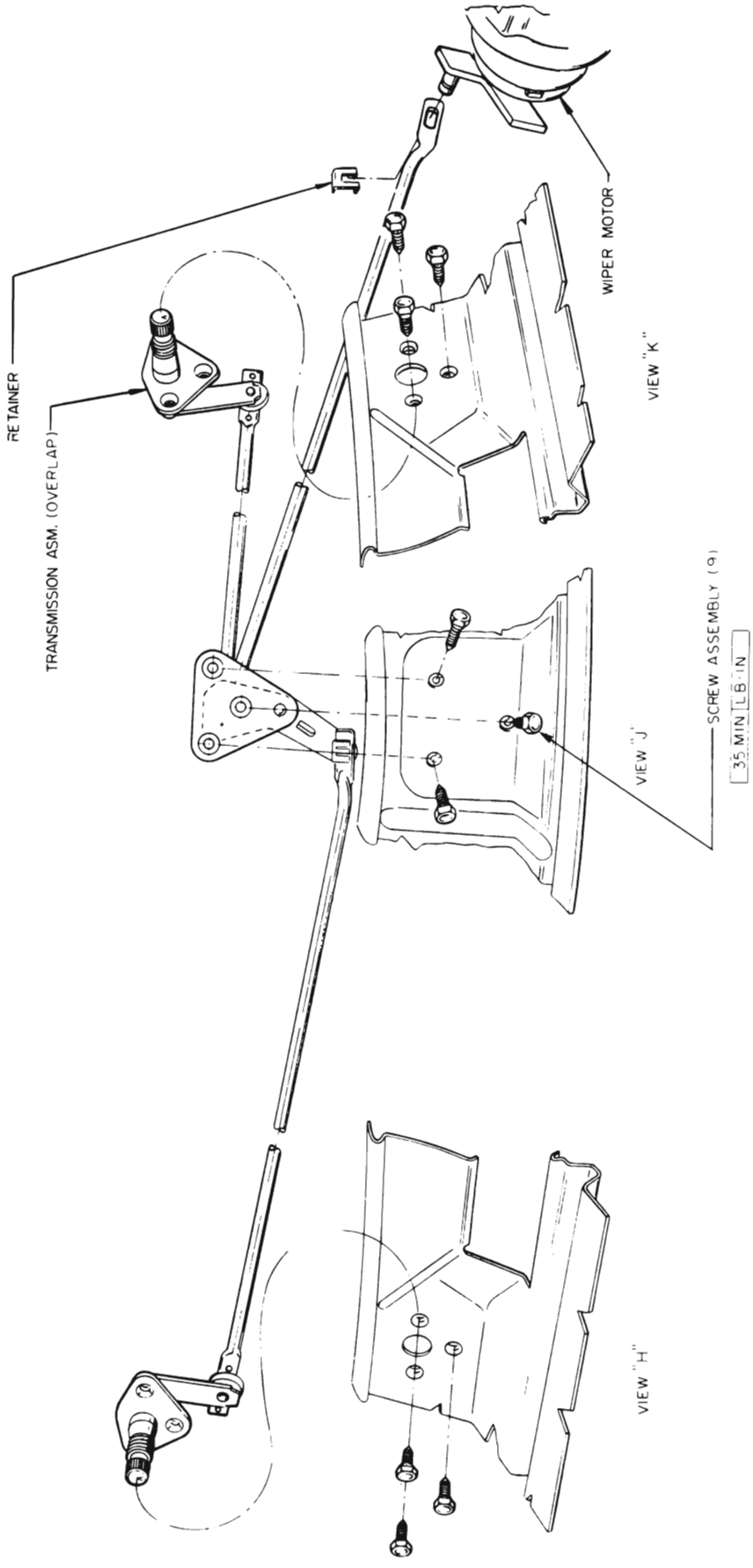


Figure 10-102—Windshield Wiper Linkage Installation - Riviera

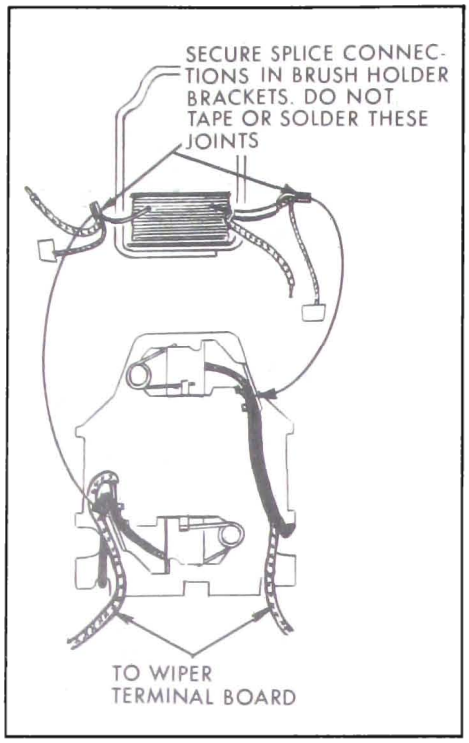


Figure 10-103—Motor Wiring

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

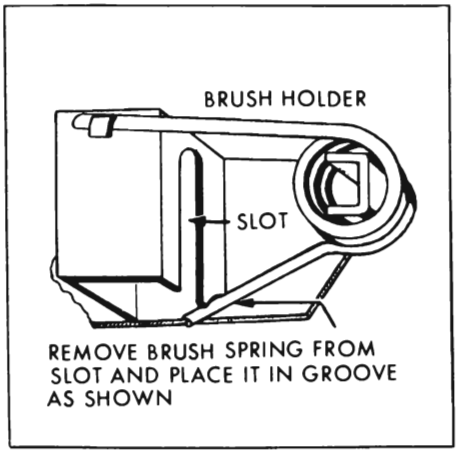


Figure 10-104—Releasing Brush Holder Spring Pressure

(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.

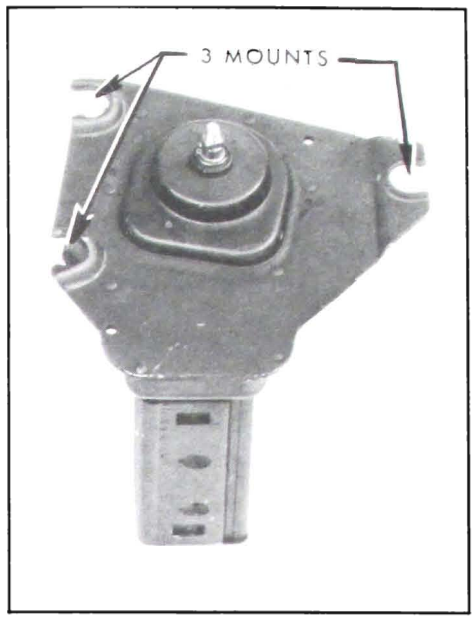


Figure 10-105—Single Speed Wiper

(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 reassembly 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 ground strap 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.

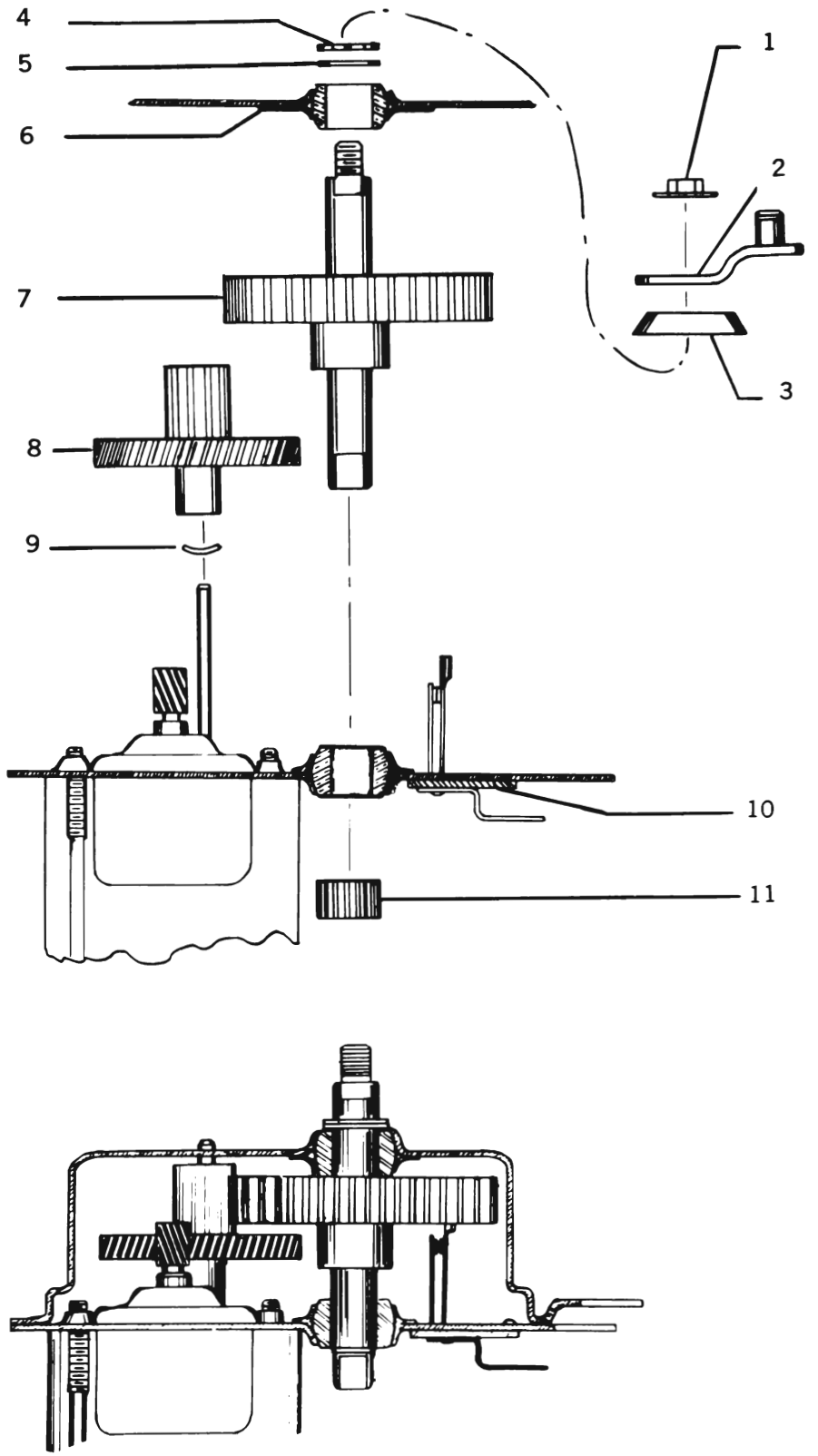
2. Reassembly of Crank Arm - Operate wiper to park position (Figure 10-102) and install crank arm on output shaft in the position shown in Figure 10-100. Clamp crank in vise before securing the retaining nut.

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.



1. Nut
2. Crank Arm
3. Seal Cap
4. Retaining Ring
5. Washer
6. Gear Box Cover
7. Output Gear and Shaft Assy.
8. Intermediate Gear
9. Spring Washer
10. Parking Switch and Terminal Board Assy.
11. Washer Pump Drive Gear

Figure 10-106—Gear Box Assembly

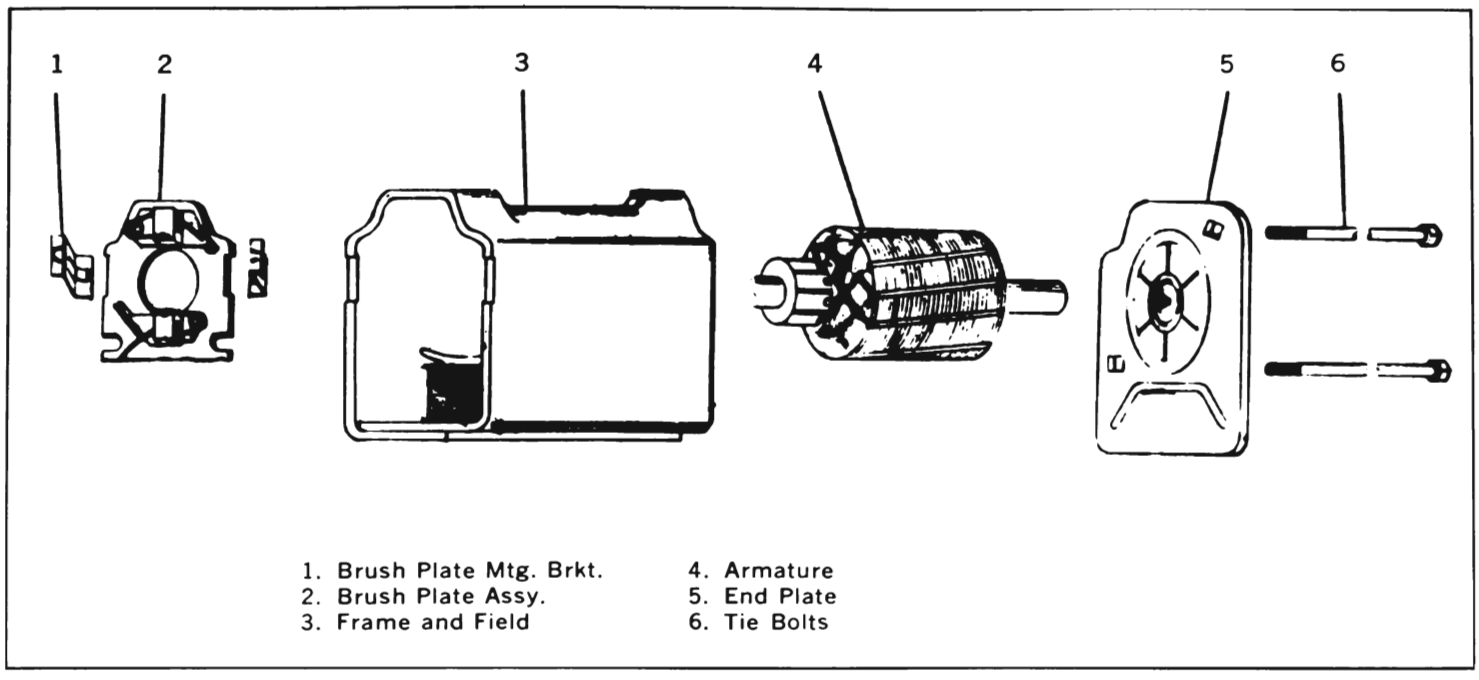


Figure 10-107—Motor Assembly

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
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 44 and 46 Series with the two-speed overlapping system available as an option. The two speed overlapping system is standard on 48 and 49 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. As shown,

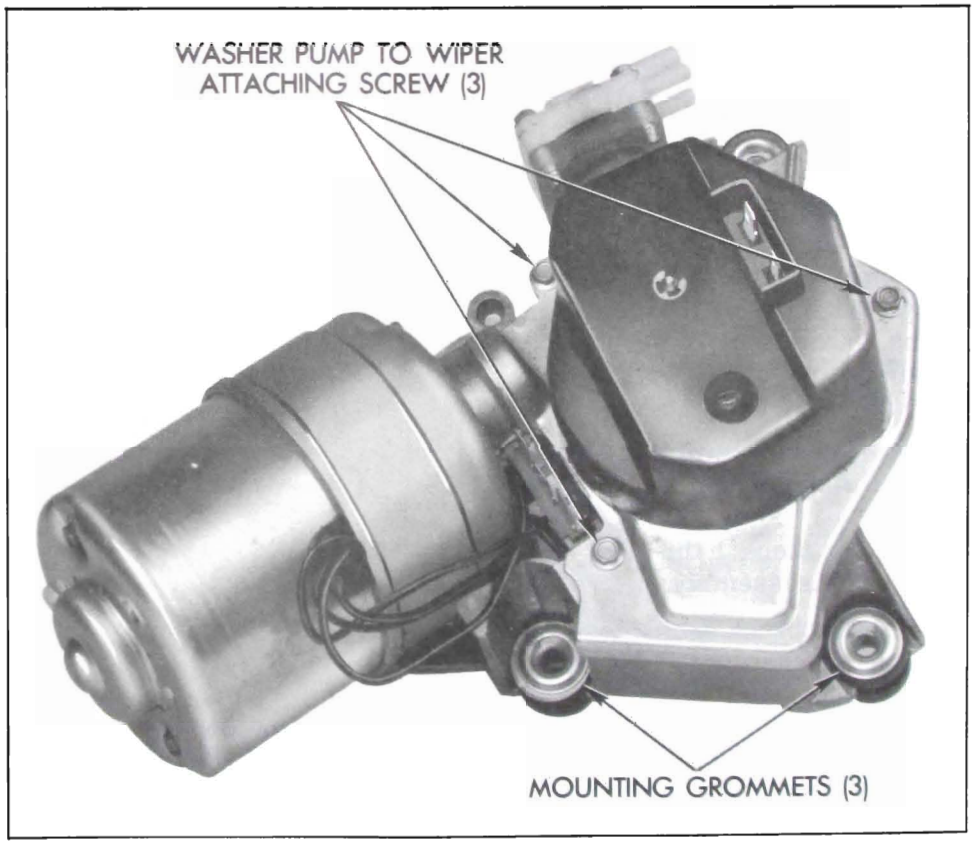


Figure 10-108—Windshield Wiper Motor - Two Speed

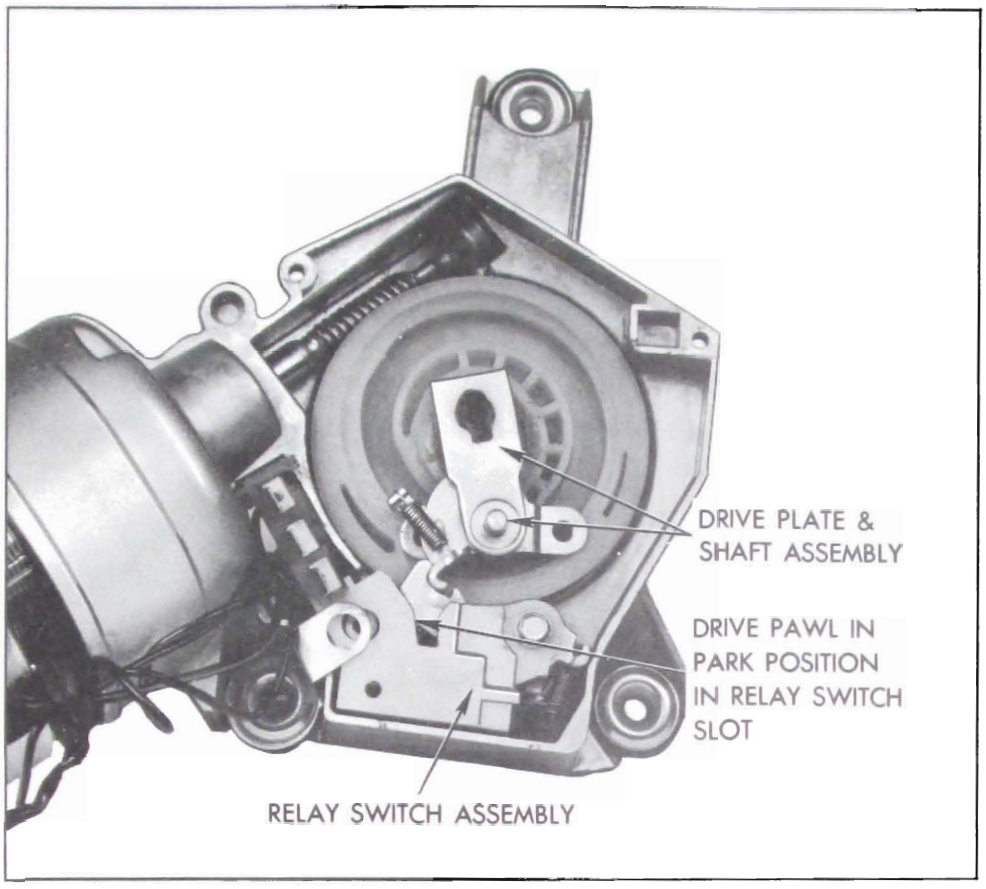


Figure 10-109—Wiper Mechanism in Park Position

the motor leads that extend between the motor and the gear box are routed externally. 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 moved by the button to the slow speed position. After the washer has stopped, the knob must be manually pulled back up to the off position to stop the wiper blades. The blades always return to the depressed park position when the switch is moved to off. If a faster wiper blade speed is desired, the knob should be pushed all the way down.

The single speed wiper switch has no button. When the switch is moved 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.

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

The drive link and bell crank assembly which is located under the air intake grille attaches to the drive crank arm on the motor shaft on one end. The right and left housing and link assemblies attach to the bell crank. 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 the 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. Wiper Off. In the off position, the wiper gear drive pawl is located in a slot in the relay switch assembly. See Figure 10-109. In this position it is pushing against a spring loaded latch arm. The latch arm, in turn, is pushing against a flexible switch contact which holds the switch contacts open. Figure 10-109 shows the wiper gear mechanism in the "park" or "off" position.

2. Wiper On Low Speed. When the owner turns the wiper on at the dash switch, the circuit through the relay switch assembly coil is completed to ground at the dash switch. The motor shunt field ground connection at the dash switch is maintained. See Figure 10-110. With the magnet coil energized, the latch arm is attracted to the magnet coil. This action trips the latch arm away from the flexible switch contact which allows the switch contacts to close. When the contacts close,

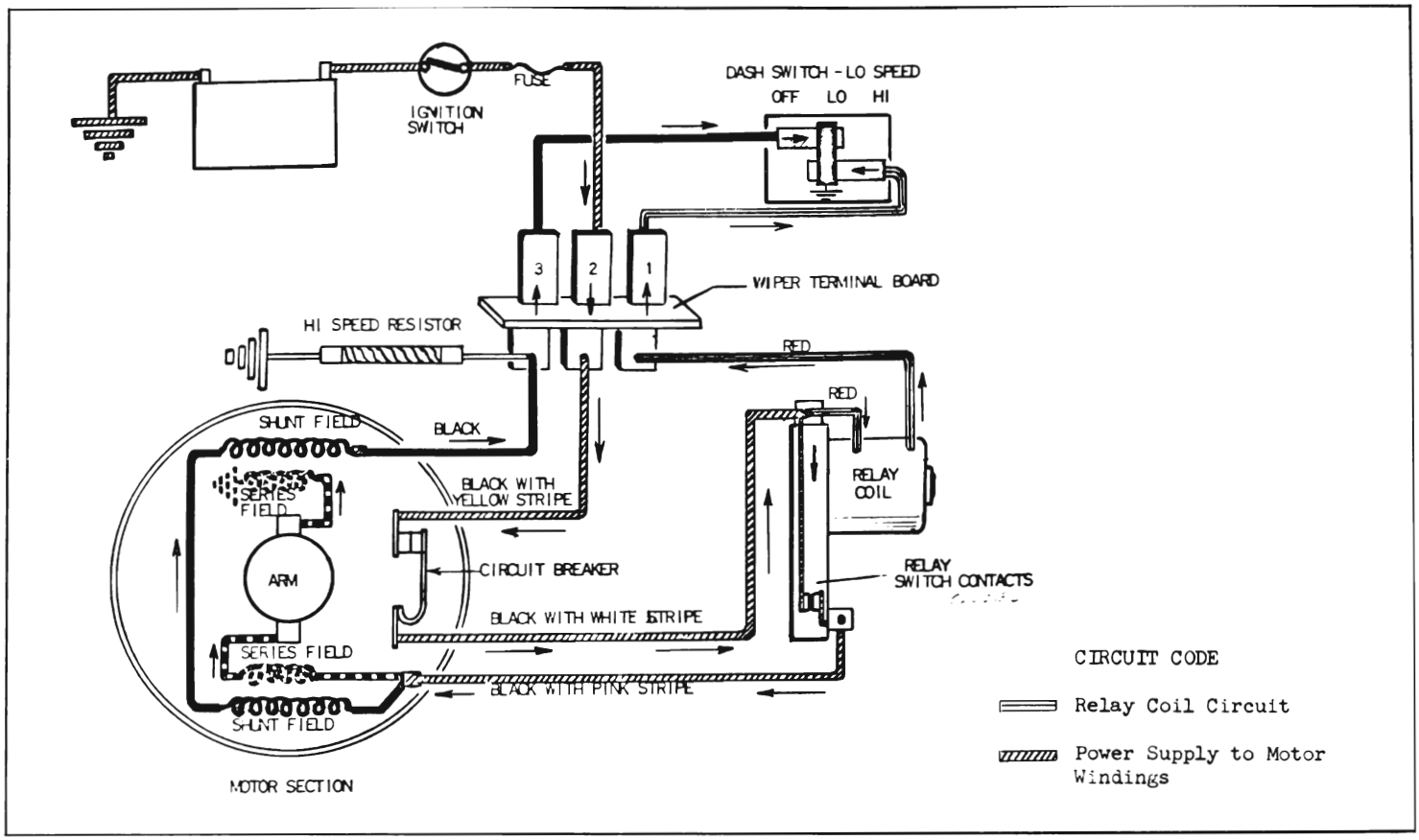


Figure 10-110—Wiring Diagram - Low Speed Operation

the 12V feed (black with pink stripe) to the wiper motor windings is completed and the wiper motor starts.

When the wiper motor first starts, only the gear rotates. The other gear assembly parts (drive pawl, lock pawl, drive plate and shaft, plus the crank arm) are unlocked from the gear and are prevented from rotating with the gear because the drive pawl extends into the magnet switch slot. Refer to Figure 10-109.

Since the gear rotates independently during this stage of the "start up", and since the crank arm or output shaft extends through the gear shaft off center a cam action results between the output shaft and gear shaft. This cam action causes the drive pawl to move out of the relay switch slot. After the gear has rotated approximately 180°, the spring loaded drive and lock pawl guide pins snap into their respective pockets in the gear locking the drive or output shafts and related parts to the gear. The complete gear mechanism is now in its normal run position, and the gear, drive pawl, lock pawl, drive plate and shaft assembly and crank arm rotate as a unit. See Figure 10-111.

3. Wiper On High Speed. Turning the wiper dash switch to the high speed position opens the shunt field circuit to ground at the dash switch. However, the shunt field circuit is then completed to ground through the resistor located on the wiper terminal board. See Figure 10-112.

With the shunt field circuit completed to ground through the resistor, the wiper will run at high speed. (Crank arm RPM approximately 70 @ 12 volts.)

4. Shutting Wiper Off. Moving the dash switch to the off position opens the relay coil circuit to ground at the dash switch. With the relay coil circuit open, the spring loaded relay latch arm moves out into the path of the gear assembly drive pawl. See Figure 10-111.

The relay switch contacts are still closed at this stage of operation, so the circuit to the wiper motor is still completed. Thus the wiper motor and gear mechanism continues to run. The continuing rotation of the gear assembly causes the drive pawl to engage the latch arm. See Figure 10-113. This action unlocks the drive pawl, lock pawl, drive plate and shaft assembly, and crank arm from the gear which prevents them from rotating with the gear. However, since the relay switch contacts are still closed, the motor continues to run and the gear continues to rotate. Since the drive shaft extends through the gear shaft off center a cam action results. The

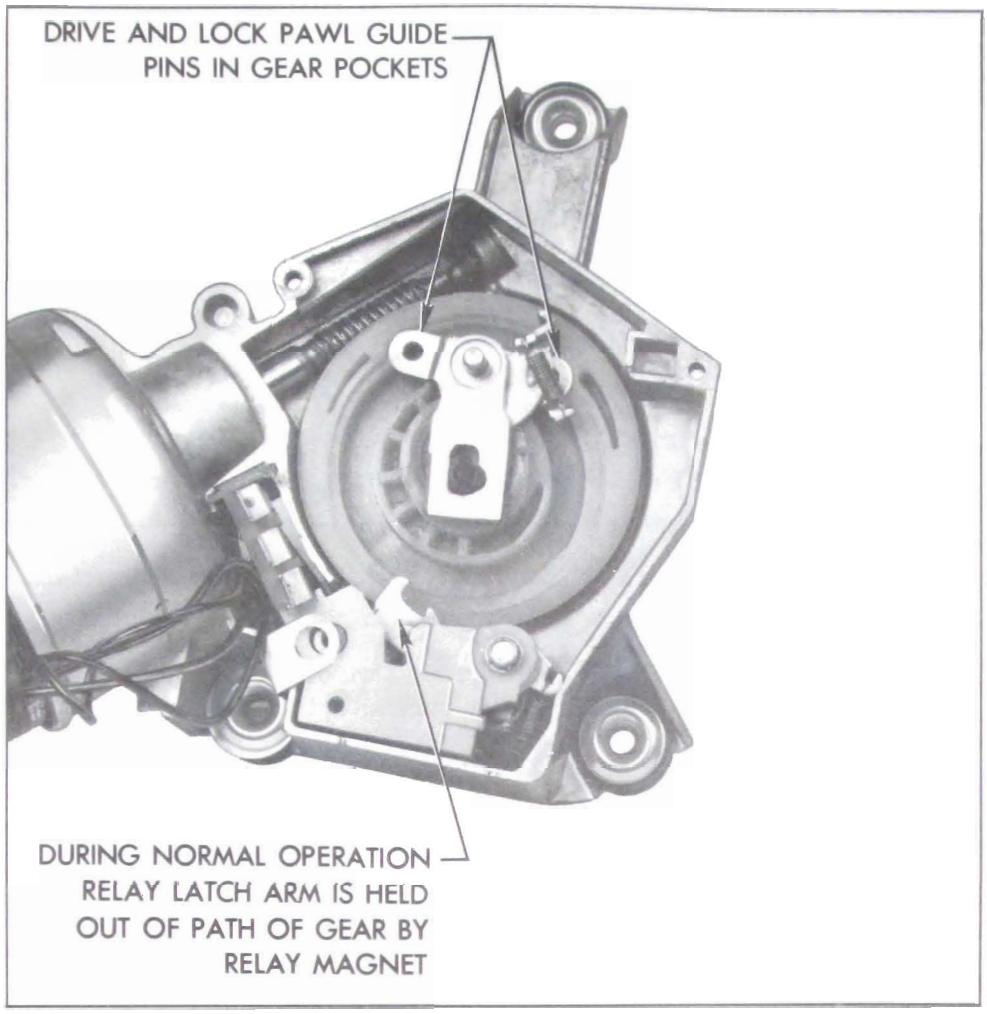


Figure 10-111—Wiper Mechanism During Normal Operation

resulting cam action causes the drive pawl to move into the relay switch slot. See Figure 10-113. As the drive pawl moves into the switch slot it pushes against the latch arm which, in turn, opens the switch contacts. This action opens the circuit to the wiper motor and the wiper motor stops. Refer to Figure 10-109 for wiper gear mechanism in full park or off position.

IMPORTANT: Wipers must operate in the low speed range to shut off properly. Note that the shunt field circuit is connected to ground at the dash switch with the dash switch in the off position.

10-58 TROUBLE-SHOOTING AND TESTING

Trouble-shooting and testing is divided into two sections. The first section covers testing with the wiper motor in the car; the second section covers testing with the wiper motor out of the car.

a. Wiper in Car

1. Preliminary Inspection. Check the following items:

(a) Body wiring properly connected to wiper terminal board and dash switch.

(b) Wiper to fire wall mounting screw tight.

(c) Dash switch securely mounted.

(d) Fuse.

(e) With ignition switch turned on there is a 12 volt supply at center terminal of wiper terminal board.

2. Checking Wiper Operation. Operate wiper independently of the car wiring or dash switch, as shown in Figure 10-114. Check low and high speeds and if wiper shuts off correctly.

(a) If wiper operates correctly, see TROUBLE CHART - WIPER IN CAR.

(b) If wiper still fails to operate correctly, disconnect wiper linkage from wiper motor and recheck for proper wiper motor operation.

(1) If wiper operates correctly in Step (b), check linkage for severe binding condition or breakage.

(2) If wiper fails to operate correctly in Step (b), remove wiper from car and check according to instructions under subparagraph b below.

b. Trouble Shooting—Wiper Out of Car

1. Preliminary Test. Try operating wiper as shown in Figure 10-115. Check if wiper has low speed, high speed, and shuts off correctly.

2. Classify Trouble. If trouble is found in Step 1, match trouble with one of the troubles listed in TROUBLE CHART - WIPER OUT OF CAR. Note possible causes listed, then turn to checking procedure for this trouble.

3. Procedure A
(Wiper Inoperative)

(a) Remove wiper gear box cover or washer pump to gain access to relay-switch assembly.

(b) Connect 12V power source to wiper - hot side to center terminal, ground side to gear housing. See Figure 10-116. Do not connect jumper to Terminal 1 and 3.

(c) To determine if wiper circuit breaker is O.K., connect test light

TROUBLE CHART—WIPER IN CAR

If wiper operated correctly independently of dash switch and car wiring, but original trouble was:	Check the Following Items:
1. Wiper Inoperative	a. Open lead wire from wiper terminal #1 to dash switch. b. Dash switch not securely mounted. c. Dash switch defective.
2. Will not Shut Off (Blades make full wipe stroke)	a. Ground condition in lead from wiper terminal #1 to dash switch. b. Check for corroded wiper terminals. Clean terminals and spread a thin coat of waterproof grease over board. c. Defective dash switch.
3. Will not Shut Off (Blades move up and down about 15° from lower windshield molding)	a. Open in lead wire from wiper terminal #3 to dash switch. b. Dash switch mounting loose. c. Dash switch defective.
4. Has one Speed "Fast"	a. Lead wire from wiper terminal #3 to dash switch open. b. Dash switch defective.
5. Has one Speed "Slow"	a. Grounded condition in lead from wiper terminal #3 to dash switch. b. Defective dash switch.
6. Intermittent Operation	a. Check for loose dash switch mounting.

TROUBLE CHART—WIPER OUT OF CAR

TROUBLE	POSSIBLE CAUSES	USE CHECKING PROCEDURE
1. Wiper Inoperative (Motor doesn't run)	1. Open relay coil 2. Circuit breaker open 3. Open armature 4. Motor series field open 5. Brushes sticking 6. Defective solder joints-relay switch 7. Binding condition-relay latch arm	A
2. Wiper will not shut off (Crank arm rotates thru 360°)	1. Relay coil-grounded 2. Relay latch spring disconnected or broken 3. Latch arm binding	B
3. Wiper will not shut off (Crank arm moves back-forth in a horizontal plane accompanied by a loud "Klunk"	1. Relay switch contacts shorting together 2. Drive pawl spring disconnected 3. Wiper has one speed fast caused by open shunt field	C
4. Wiper has one speed "Fast" (This usually results in typical trouble "3")	1. Shunt field open 2. Defective soldering at terminal No. 3 on wiper terminal board	C
5. Wiper has one speed "Slow"	1. Shunt field internally grounded 2. Shunt field lead to terminal board (black) grounded 3. Shorted armature	D
6. Wiper has excessive speed in "Hi"; "Lo" speed normal	1. Open speed resistor 2. Poor resistor ground connection	E
7. Wiper stops at random (Crank arm stops rotating immediately and does not return to full park position, shown in Figure 19, View "A")	1. Relay switch contacts dirty or broken	Replace Relay Switch Assembly
8. Intermittent Operation	1. Defective circuit breaker (weak)	F

TROUBLE CHART—WIPER OUT OF CAR (Cont'd.)

TROUBLE	POSSIBLE CAUSES	USE CHECKING PROCEDURE
	2. Circuit breaker tripping because of shorted armature and/or fields causing motor to draw excessive current	
9. No apparent trouble on bench test but fails occasionally on car	1. Armature end play tight 2. Gear assembly end play tight 3. Loose solder or weld joints	See adjustments Section

to relay switch terminal as shown in Figure 10-116.

(1) Test Lamp Lights. Circuit from Terminal No. 2 through circuit breaker to relay - switch O.K.

(2) Test Lamp Doesn't Light. Circuit breaker or solder connections at circuit breakers defective.

(d) To determine if relay coil is open connect test lamp to wiper Terminal No. 1, Figure 10-116.

If lamp doen't light, coil is open or solder connection to No. 1 Terminal is defective.

(e) Test relay switch as follows: If gear mechanism is in full park position, use a small screwdriver in the switch slot and push latch arm down toward relay coil. See Figure 10-116. Next, remove a small amount of insulation from black lead with pink tracer and touch test lamp to exposed wire.

(1) Test lamp lights but motor doesn't run - proceed to Step (f).

(2) Test lamp doesn't light - Relay-switch defective.

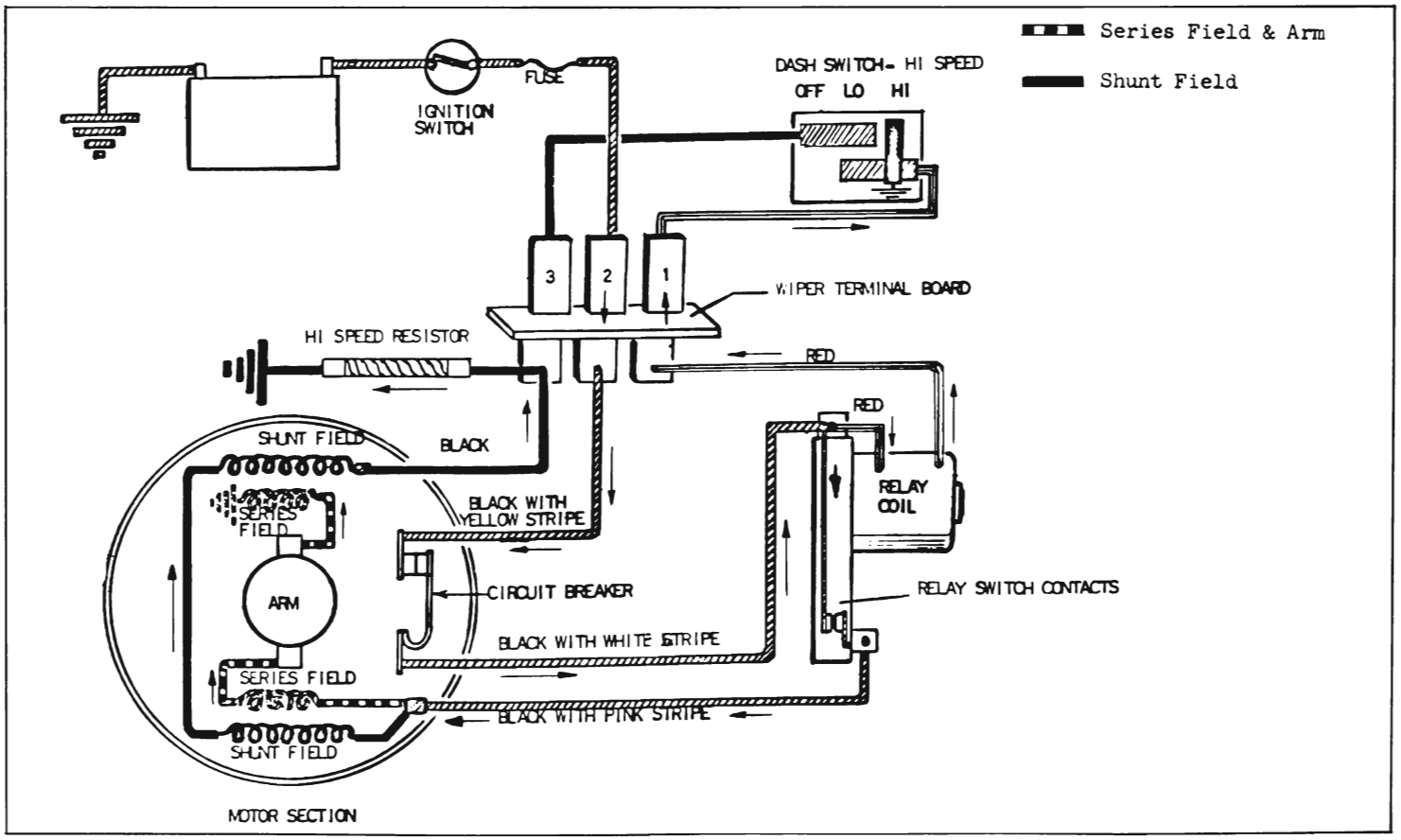


Figure 10-112—Wiring Diagram - High Speed Operation

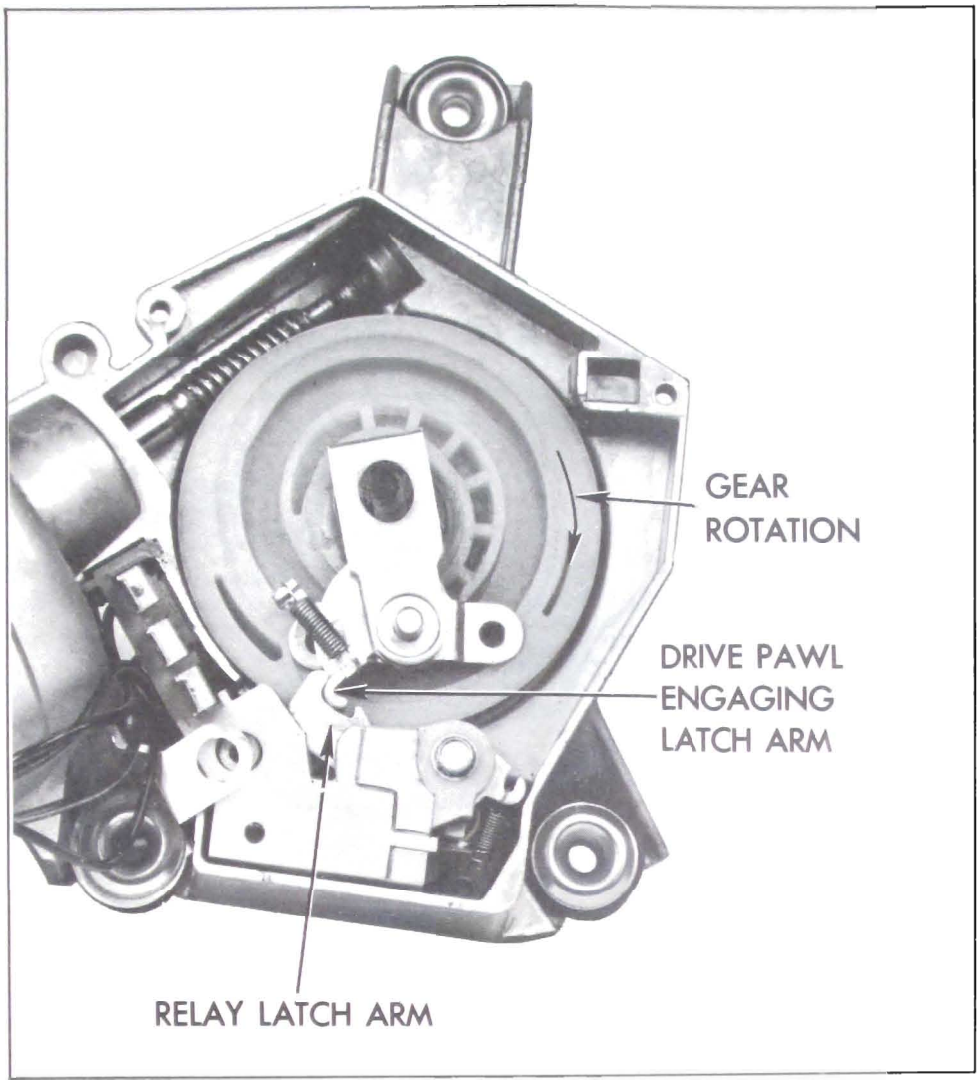


Figure 10-113—Wiper Mechanism During Parking Operation

NOTE: Cover exposed wire with tape after the test.

(f) Disassemble motor section and check the following:

(1) Hung brush.

(2) Solder connections at brush holders.

(3) Splice joints at field coil connections to leads.

(4) Open armature.

(5) Series field ground connection on field lamina.

4. Procedure B (Wiper will not shut off - Crank arm rotates thru 360°)

(a) Observe if relay latch arm spring is connected properly. See Figure 10-117.

(b) Manually operate latch arm to check it for possible binding condition.

(c) If items in a and b check out, connect power source to wiper and connect jumper wire from Terminal No. 3 to wiper housing, Figure 10-117. Do not make any connections from Terminal No. 1. Manually actuate latch arm in direction of arrow and observe if it remains in energized position (inside plastic switch housing out of path of gear drive pawl). If it remains in energized position, check for grounded red leads from coil to Terminal No. 1. If red lead is not grounded, coil is probably grounded internally and relay switch should be replaced.

5. Procedure C (Wiper will not shut off - Recycles)

NOTE: Crank arm oscillates in a somewhat horizontal plane and is accompanied by a loud "knock" with each revolution of the gear.

(a) Check that drive pawl and relay latch arm springs are properly connected as shown in Figure 10-117.

(b) Check wiper for low speed operation. If wiper has high speed only, check the following items:

(1) Solder joint at No. 3 wiper terminal.

(2) Splice joint - black lead with pink stripe to field coil leads.

(3) Splice joint - black lead to field coil.

(c) Check relay switch as follows:

(1) Remove small amount of insulation from black lead with pink stripe and connect test light between exposed wire and wiper housing.

(2) Connect power source and jumper to wiper as shown in Figure 10-117 and observe if test light goes out once for each revolution of gear or if light glows steady. If light glows steady, relay switch contacts are not opening and switch is defective. If light goes out each time drive pawl moves into relay switch slot relay switch is functioning correctly.

6. Procedure D (Wiper has one speed "slow")

(a) Check for grounded condition in the internal black lead that connects to wiper terminal No. 3. Refer to Figure 10-117 for Terminal No. 3 location.

(b) Disassemble motor section of wiper and check for grounded field coil.

IMPORTANT: Occasionally the field coils are loose on the poles and this enables them to slide

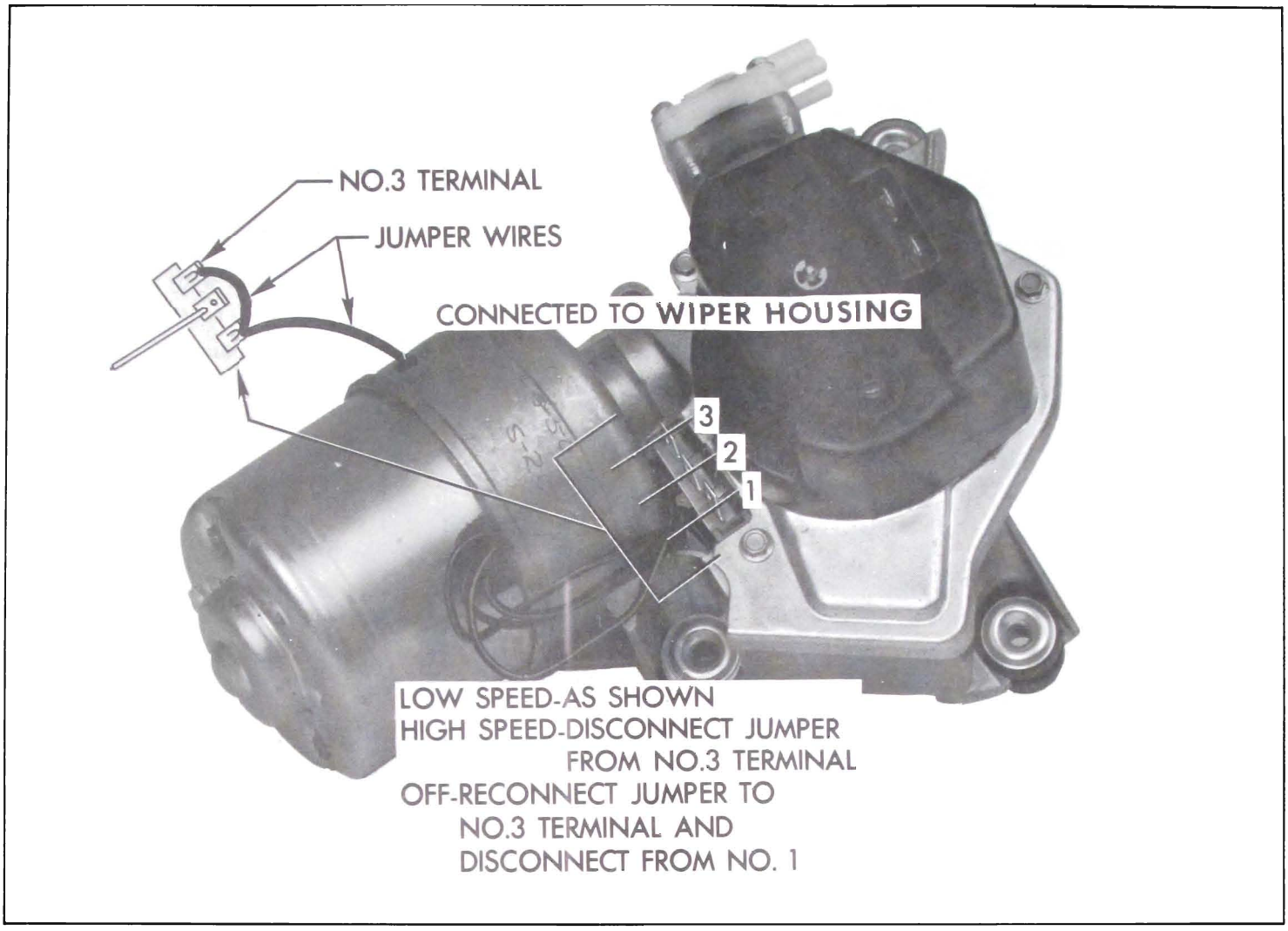


Figure 10-114—Connections to Operate Wiper Independent of Dash Switch

into a position where they short on the corners of the poles. Center the coils on the poles and wedge them in a fixed position.

7. Procedure E (Wiper has excessive speed in "HI" but "LO" is normal)

(Crank Arm RPM exceeds 70 @ 12 Volts.)

(a) Check for open resistor and the resistor ground connection. (Motor uses 20 ohm resistor.)

8. Procedure F (Intermittent Operation)

(a) Check solder connections at wiper terminal board.

(b) Connect up wiper to operate in "Lo" speed (Figure 10-115). Connect ammeter (Range 0 - 30 amps.) in feed wire circuit to wiper and observe current draw. Allow motor to run until it becomes hot.

(1) If current draw is normal (3.5-5 amps. max.) and wiper cycles on and off, a weak circuit breaker is indicated. Replace case and brush assembly.

(2) If current draw exceeds 5 amps. proceed to Steps c, d and e.

(c) Adjust armature end-play as required and recheck current draw.

(d) Adjust gear assembly end-play as required and recheck current draw.

(e) If adjustments in Steps c and d fail to correct excessive current draw condition, disassemble motor section of wiper and check armature on growler for shorted or grounded condition.

10-59 DISASSEMBLY AND ASSEMBLY

a. Disassembly of Motor

1. Remove the two motor tie bolts that attach steel case to gear housing.

2. Strike the steel case lightly with a mallet to partially loosen it from die cast housing and motor field.

3. Remove the armature end-play adjusting screw and insert a tool

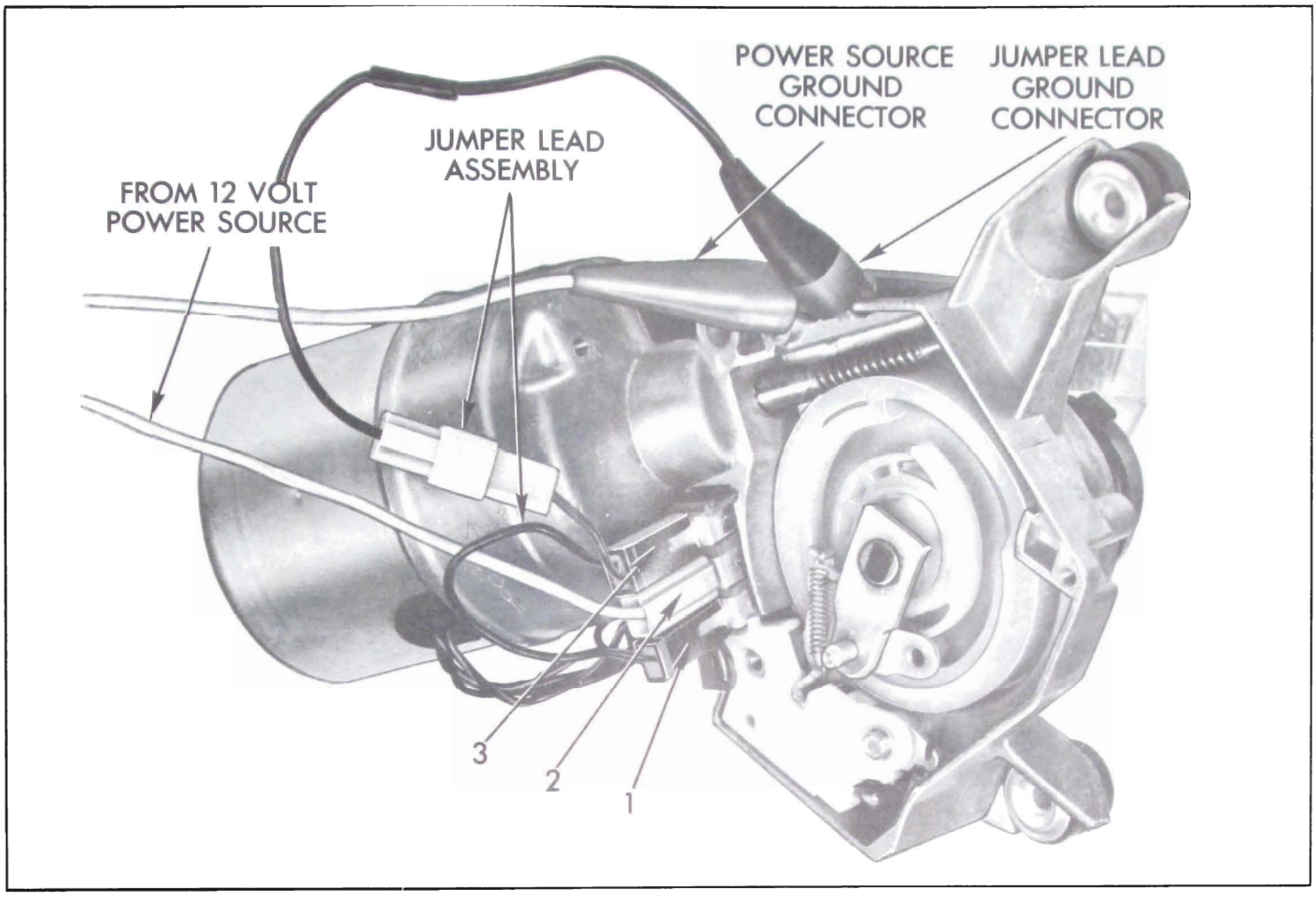


Figure 10-115—Connections to Operate Wiper Out of Car

through the armature adjusting screw opening. See Figure 10-118. 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.

4. To separate armature from case while still retaining the brush-springs and brushes in place, fashion a spring similar to that shown in Figure 10-119 and insert behind the brush leads as shown.

5. Pull the armature out of the case and install "U" shaped brush Retainer Spring J-7890 as shown in Figure 10-120. Remove spring installed in Step 4.

6. Remove the felt washer, thrust plate, and rubber thrust disc from the case assembly bearing as required.

7. The field assembly is pressed in the housing under light pressure and should be carefully checked prior to removal. If necessary, remove the field as follows:

(a) Cut the plain black and black with pink stripe 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. Code them for reassembly.

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

(d) Install Field Puller J-7844 in motor housing as shown in Figure 10-121. Make certain puller screw base plate is installed flat side up and puller flanges straddle the field lamina.

Turn the puller screw clockwise to remove field assembly.

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 7a and 7b under motor disassembly.

(b) Scribe a reference line on the replacement field in the appropriate same location as the one

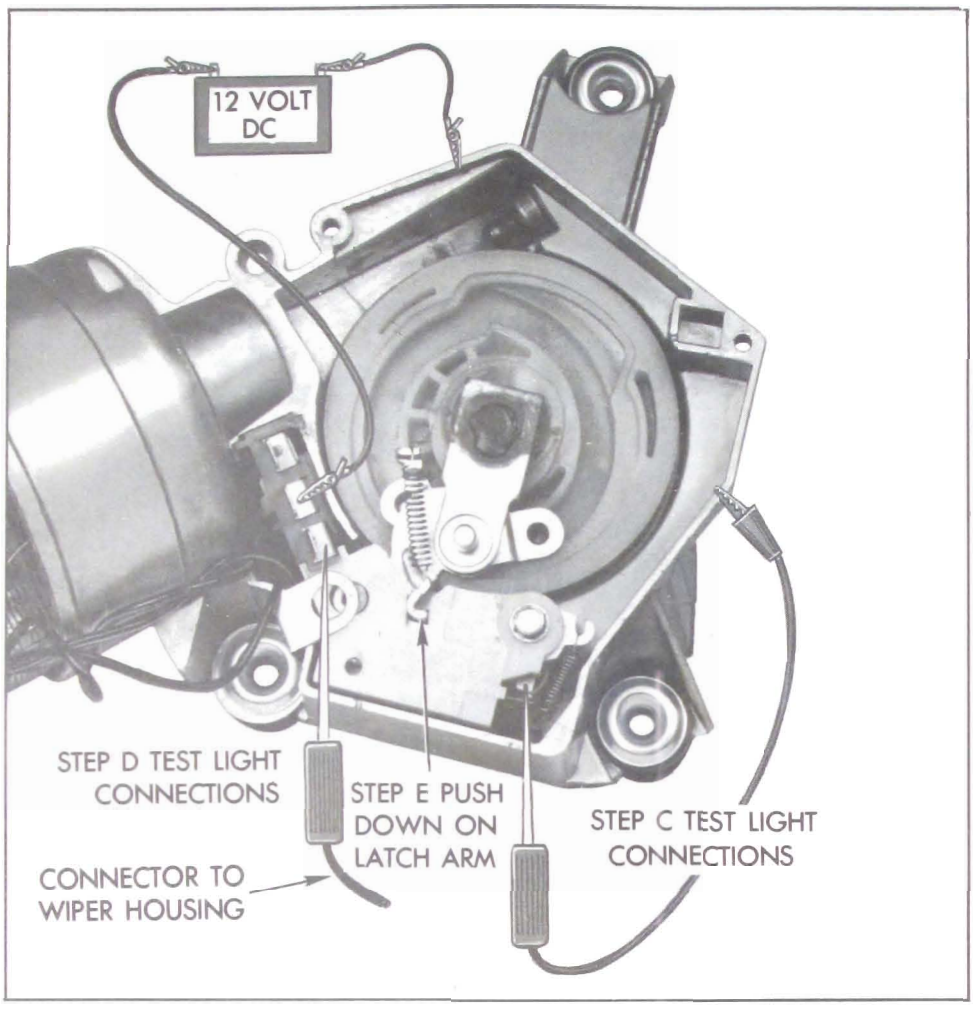


Figure 10-116—Test Light Checks

scribed on the original field (Step 7c under motor disassembly).

(c) Temporarily install tie bolts, then 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 10-122.

(d) Using a suitable mallet, work the field back into the housing by striking alternately each side of the field lamina until the field bottoms against the machined ridge.

CAUTION: Be very careful not to damage field coils or attaching leads.

2. Install rubber thrust disc, steel thrust plate and felt washer in the case assembly bearing in the order indicated. See Figure 10-118.

3. Be sure steel ball is located in 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.

NOTE: Replacement armatures are NOT supplied with thrust ball. To remove thrust ball from original armature use a magnet.

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.

CAUTION: It may be necessary at this point to rotate armature slightly before the worm will engage with 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 Adjusting Armature End-Play.

c. Removal of Relay Switch and Terminal Board

1. Remove gear box cover and/or washer pump.

2. If wiper gear drive pawl is in full park position (Figure 10-116), remove gear assembly. See subparagraph e below.

If wiper gear mechanism is away from park position (drive pawl away from latch arm (Figure 10-123), proceed to Step 3.

3. Remove relay-switch attaching screw and carefully lift the relay-switch assembly out of the gear box. Unsolder leads from switch terminals as required.

4. To remove terminal board assembly simply slide it out of housing and unsolder leads as required.

d. Installation of Relay Switch and Terminal Board

1. Resolder red coil lead to wiper terminal board as required.

2. Slide terminal board into wiper housing being careful to position the terminal board resistor lead as shown in Figure 10-124.

NOTE: With the relay-switch assembly replaced in the housing and washer pump or gear box cover reinstalled, the relay-switch plastic housing applies

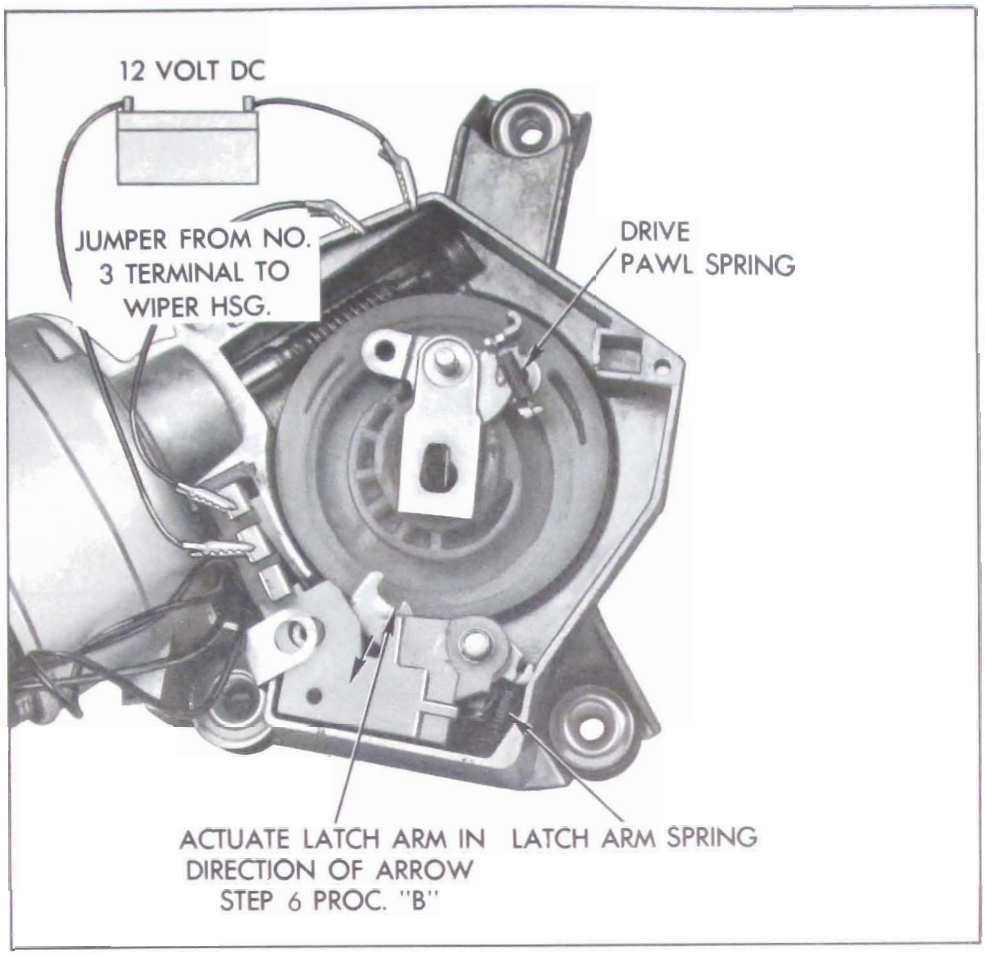


Figure 10-117—Checking Operation of Relay and Latch Arm

pressure against the resistor lead to form a positive ground connection to the wiper housing.

3. Resolder leads to relay-switch assembly as required.

4. Position relay-switch assembly in housing.

CAUTION: Be very careful to route leads in such a manner as to avoid having them pinched between relay and wiper housing.

5. Install relay-switch mounting screw. See Figure 10-123.

6. Assemble gear box cover and/or washer pump to wiper being careful that the ground strap is properly connected. Refer to Figure 10-130 for assembly of washer pump to gear housing.

e. Disassembly of Drive Gear Mechanism

1. Remove crank arm retaining nut, crank arm, rubber seal cap, retaining ring, shim washers, shield and spacer washer in the order indicated.

2. Slide gear assembly out of housing. See Figure 10-125.

3. Slide drive plate and shaft out of gear and remove the drive pawl, lock pawl and coil spring as required. See Figure 10-126.

f. Assembly of Drive Gear Mechanism

1. Position drive pawl on drive plate as shown in Figure 10-127.

2. Assemble lock pawl over pawl as shown in Figure 10-128.

3. Slide gear and tube over the drive shaft. See Figure 10-129. (Move drive and lock pawls as required to allow their respective pins to fit in the gear guide channel.)

4. Holding the gear, manually rotate the drive plate until the drive and lock pawl guide pins snap into their respective pockets in the gear.

5. Reinstall coil spring between lock and drive pawls.

IMPORTANT: Be very careful to maintain lock and drive pawl guide pins in their respective pockets during Step 6.

6. Assemble inner spacer washer over gear shaft and assemble gear mechanism in housing so that it is positioned with respect to the housing in the approximate location shown in Figure 10-125.

7. Reassemble the outer spacer washer, shield, shim washers as required to obtain .005" maximum end-play, snap ring and rubber seal cap in the order indicated.

8. Operate wiper to "park" or "off" position and install crank arm in the approximate position shown in Figure 10-125.

9. Reassemble washer pump to wiper. See Figure 10-130.

g. Adjusting Armature End-Play

1. Loosen adjusting screw locknut and tighten or loosen the adjusting screw as required until end of screw barely touches end of armature.

2. Back off set screw 1/4 turn and tighten locknut.

h. Adjusting Gear Assembly End-Play

1. Add or remove end-play washers as required to obtain .006" minimum end-play.

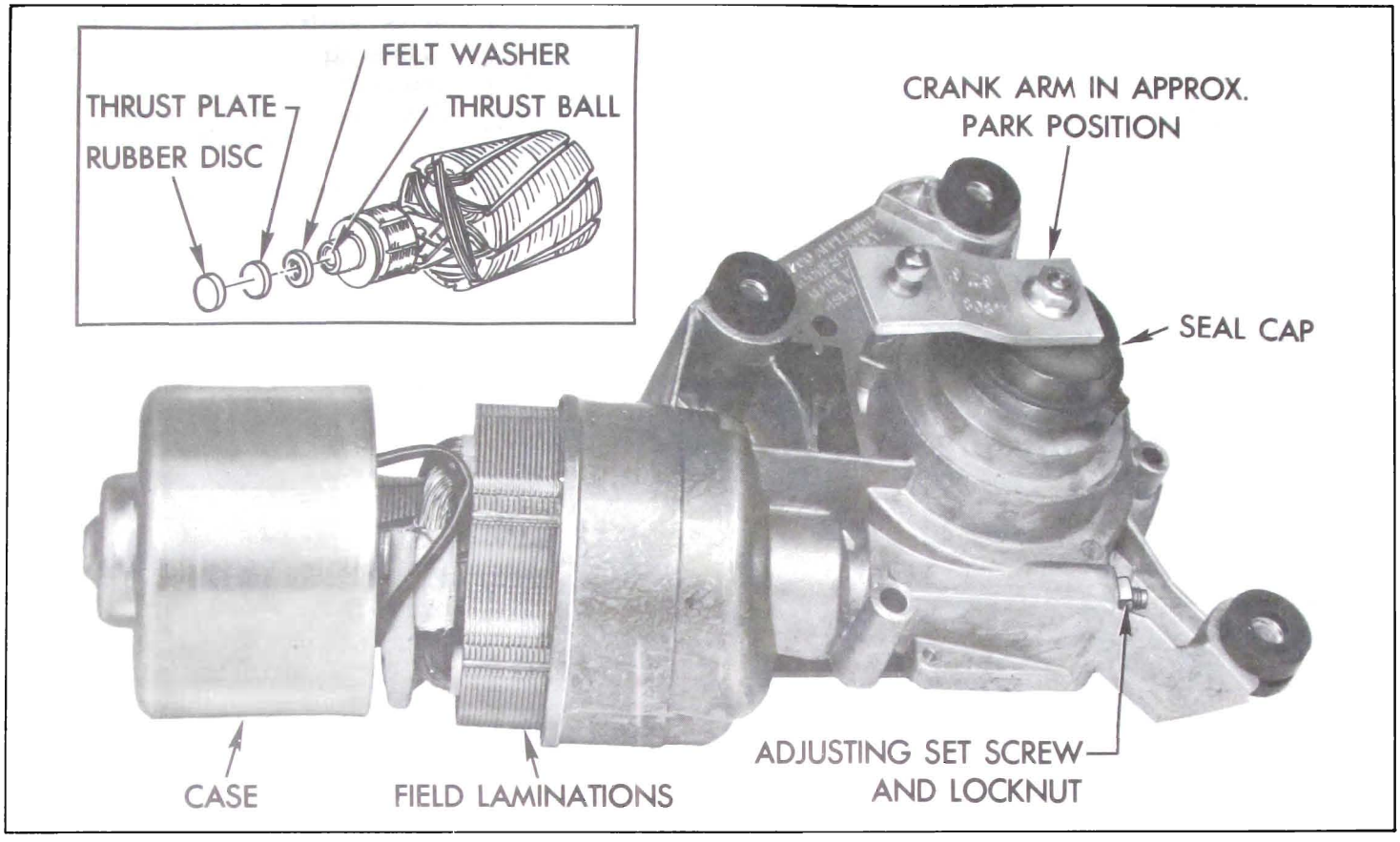


Figure 10-118—Removing Case from Motor Field

i. Wiper Specifications

1. Lubrication:

Gear Teeth & Gear Clutch Mechanism	Delco Remy Cranking Motor and Distributor Lubricant
Gear Shaft	
Seal Cap (inside)	
Armature Worm	

2. Performance:

Operating Test Voltage 12

Current Draw -

Bench Check (No Load) . . . . 3.1-4.5 Amps.
Installed in Car . 3.5-5.0 Amps.

Crank Arm Rotation . . . . . CCW

Crank Arm Speed - RPM'S

Lo 40-50
Hi 70-85

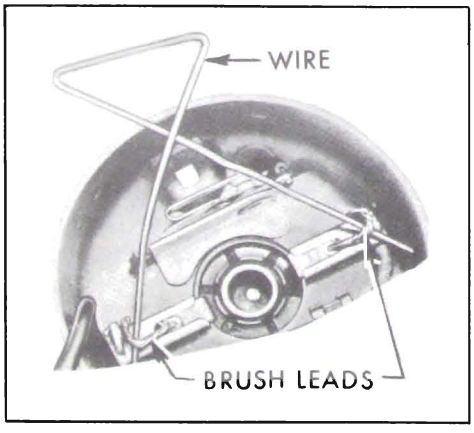


Figure 10-119—Holding Brush Leads

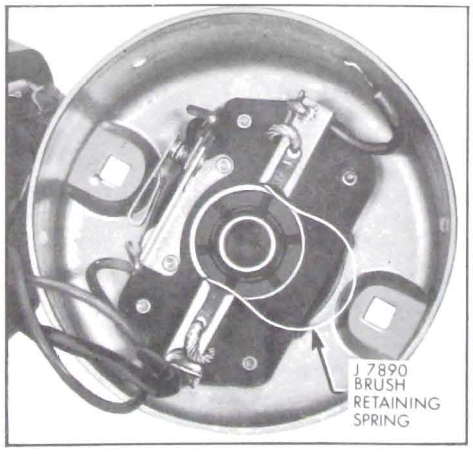


Figure 10-120—Installing Brush Retaining Spring

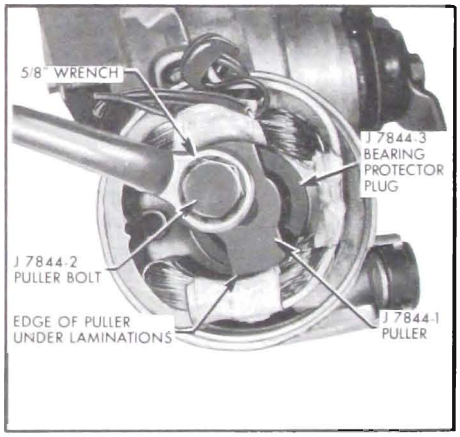


Figure 10-121—Removing Field Coils

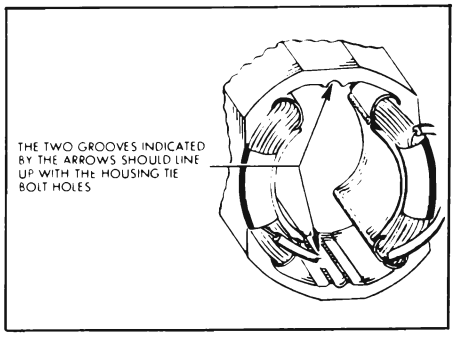


Figure 10-122—Aligning Field Coils

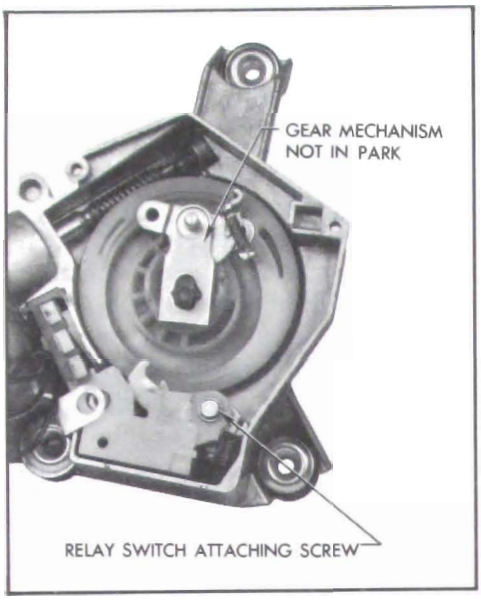


Figure 10-123—Removing Relay Switch Assembly

10-60 REMOVAL AND REPLACEMENT OF ASSEMBLIES

a. Wiper Motor Assembly

1. Removal

(a) Disconnect wire connectors from motor and pump.

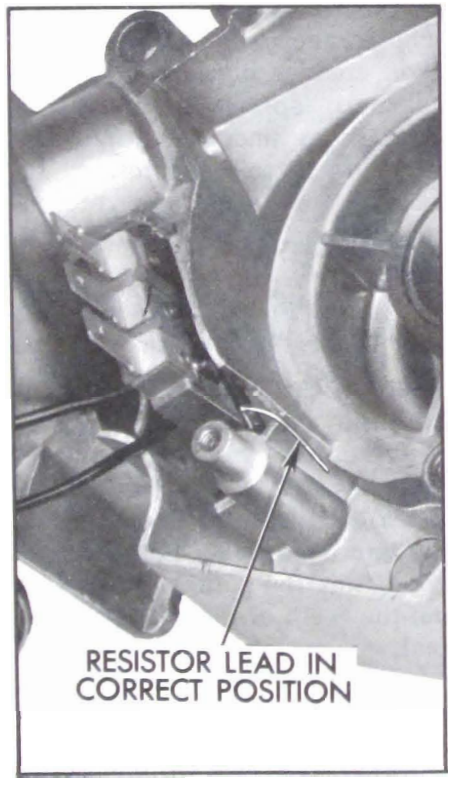


Figure 10-124—Installing Terminal Board

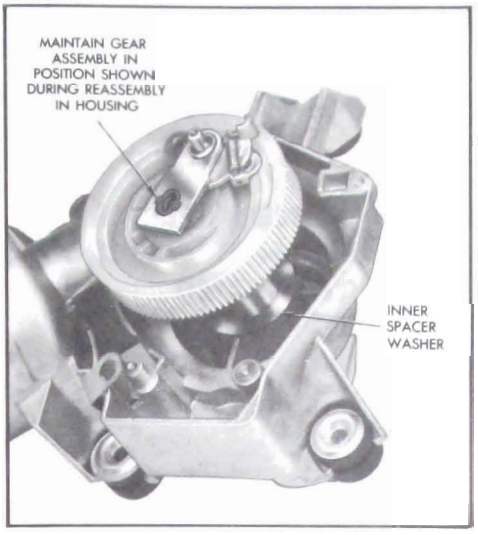


Figure 10-125—Removing or Installing Gear Assembly

(b) Pull washer hoses loose from pump.

(c) Remove air intake grille.

(d) Remove grommet from hole over wiper motor lever and loosen two nuts at end of drive link.

(e) Lift transmission drive link off crank arm ball.

(f) Remove three wiper motor bolts.

2. Replacement

Reverse Steps (f) through (a).

b. Wiper Transmission

1. Removal

(a) Remove wiper blade and arm assemblies, escutcheon retaining nuts and escutcheons.

Figure 10-126—Disassembly Gear Assembly

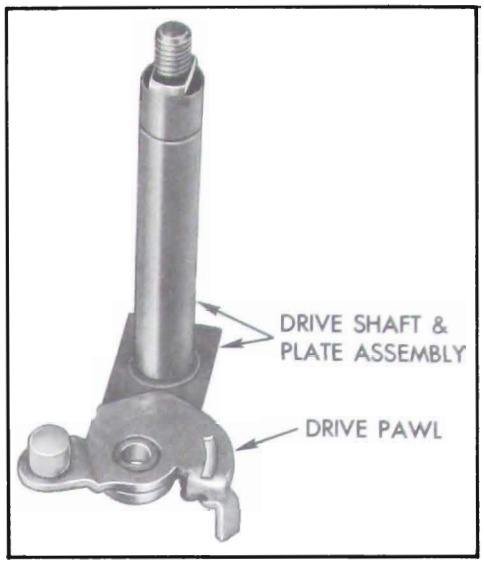


Figure 10-127—Assembly Drive Pawl on Drive Plate

(b) Remove air intake grille retaining screws. Slide grille out from under reveal molding.

(c) Remove grommet from hole over wiper motor lever and loosen two nuts at end of drive link. Lift drive link off crank arm ball.

(d) Remove the nine transmission retaining screws.

(e) Slide transmission assembly to the right until transmission and drive link can be lifted

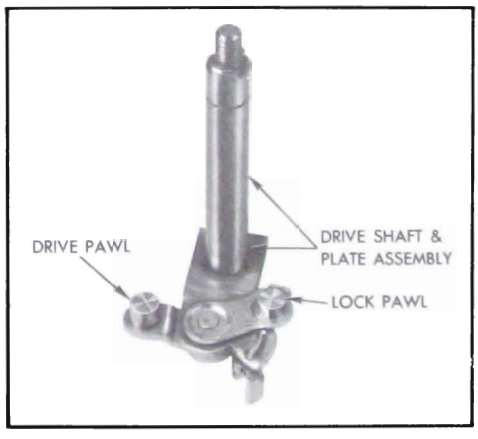


Figure 10-128—Assembly Lock Pawl Over Drive Pawl

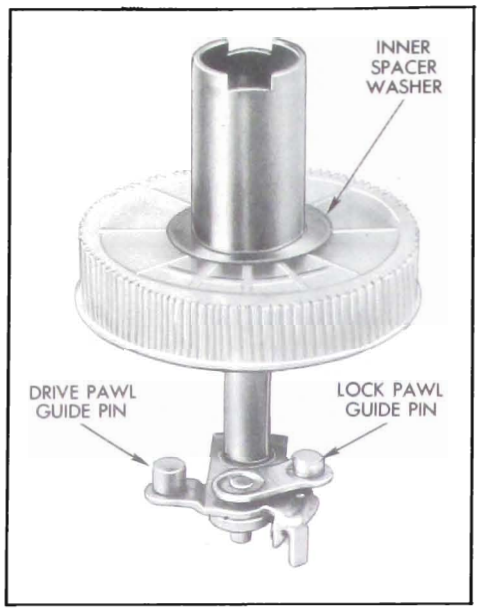


Figure 10-129—Assembling Gear Over Drive Shaft

through left opening. Slide transmission assembly out to the left.

2. Replacement

Reverse Steps (e) through (f).

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.

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 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 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. When energized, the armature is pulled up against the relay to release the

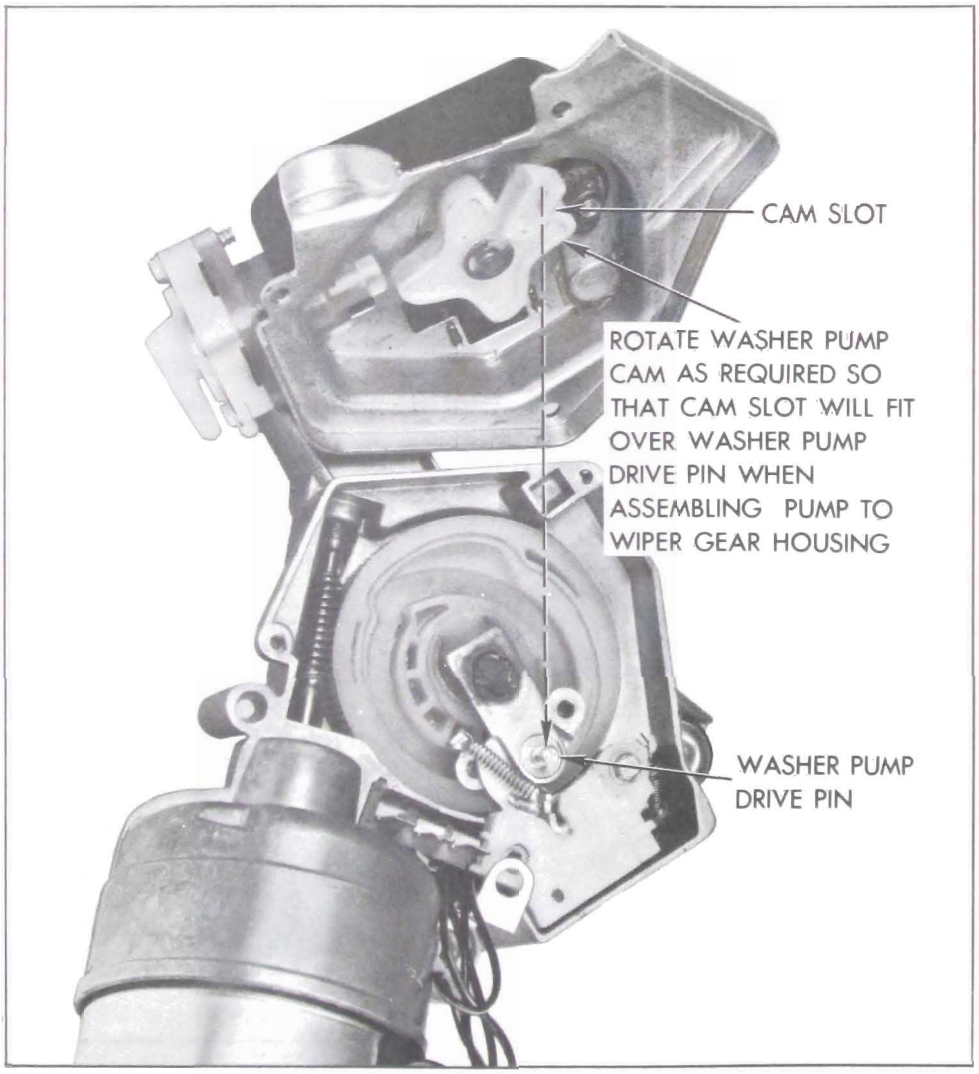


Figure 10-130—Assembling Washer Pump to Wiper

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 whell 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 DISASSEMBLY AND ASSEMBLY

a. Removal and Replacement of Relay and Terminal Board

1. Remove washer pump cover.

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.

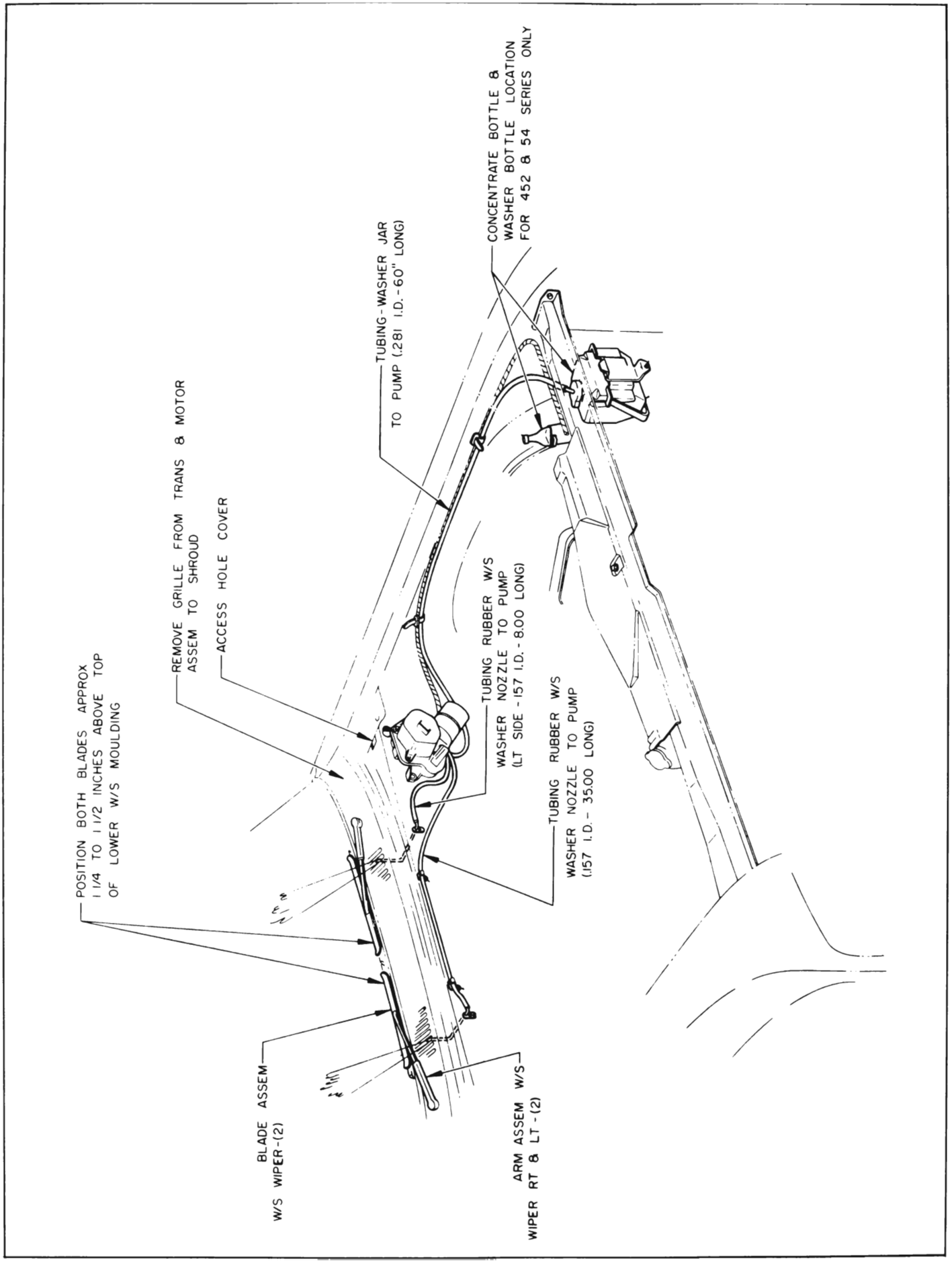


Figure 10-131—Wiper Arm Installation - Single Speed Wiper

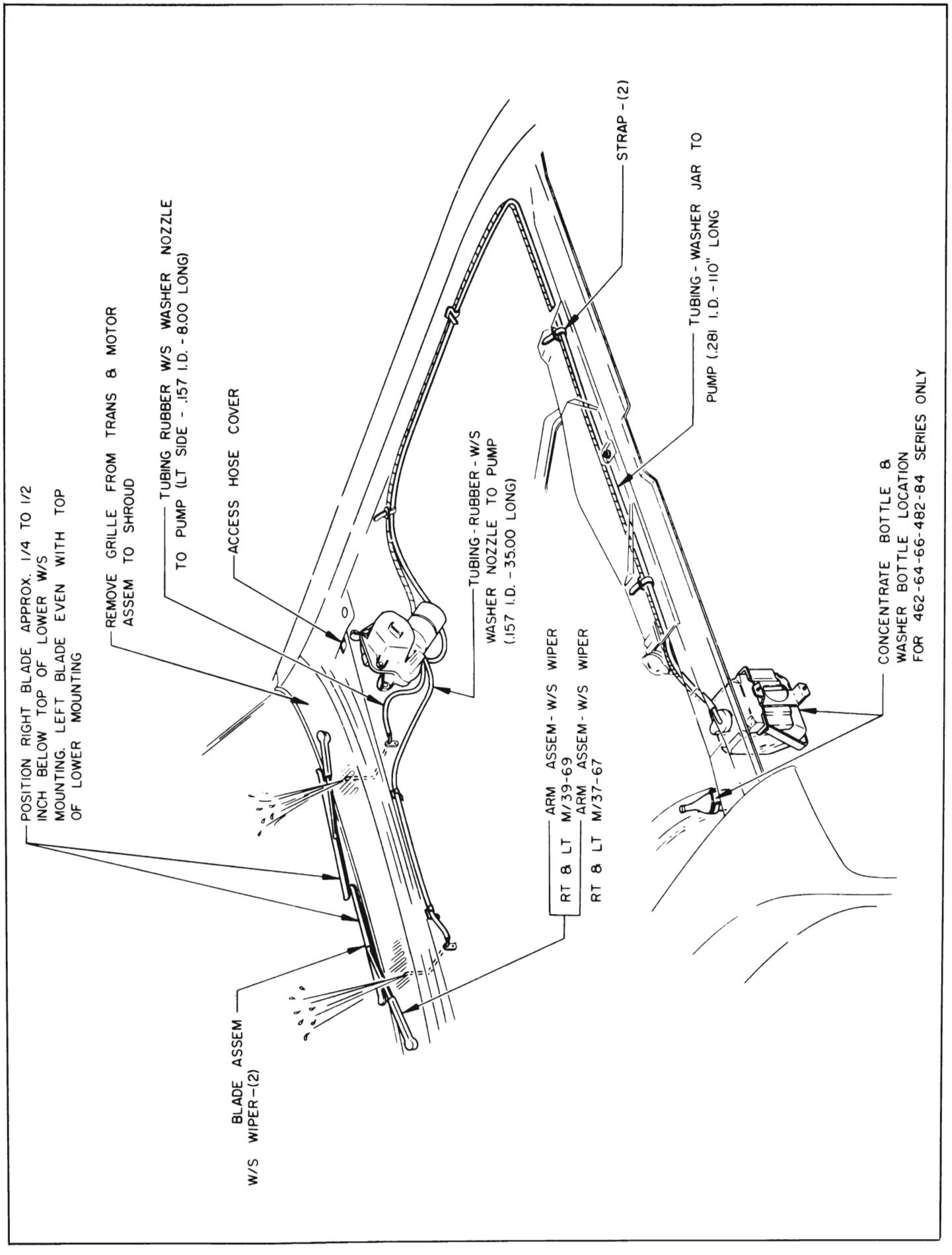


Figure 10-132—Wiper Arm Installation - Two Speed Wiper

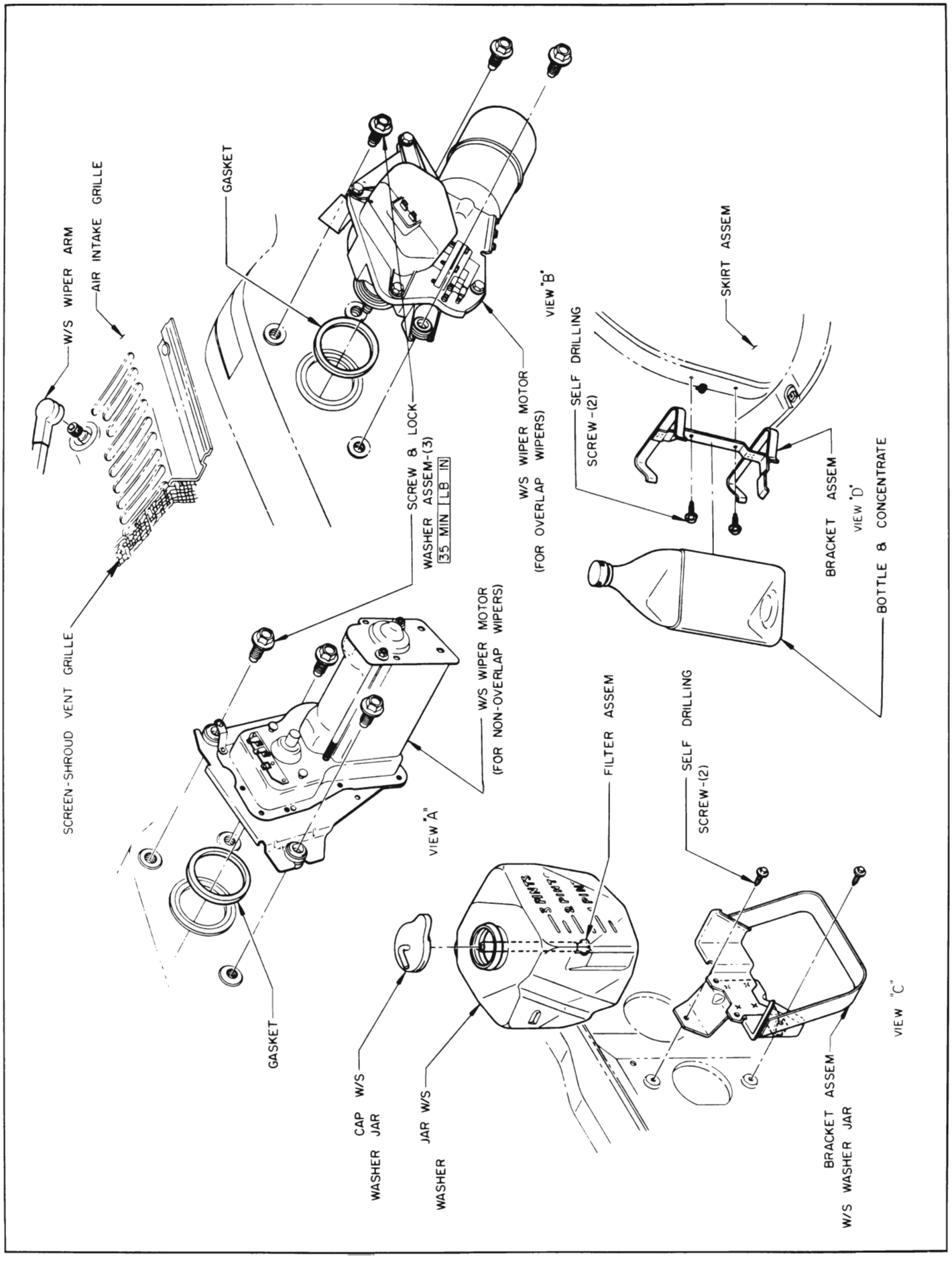


Figure 10-133—Wiper Motor and Washer Jar Installation

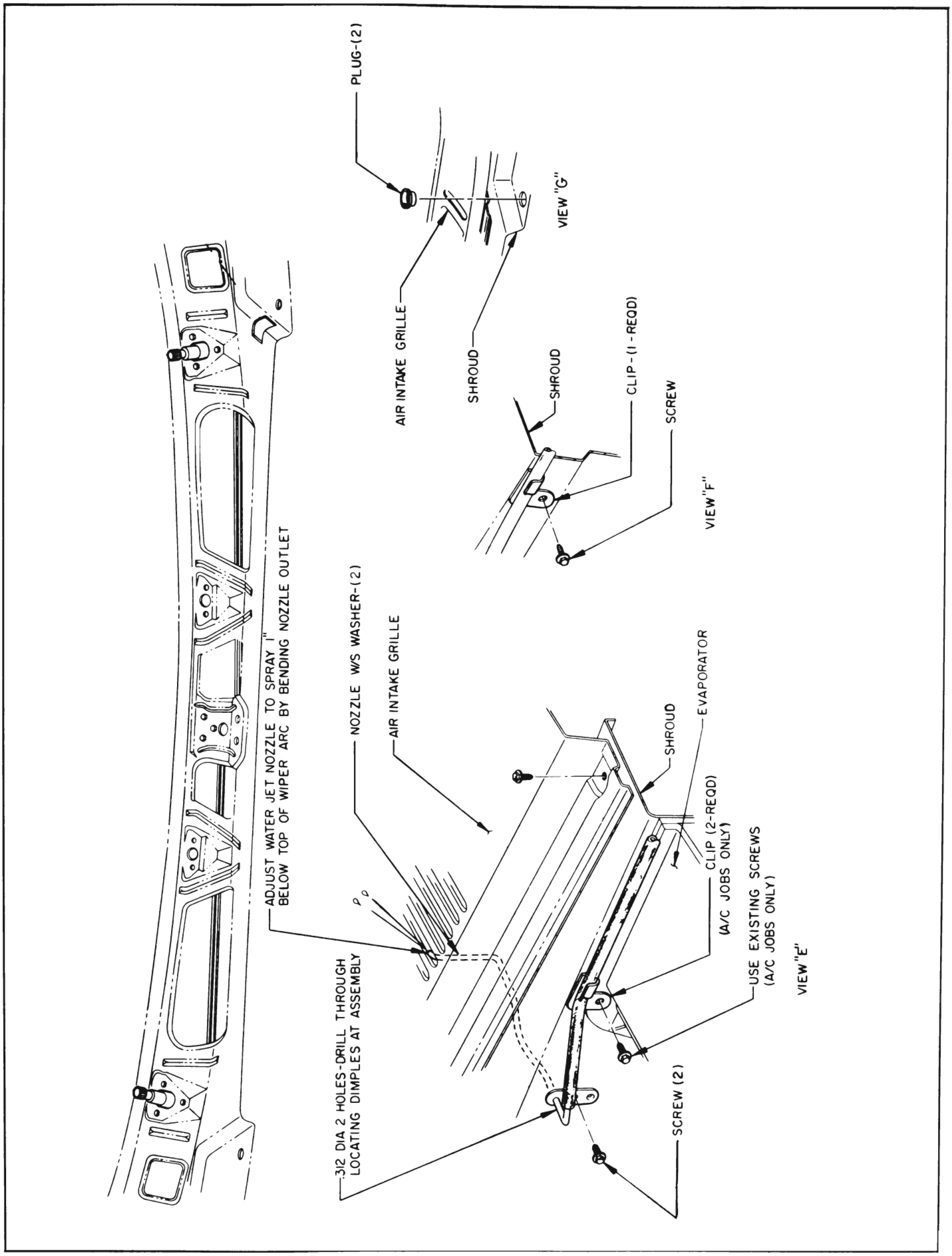


Figure 10-134—Washer Nozzle Aiming

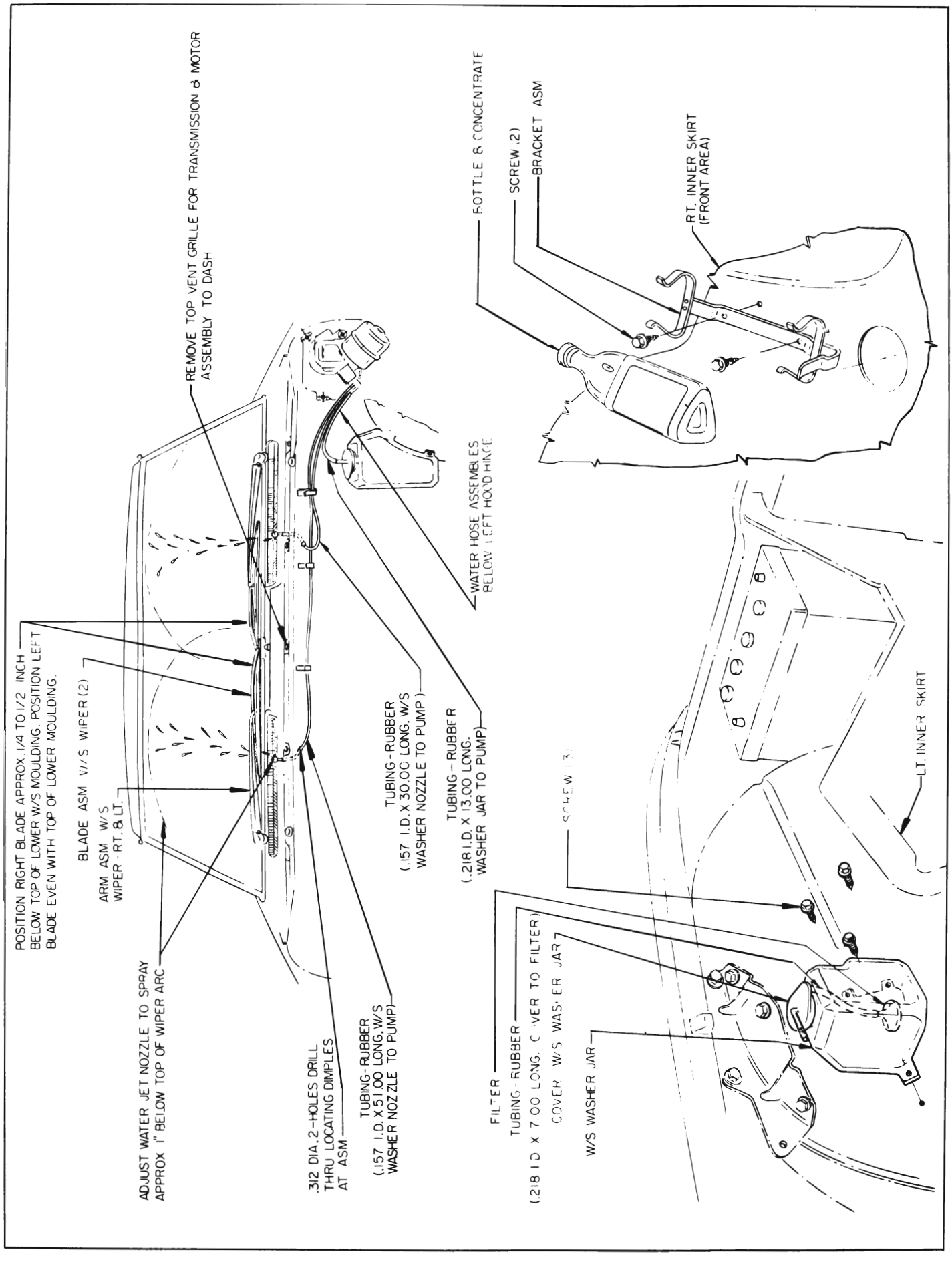


Figure 10-135—Windshield Wiper and Washer - Riviera

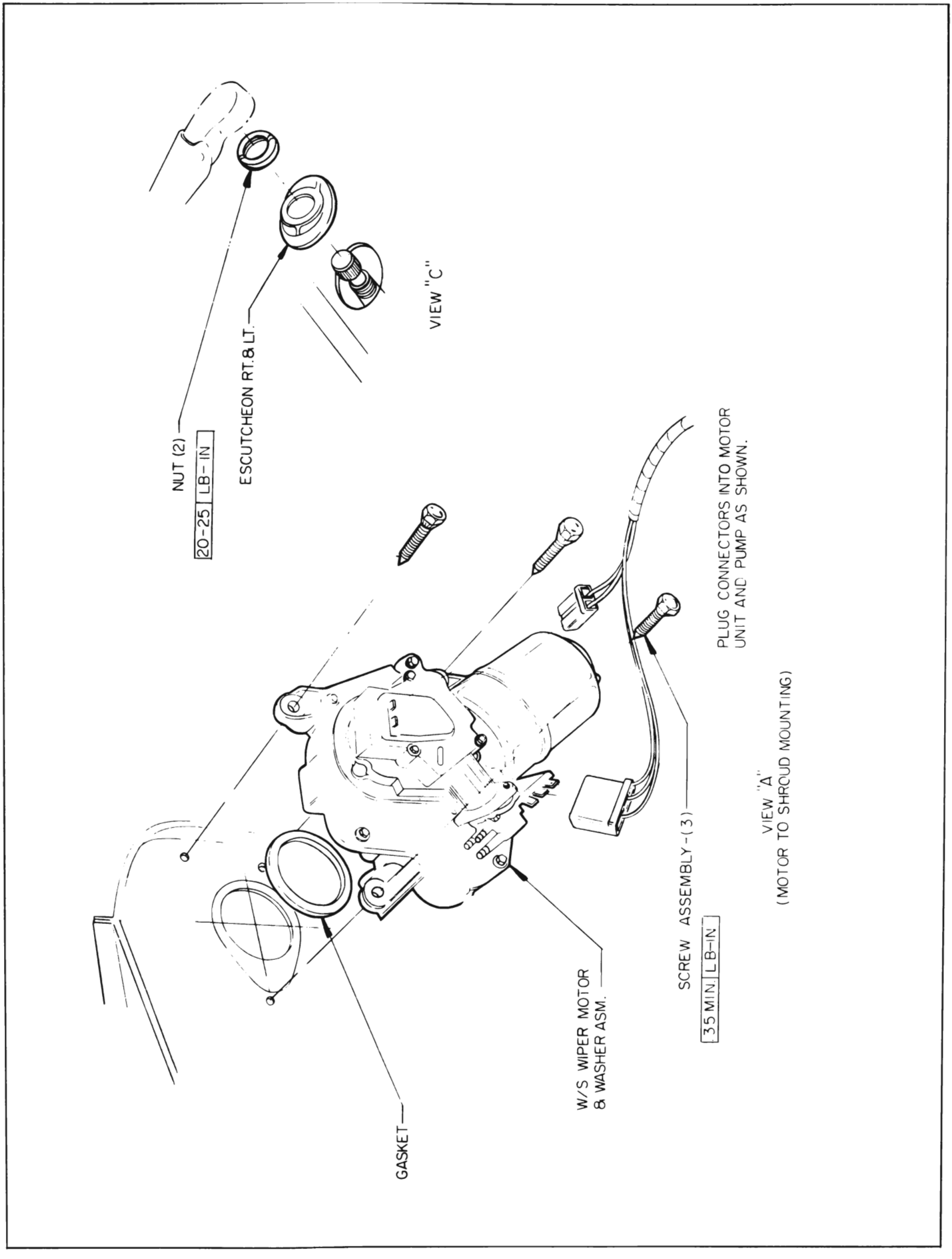


Figure 10-136—Windshield Wiper Motor Installation - Riviera

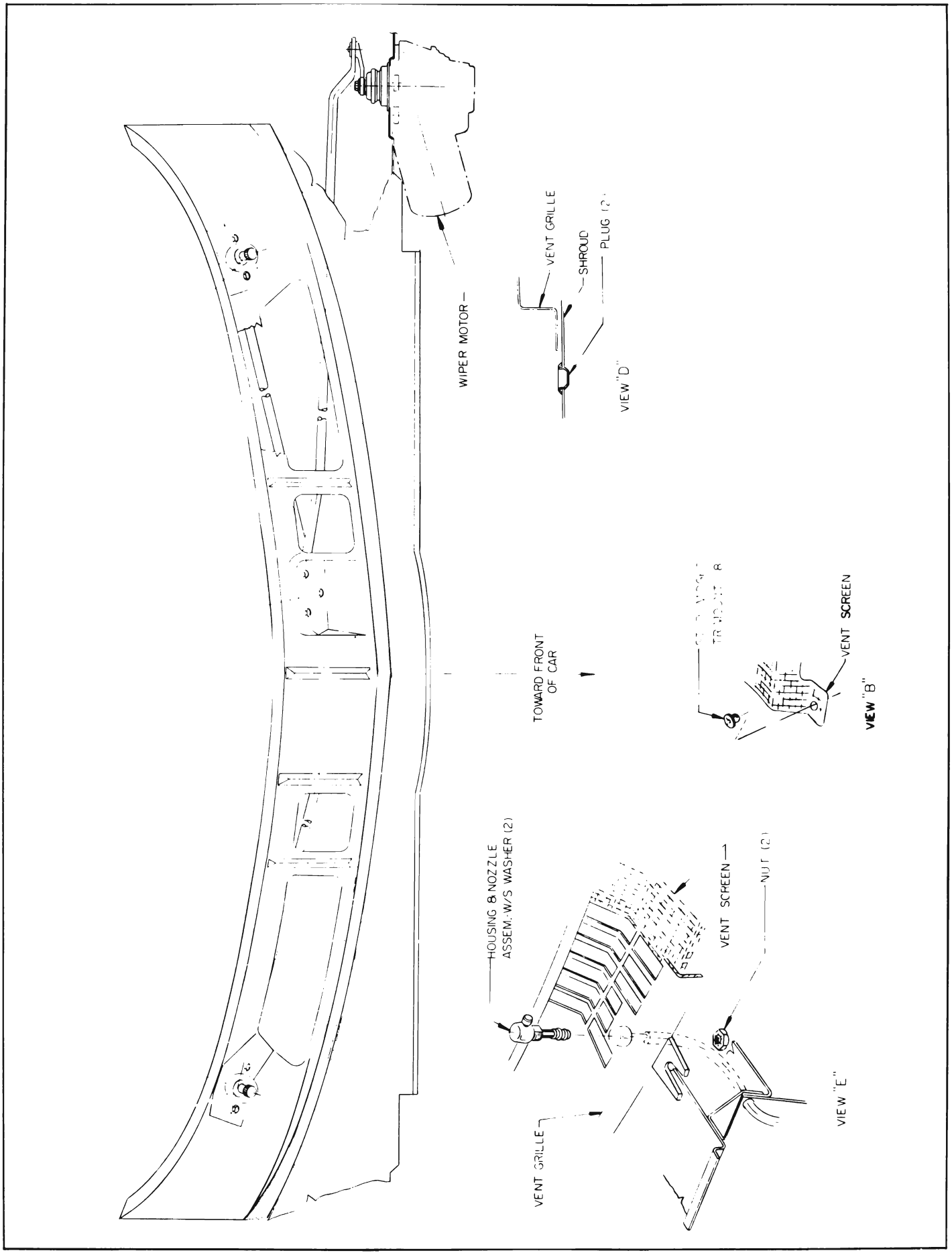


Figure 10-137—Windshield Wiper Linkage and Washer Nozzle Mounting - Riviera