

# SECTION A

## WINDSHIELD WIPER—SERIES 43-44000

### CONTENTS

Division	Paragraph	Subject	Page
I	10-1	SPECIFICATIONS AND ADJUSTMENTS: Specifications . . . . .	10-2
II	10-2 10-3	DESCRIPTION AND OPERATION: Description and Operation -- Two Speed Lower Series. . . . . Windshield Washer Description and Operation . . . . .	10-2 10-4
III	10-4 10-5	SERVICE PROCEDURES: Disassembly and Assembly . . . . . Windshield Washer Disassembly and Assembly. . . . .	10-7 10-8
IV	10-6 10-7	TROUBLE DIAGNOSIS: Trouble-Shooting and Testing . . . . . Windshield Washer Trouble-Shooting . . . . .	10-8 10-10

## DIVISION I

### SPECIFICATIONS AND ADJUSTMENTS

#### 10-1 SPECIFICATIONS

Operating Volts . . . . .	12 VDC
Gear Ratio . . . . .	36:1
Crank Arm Rotation (looking at Crank Arm) . . . . .	CCW
Crank Arm Speed: (RPMs) (No Load)	
Lo . . . . .	34 Min.
Hi . . . . .	65 Min.
Current Draw: (Amps)	
No Load (Lo Speed) . . . . .	3.6 Max.
Installed in Car - (Dry Glass)	
Stall . . . . .	4.5 Max.
Stall . . . . .	12 Max.
Shunt Field Resistor . . . . .	20 OHMS

## DIVISION II

### DESCRIPTION AND OPERATION

#### 10-2 DESCRIPTION AND OPERATION— TWO SPEED LOWER SERIES

##### a. General Description

The two-speed non-depressed park wiper consists of a rectangu-

lar shaped compound wound motor (series and shunt field). The two-speed wipers have a 36:1 gear ratio.

##### b. Operation

A combination pictorial and schematic circuit is shown in Figure

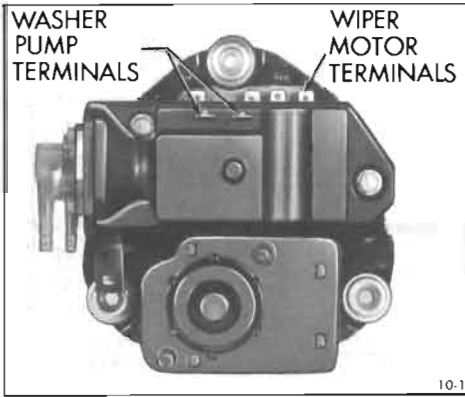


Figure 10-1—Windshield Wiper Motor - Two Speed Lower Series

10-2. An explanation of “LO”, “HI” and parking circuits follows:

1. Lo Speed

When the wiper switch is moved to the “LO” speed position (Ign. Sw. On) current from the battery flows through the series field coil and divides; part passing through the shunt field coil to ground at the dash switch, the other part passing through the armature to ground at the dash switch. See Figure 10-3.

2. Hi Speed

Moving the wiper switch to the

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

3. Parking Circuit

Moving the dash switch to the “off” position opens both the armature and shunt field circuits to

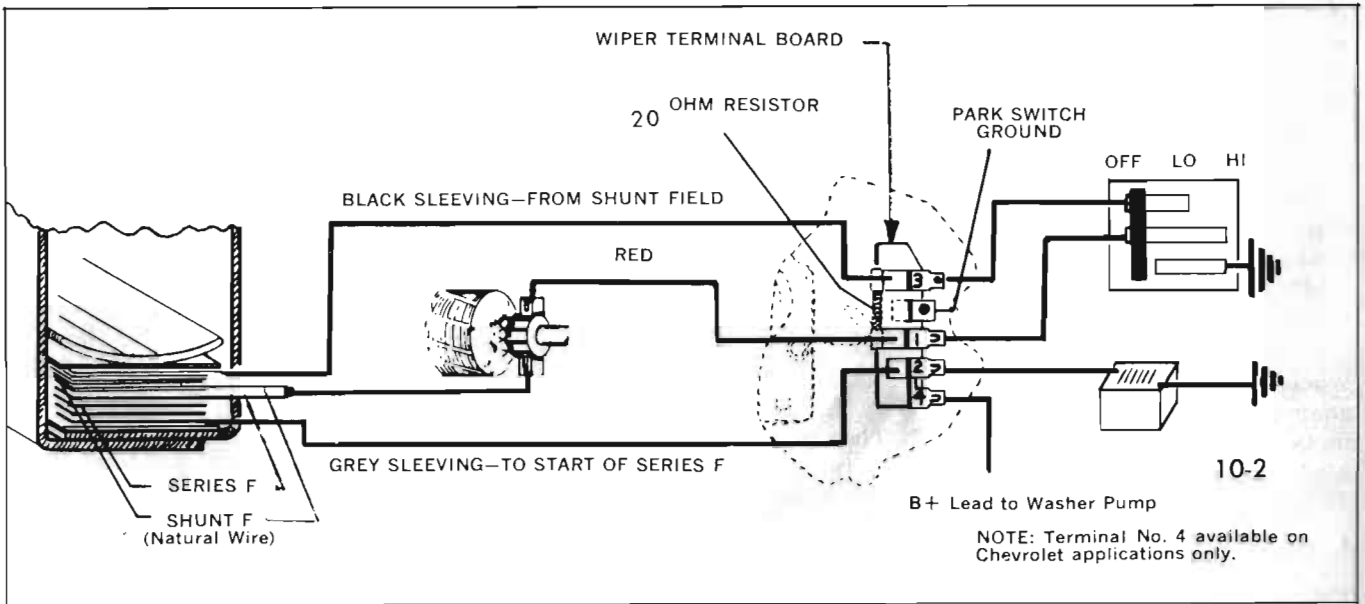


Figure 10-2—Two Speed Wiper Motor Wiring

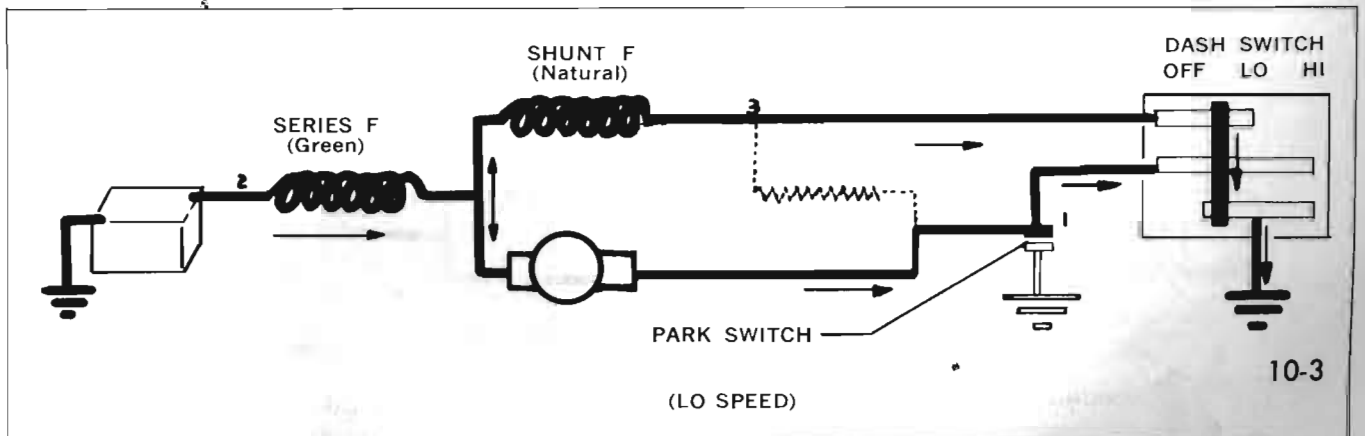


Figure 10-3—Lo Speed Circuit

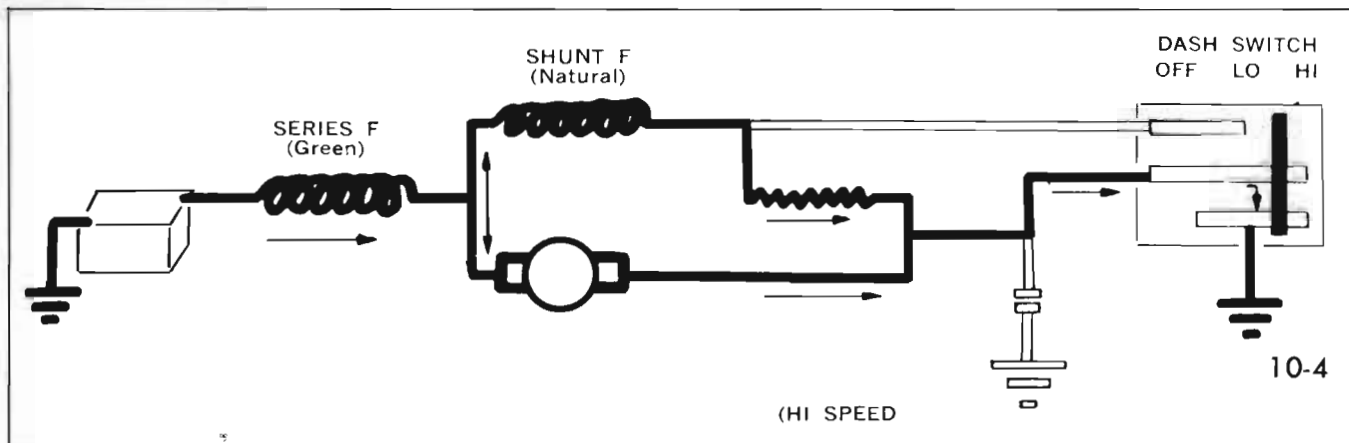


Figure 10-4—Hi Speed Circuit

ground at the dash switch. However, both of these circuits are still closed to ground through the parking switch.

**NOTE:** The shunt field circuit actually flows via the dash switch back to the wiper parking switch direct to ground which means that wiper is actually operating in "LO" speed during the parking cycle. See Figure 10-5.

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

4. Connections to Operate Wiper

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

or to run wiper independently of dash switch and car wiring when installed in car.

10-3 WINDSHIELD WASHER DESCRIPTION AND OPERATION

a. General Description

The washer pump used on the two speed non-depressed park wiper is a positive displacement type pump employing a small bellows, bellows spring and valve arrangement. The pumping mechanism is actuated by a 4 lobe cam driven by the wiper. See Figure 10-9. The programming (starting and completion of a wash cycle) is accomplished electrically and mechanically by a relay assembly and ratchet wheel arrangement. See Figure 10-8.

Explanation of pump operation follows:

b. Washer Operation

1. Wiper On - Washer Off

When the washer pump is mounted on the wiper correctly, a cam follower on the washer pump engages a 4 lobe cam on the output shaft of the wiper output gear. (Figure 10-9). The cam follower is part of the spring loaded plate and ratchet pawl assembly. See Figure 10-8. Thus, with the wiper running, the 4 lobe cam rotates continuously and actuates the plate and ratchet pawl assembly back and forth in a horizontal plane. A second pin, attached to the plate and ratchet pawl assembly, extends through a slot in the bellows plunger arm. This pin moves freely back and forth in the slot while the pumping mechanism

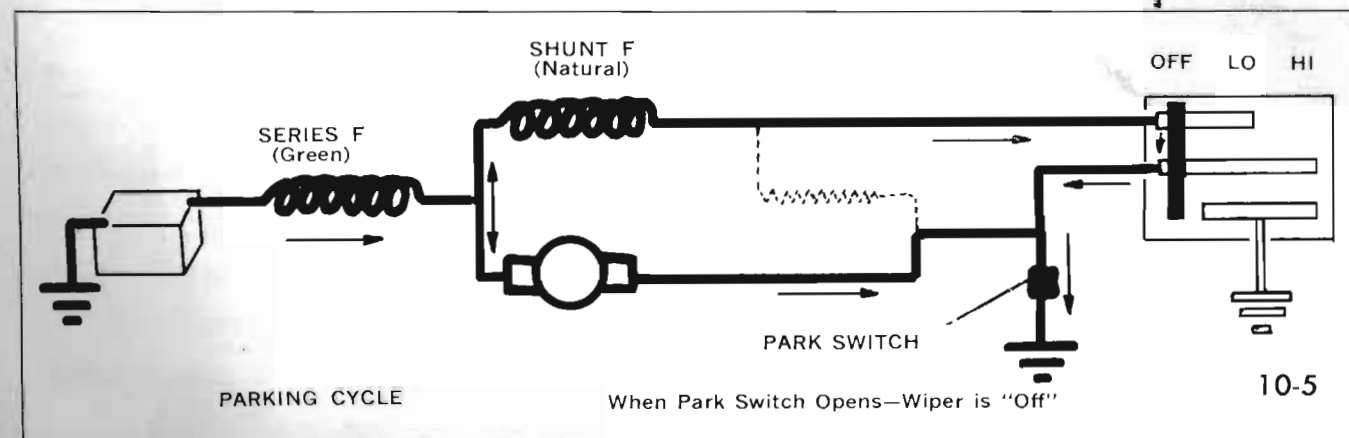


Figure 10-5—Parking Circuit

is in the "lock-out" position and no pumping action occurs.

The pump is in the "lock-out" position when the relay holding contacts are open and a tang on the plunger arm rests against the widest part of an eccentric ramp located on the lower surface of the ratchet wheel. The tang holds the bellows plunger arm in a retracted position (bellows spring compressed) allowing the plunger arm actuator pin on the plate and ratchet pawl assembly (Figure 10-8) to move freely back and forth in the plunger arm slot and thus no pumping action occurs.

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

2. Turning The Washer On

Depressing the dash switch washer button closes the washer pump relay circuit to ground. (Refer to Figure 10-10).

**NOTE:** If wiper was "off" the wiper switch is mechanically turned to the "on" position by the washer button.

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

When the ratchet wheel has been rotated one tooth, two simultaneous functions occur (1) the eccentric ramp on the ratchet wheel is moved away from the plunger arm tang, releasing the pumping mechanism from its lock-out position and (2) a set of holding contacts close, maintaining the coil circuit to ground. The contacts will stay closed until the ratchet wheel has been turned through 360° or 21

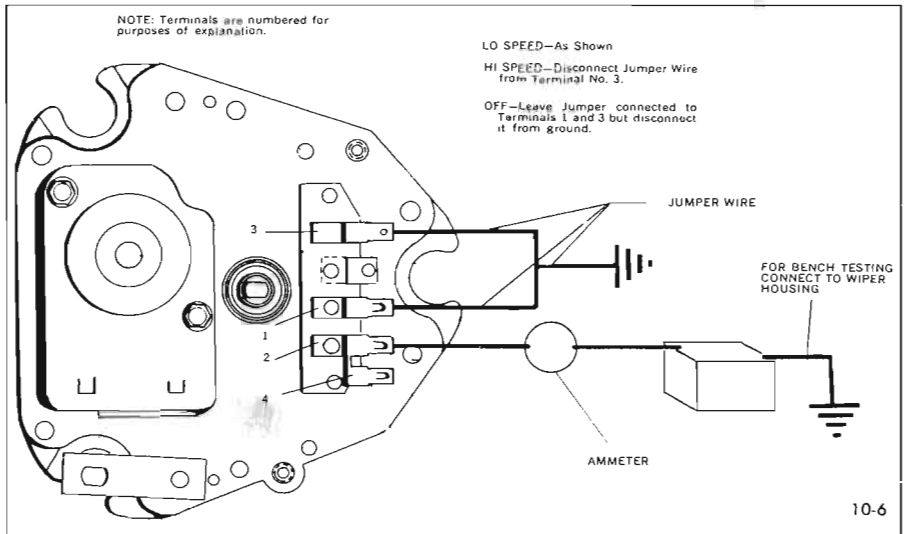


Figure 10-6—Connections to Operate Wipers

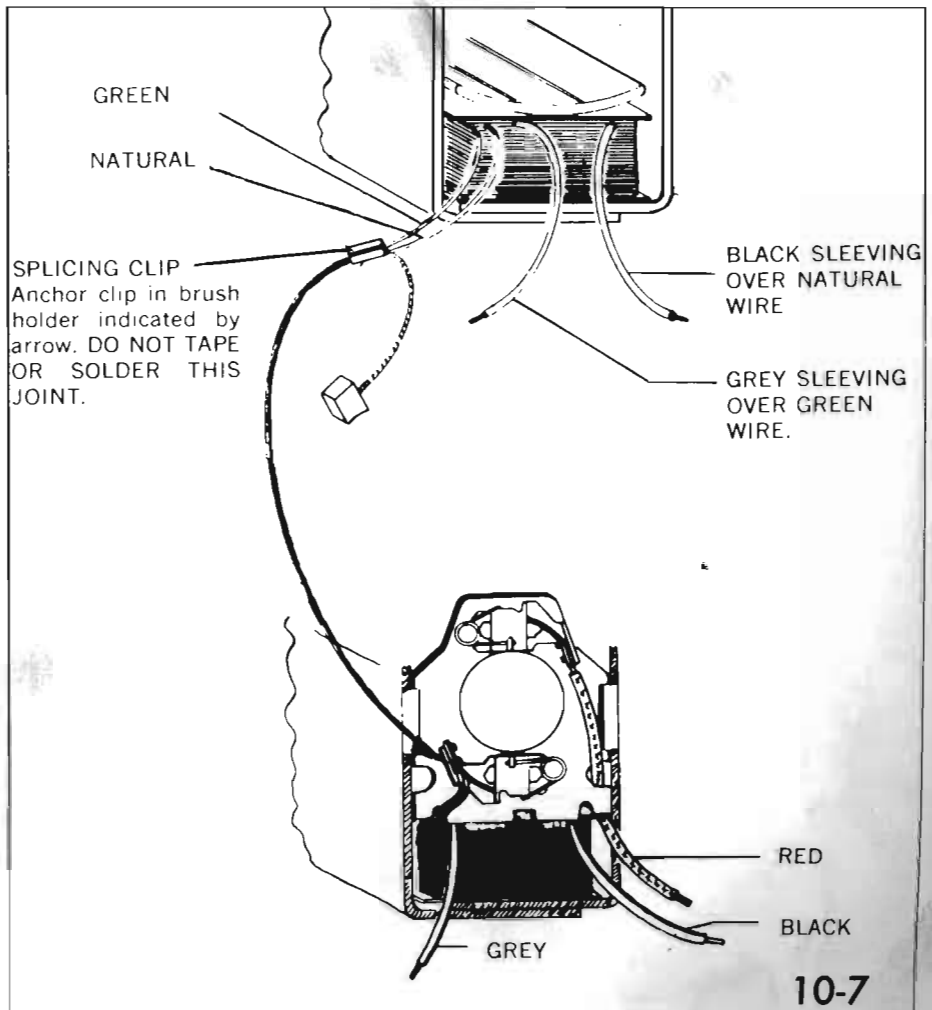


Figure 10-7—Two Speed Motor Wiring

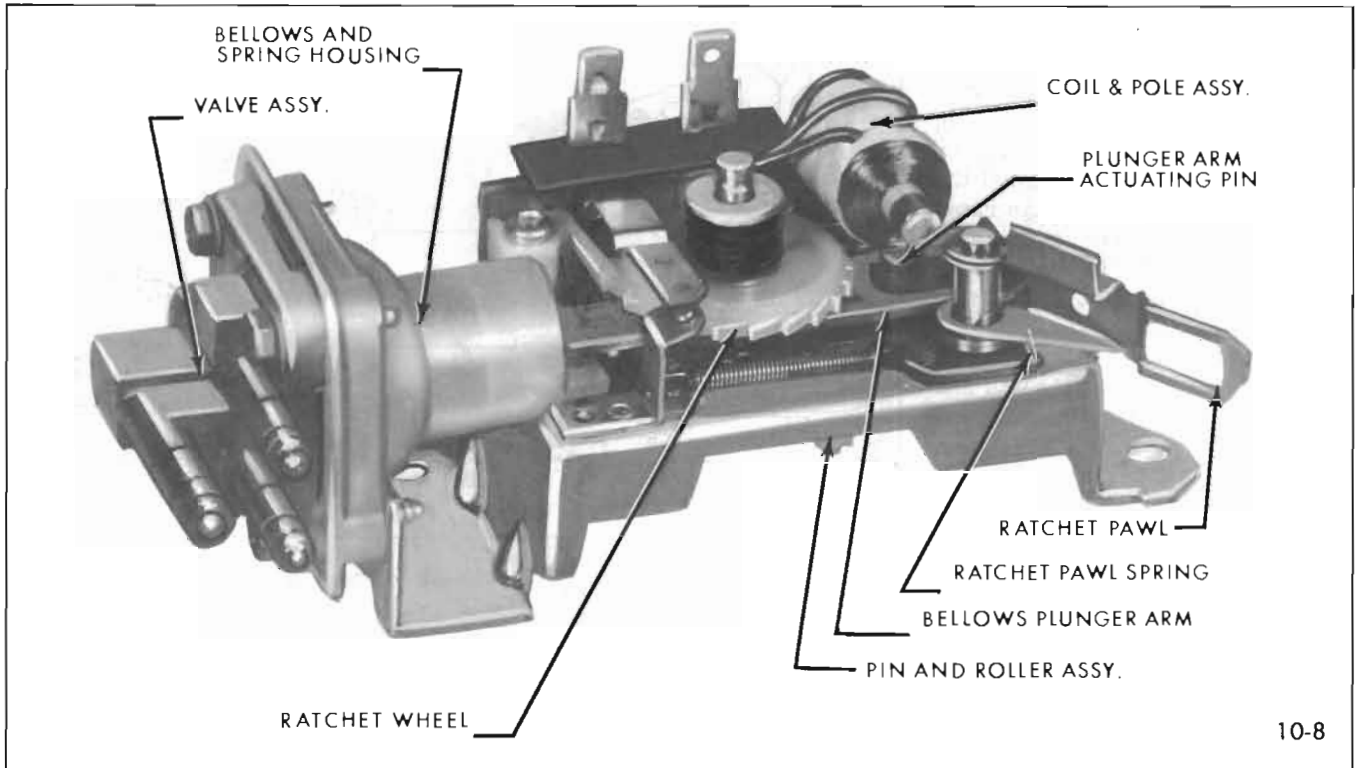


Figure 10-8—Washer Pump with Cover Removed



Figure 10-9—Washer Pump Drive

teeth, at which time the ratchet wheel will again open the contacts.

### 3. Pumping Cycle

(a) (Exhaust half of pump stroke:)

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

(b) (Intake half of pump stroke:)

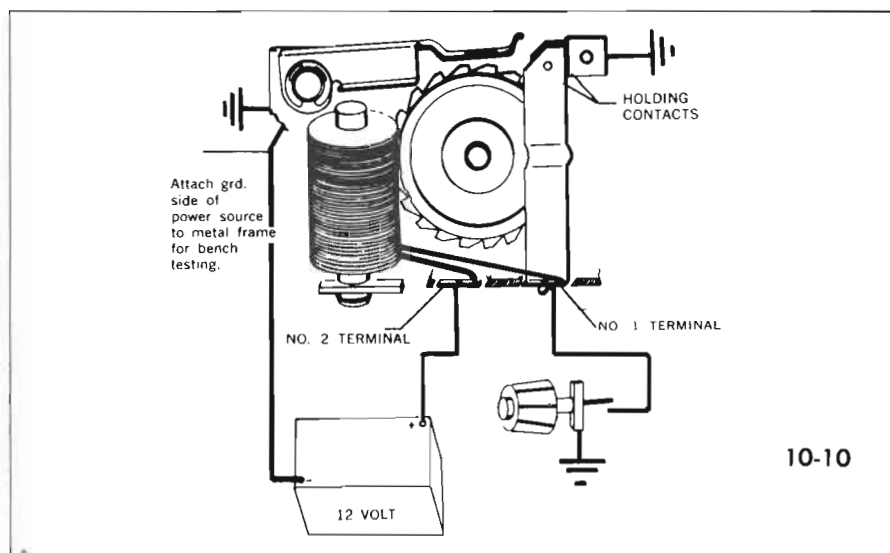


Figure 10-10—Washer Pump Wiring Diagram

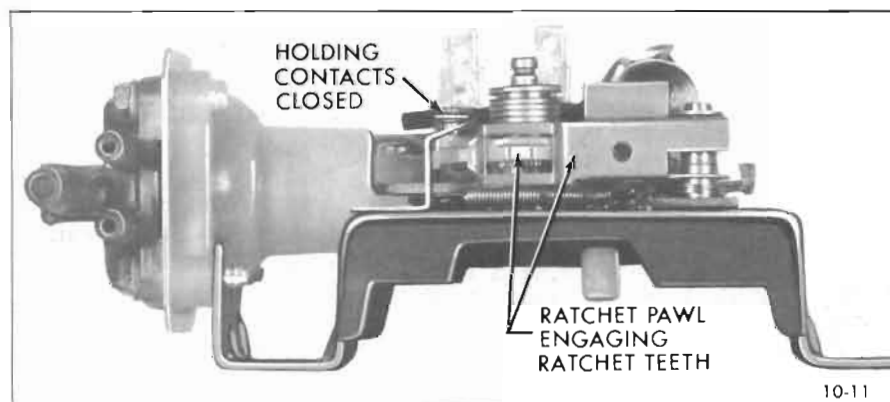


Figure 10-11—Ratchet Pawl Engaging Ratchet Teeth

Pulling the plunger arm back compresses the bellows spring (Figure 10-13) and water is drawn into the bellows through the intake valve. During the intake of water, the exhaust or outlet valves are drawn tight against their seats. During each intake stroke of the pumping mechanism, the ratchet wheel is rotated one tooth.

#### 4. Completion Of Wash Cycle

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

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

As the ratchet wheel rotates, the tang on the bellows plunger arm starts to ride up the eccentric ramp on the lower surface of the ratchet wheel. The full "lock-out" position of the pumping mechanism is reached when the tang is up on the widest part of

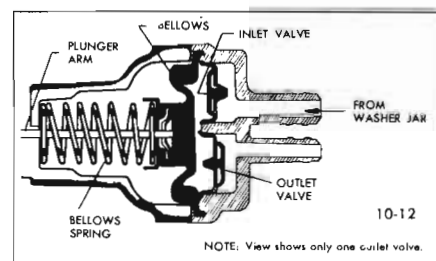


Figure 10-12—Pump Stroke (Exhaust)

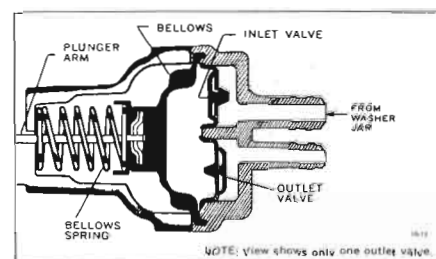


Figure 10-13—Pump Stroke (Intake)

the ramp. The tang reaches the "lock-out" position at the same time the relay coil holding contacts open.

### DIVISION III SERVICE PROCEDURES

#### 10-4 DISASSEMBLY AND ASSEMBLY

##### a. Gear Box Disassembly

1. Remove washer pump drive cam as required. 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 washers.

**NOTE:** Seal cap should be cleaned and repacked with a water proof 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.

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 6 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 and install crank arm on output shaft with park position marks aligned. Clamp crank in vise before securing the retaining nut.

#### c. Motor Disassembly and Assembly

1. Follow Steps 1 thru 6(a) under gear box disassembly.

2. Release brush spring pressure against brushes.

3. Move brushes away from armature and slide armature out of frame and field assembly. Pull end cap assembly off armature.

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.

### 10-5 WINDSHIELD WASHER DISASSEMBLY AND ASSEMBLY

#### a. Removal and Installation of Relay

1. Remove washer pump cover.

2. Unsolder coil leads from terminals.

**NOTE:** No coil polarity is necessary when resoldering coil leads.

3. Remove coil retainer clip and slip coil assembly out of mounting bracket.

4. To install reverse removal procedure.

#### b. Removal and Installation of Ratchet Pawl

1. Remove washer pump cover.

2. Disengage spring from ratchet pawl.

**CAUTION:** Be sure spring is properly assembled before replacing washer pump cover.

3. Remove "E" ring and slide ratchet pawl off shaft.

4. To install reverse removal procedure.

#### c. Removal and Installation of Valve Assembly

1. Remove the four screws that secure the valve assembly to the bellows housing.

**CAUTION:** It is sometimes necessary to carefully pry the bellows lip out of the valve body groove.

2. Manually operate pump to release pump from "lock-out" position (See "Checking Washer Pump Detached").

3. Hold bellows plunger arm from moving, then push in against bottom of bellows with thumb and twist bellows 90°. This should release bellows and bellows spring.

4. To install reverse removal procedure.

## DIVISION IV

### TROUBLE DIAGNOSIS

#### 10-6 TROUBLE-SHOOTING AND TESTING

##### a. Trouble-Shooting—Wiper in-Car

#### 1. Wiper Inoperative

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

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

(c) To determine if dash switch or car wiring are at fault, disconnect harness from wiper motor and try operating wiper as shown in Figure 10-6. If wiper fails to operate, remove body parts as required, disconnect transmission from wiper crank arm and recheck wiper operation. If wiper still fails to perform correctly, remove wiper from car and check wiper according to procedure under Trouble-Shooting Wiper Out-of-Car.

#### 2. Wiper Will Not Shut Off

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

(b) Disconnect wiring harness from wiper motor and try operating wiper independently of dash switch as shown in Figure 10-6.

If wiper operates correctly independently of the dash switch, (i.e. shuts off correctly with crank arm in park position) refer to the table below for possible trouble location -

If wiper still fails to operate correctly in Step (b), remove it

## TROUBLE CHART—WIPER IN CAR

Wiper Will Not Shut Off And:	Possible Trouble
Wiper has both speeds.	(1) Lead between wiper terminal No. 1 and dash switch grounded. (2) Defective dash switch.
Wiper has "Lo" speed only.	(1) Lead between wiper terminal No. 3 and dash switch grounded. (2) Defective dash switch.
Wiper has "Hi" speed only.	(1) Lead between wiper terminal and dash switch open. (2) Defective dash switch.

## TROUBLE CHART—WIPER OUT OF CAR

Ammeter Reading (Amps)	Possible Trouble
0	(1) Loose solder connection at wiper terminal No. 2. (2) Loose splice joints or brush lead connections.
1-1.5	(1) Open armature. (2) Brushes sticking. (3) Loose splice joint.
11.0	(1) Broken gear or some other condition that will stall the wiper.

2. Wiper will not shut off and:	Possible Trouble
Wiper has both speeds.	(1) Park switch contacts not opening. (2) Internal wiper motor lead that connects to wiper terminal No. 1 grounded.
Wiper has "Lo" speed only.	(1) Internal wiper motor lead that connects to wiper terminal No. 3 grounded. (2) Shunt field coil grounded.
Wiper has "Hi" speed only.	(1) Internal wiper motor lead that connects to wiper terminal No. 3 open. (2) Shunt field open.

from car and check it per instructions under Trouble-Shooting Wiper Out-of-Car.

## 3. Wiper Has One Speed - Fast

Check for a defective dash switch or open lead between terminal Number 3 and dash switch.

## 4. Wiper Has One Speed (Slow) and shuts "Off" With Dash Switch In "Hi" Speed Position

Reverse harness leads that connect to wiper terminal 1 and 3.

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

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

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

## 6. Wiper Speed Normal In "Lo" But Too Fast In "Hi"

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

## 7. Intermittent Operation

Check for loose wiper ground connections and/or loose dash switch mounting.

## b. Trouble Diagnosis—Wiper Out-of-Car

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

**IMPORTANT:** Be sure and use an ammeter capable of reading at least 30 amperes in the feed wire circuit.

## 1. Wiper Inoperative

Connect wiper to operate in "Lo" speed and observe current draw.



Current draw ratings shown below will provide a hint as to the possible source of trouble.

3. Wiper Has "Hi" Speed Only  
See Possible Trouble under 2.

4. Wiper Has "Lo" Speed Only  
See Possible Trouble under 2.

5. Wiper Crank Arm Does Not Return To Park Position When Wiper Is Turned Off. Park Position is shown in Figure 10-7. Check for dirty, bent or broken part switch contacts.

6. Wiper Speed Normal In "Lo" But Too Fast In "Hi"

Check for open 20 ohm resistor on back of wiper terminal board.

7. Intermittent Operation

Check for sticking brushes, loose splice joints, etc.

### 10-7 WINDSHIELD WASHER TROUBLE SHOOTING

#### a. Washer Inoperative

1. Check the following items:

(a) Jar has adequate quantity of water solution.

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

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

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

(e) Nozzles are not plugged.

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

3. If correct voltage was found in Step No. 2, connect a jumper wire from terminal with tab to ground and operate wiper. If washer relay "click" is heard and pump functions correctly, a defective dash switch or an open circuit between washer pump and dash switch is indicated - "No Click" indicates an open relay coil.

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

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

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

#### b. Checking Pump Operation With Washer Pump Detached

1. Remove washer pump cover and connect 12 volt power supply to washer pump as shown in Figure 10-10. Connect jumper wire from terminal No. 1 to ground. Turn ratchet pawl to the position shown in Figure 10-10. Ratchet pawl should be pulled toward relay pole and engage ratchet teeth.

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

2. If relay and ratchet pawl perform correctly in Step 1, manually rotate the 3 lobe cam 1 lobe in a clockwise direction (looking at the cam). Observe if relay holding contacts close (Figure 10-11) and the pump plunger arm is released from its lock-out position.

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

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

#### c. Checking Valve Assembly

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

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

If any of three valves allow air to pass in both directions, the valve assembly is defective.

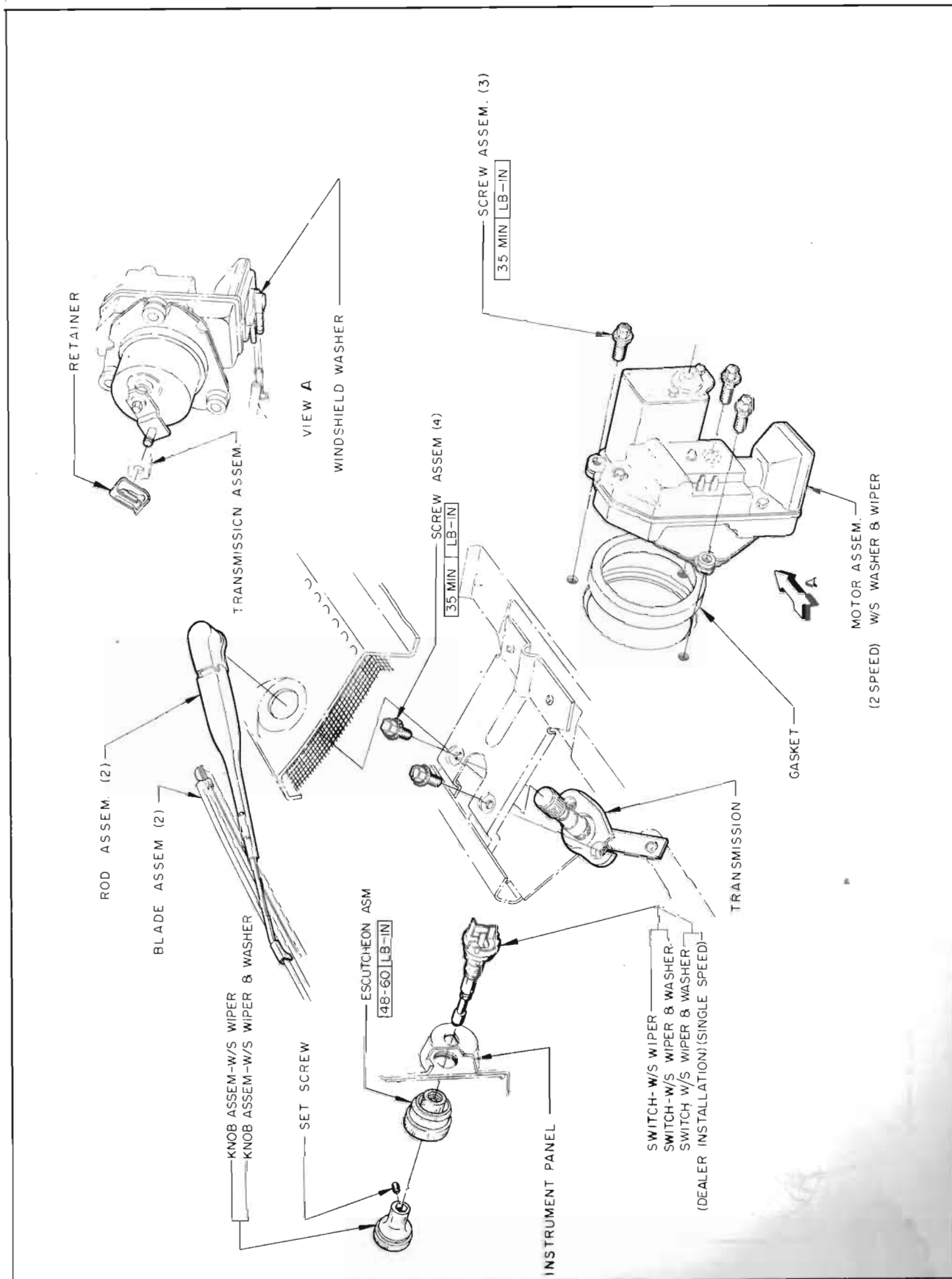


Figure 10-14—Windshield Wiper Installation - Special & Skylark



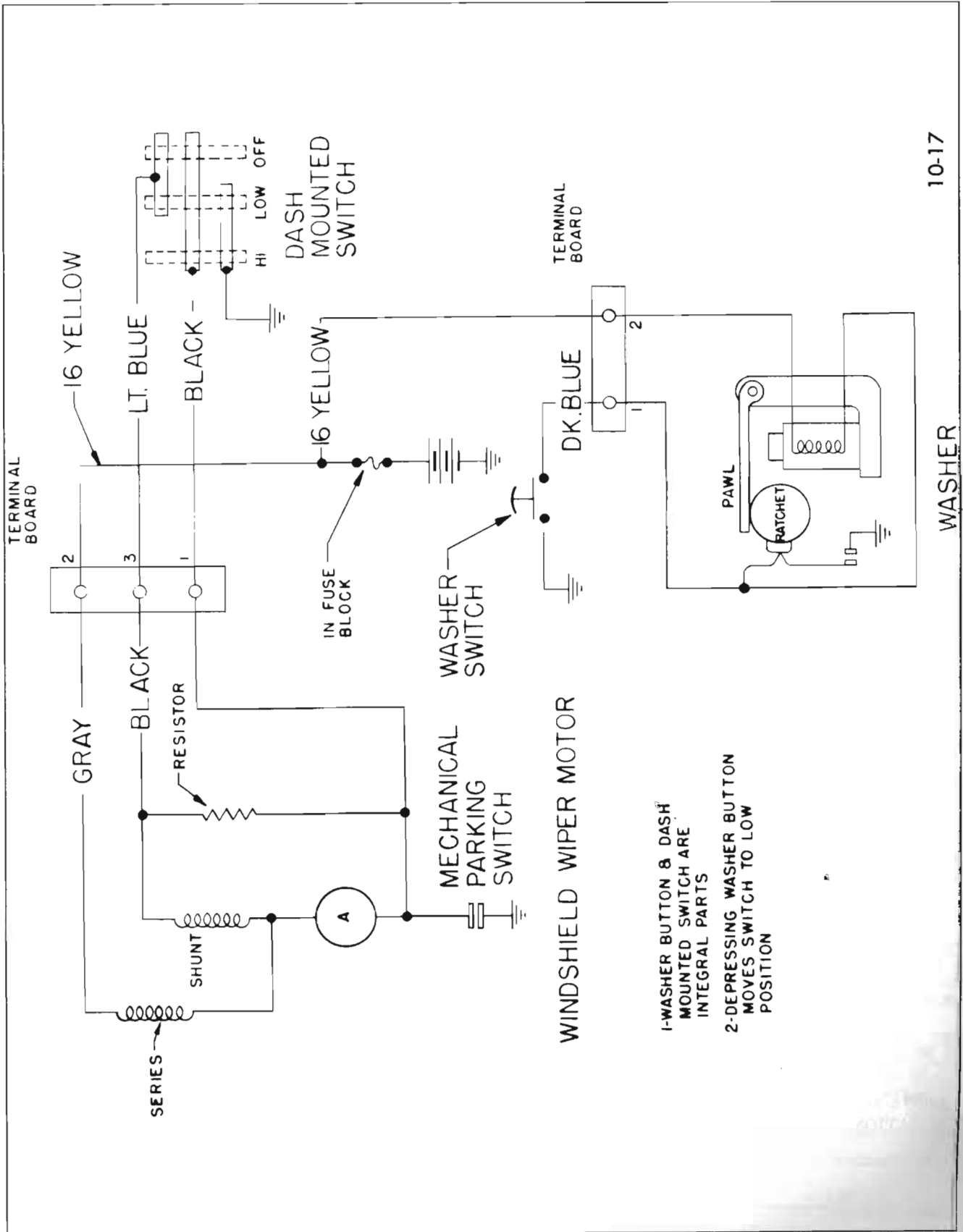


Figure 10-17—Windshield Wiper and Washer Wiring Circuit Diagram - Two Speed - Special & Skylark