WINDSHIELD WIPER

GENERAL DESCRIPTION

PONTIAC AND TEMPEST OPTIONAL SYSTEM

The Pontiac system utilizes the articulated-overlap design while the optional Tempest system uses a tandem-articulating design on one side only. Overlapping action on the Pontiac is accomplished by a double pin drive in the wiper transmission and longer arms and blades. The articulated action is accomplished by the use of a drag link which is attached parallel to wiper arm by a pin at the transmission and connected to a swivel at the blade to arm connection. The wiper patterns for the two systems are shown in Fig. 12-18. When in the park position the wiper arm and blade remain recessed below the windshield reveal molding and under the cowl as shown in Figures 12-20 and 12-21.

The wiper arm and blade may be serviced separately. If the wiper blade becomes worn, it can be replaced by pinching the lock on lower end of blade and pulling out blade insert. A new insert can be installed by reversing this procedure. If spring in blade becomes weak, a new blade must be installed.

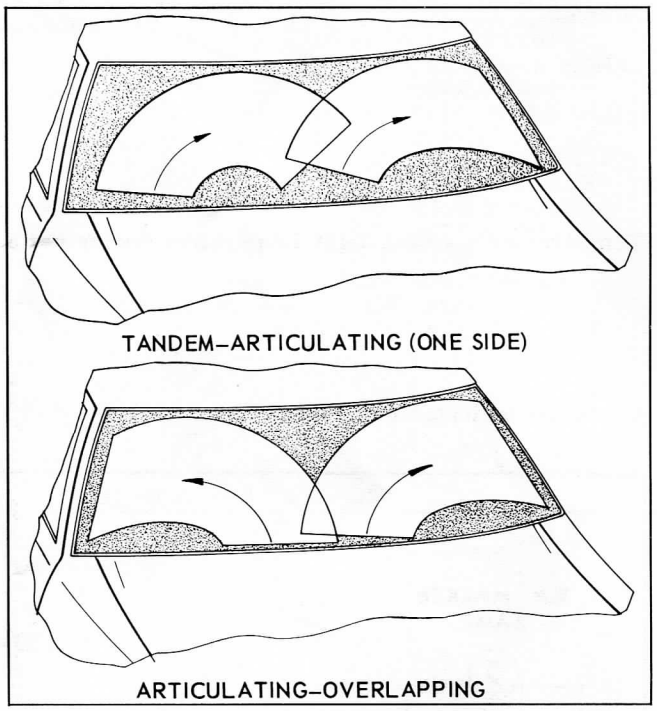

Fig. 12-18 Wiper Patterns

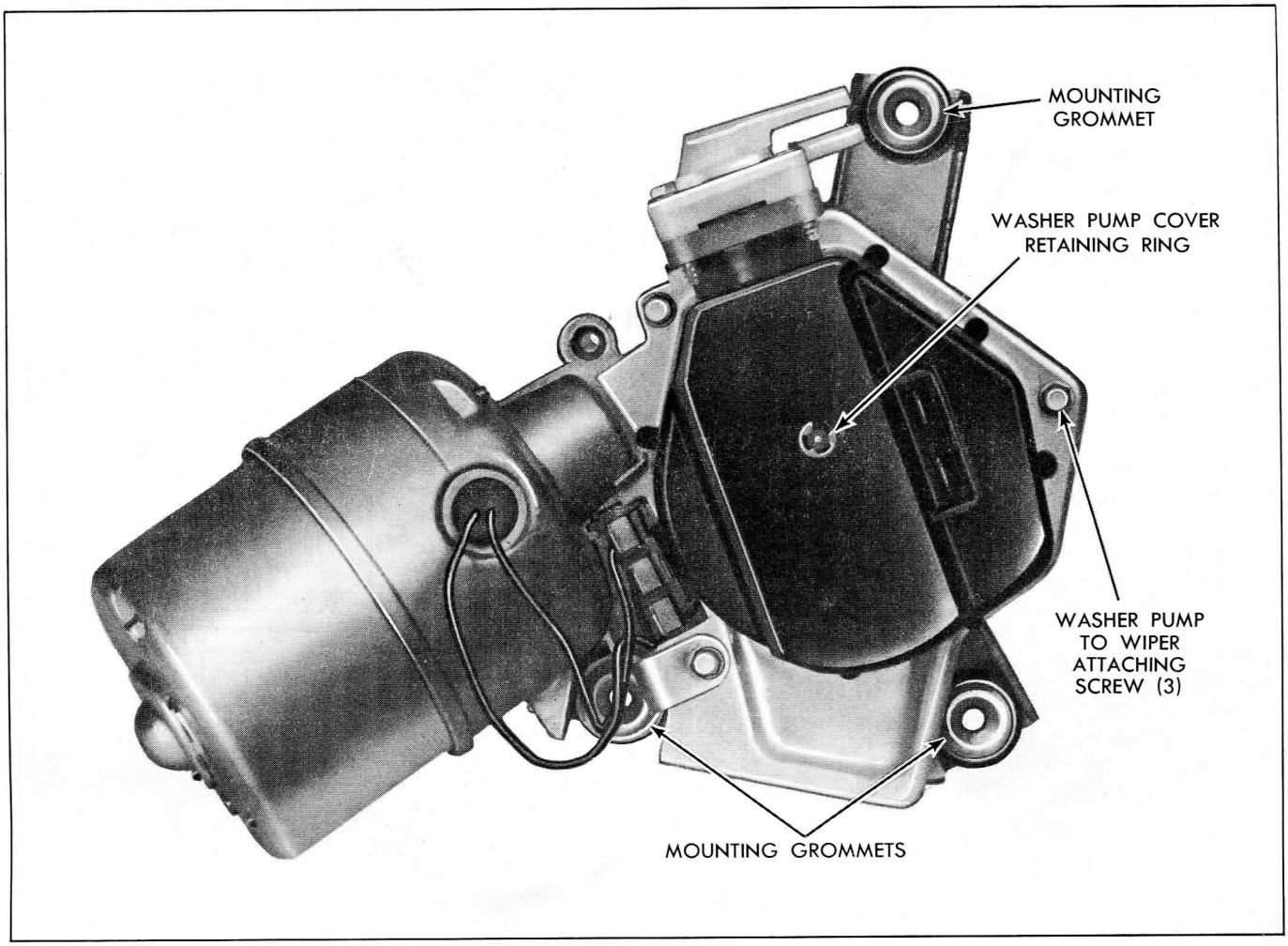

Fig. 12-19 Pontiac and Tempest Optional Wiper Motor

OPERATING PRINCIPLES

WIPER OFF

In off position, the wiper gear drive pawl is located in a slot in the relay switch (Fig. 12-22). 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. Electrical circuit in OFF position is shown in Fig. 12-25.

TURNING THE WIPER ON: (LO SPEED)

When wiper switch is turned to low position, the circuit through the relay switch is completed to ground at dash switch (Fig. 12-26). With the relay coil energized, the latch arm is attracted to the relay coil. This action pulls the latch arm away from flexible switch contact which allows relay switch contacts to close. When contacts close, the 12 volt 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 are unlocked from the gear and are prevented from rotating with the gear because of the drive pawl extending into the relay switch slot (Fig. 12-22).

Since the gear rotates independently during this first stage of operation, the cam action that results from the crank arm or output shaft extending off center through the gear shaft, causes the drive pawl to gradually move out of the relay switch slot. This cam action occurs within the first 180° of rotation of the gear. At the end of this first 180° of rotation the spring-loaded drive and lock pawl guide pins snap into their respective pockets of 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 (Fig. 12-23) and the gear, drive pawl, lock pawl, drive plate and shaft assembly, and crank arm rotate as a unit at approximately 40-50 rpm.

HI SPEED OPERATIONS

Turning wiper dash switch to Hi-Speed position, opens the shunt field circuit to ground at dash switch. The shunt field circuit is then completed to ground through the resistor located on wiper terminal board (Fig. 12-27).

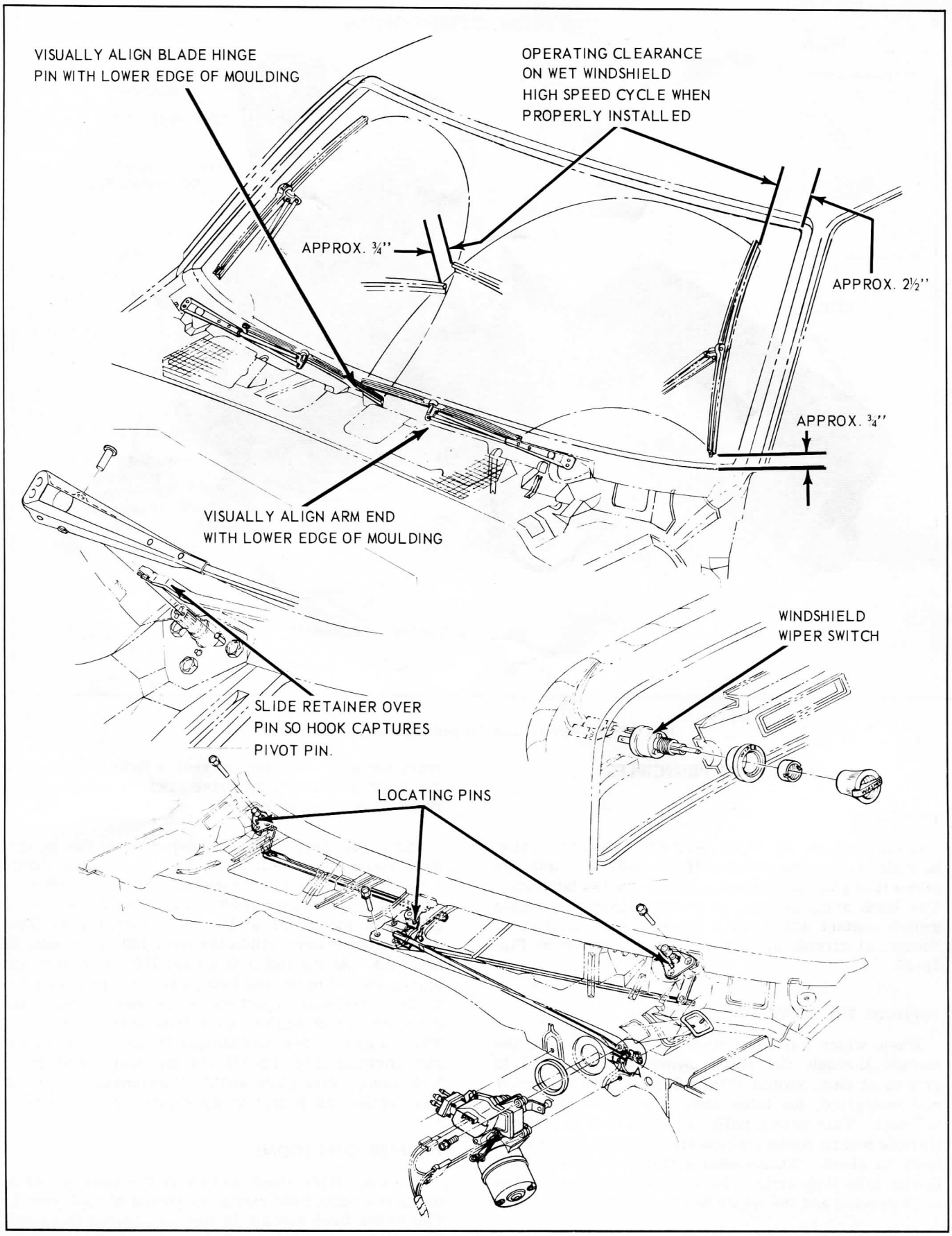

Fig. 12-20 Pontiac Windshield Wiper System

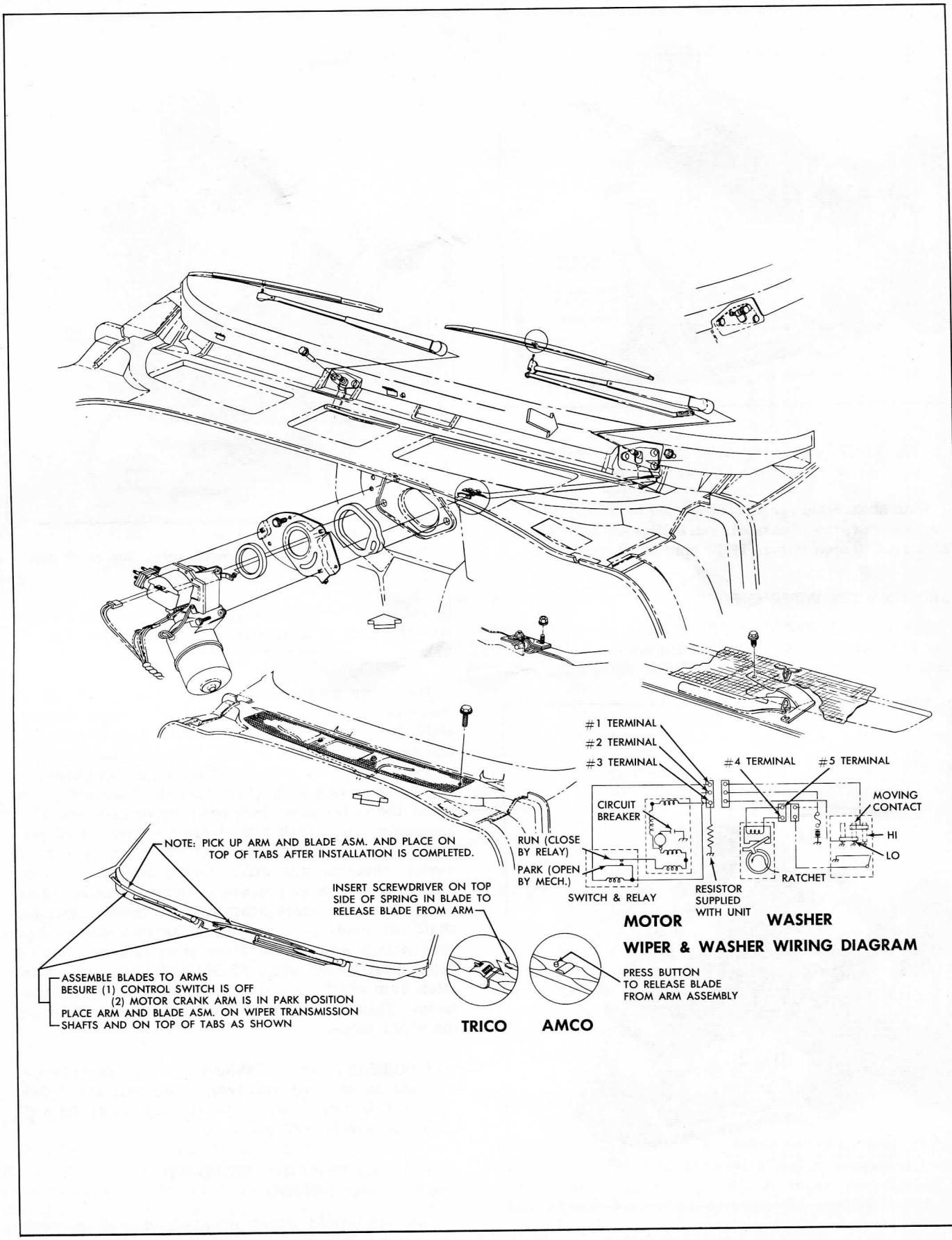

Fig. 12-21 Optional Tempest Windshield Wiper System

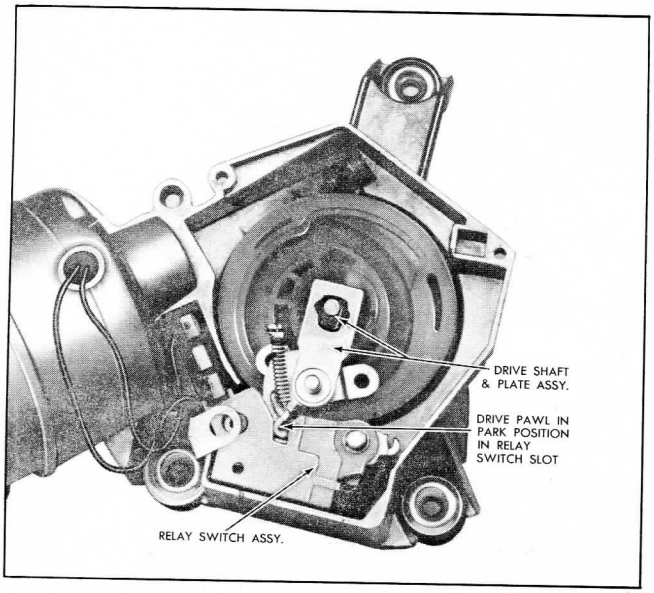

Fig. 12-22 Location of Drive Pawl in Off Position on Pontiac and Optional Tempest

With shunt field circuit completed to ground through the resistor, the wiper will run in High-Speed. Crank arm rpm is approximately 70 rpm at 12 volts.

SHUTTING THE WIPER OFF

Moving dash switch to OFF position opens the relay coil circuit to ground at dash switch. With relay coil circuit open, the spring loaded relay latch arm

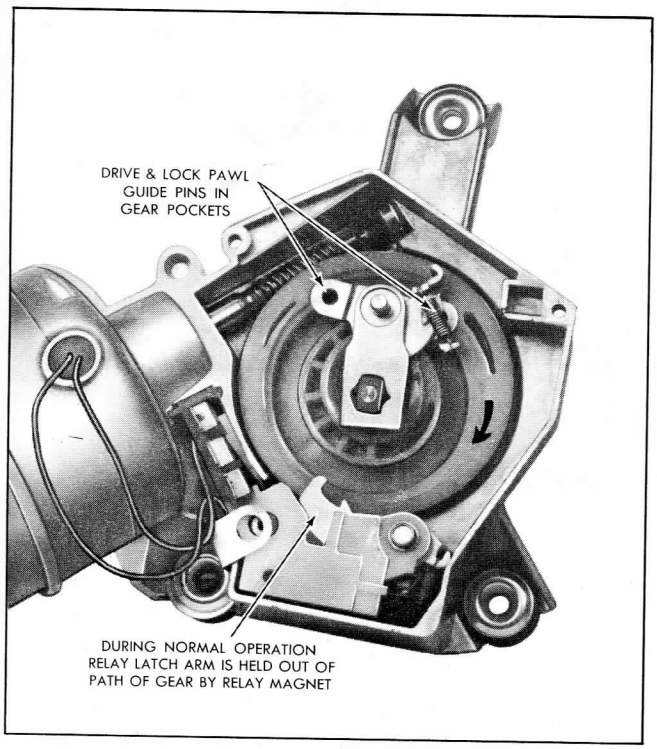

Fig. 12-23 Guide Pins in Drive Gear Pockets on Pontiac and Optional Tempest

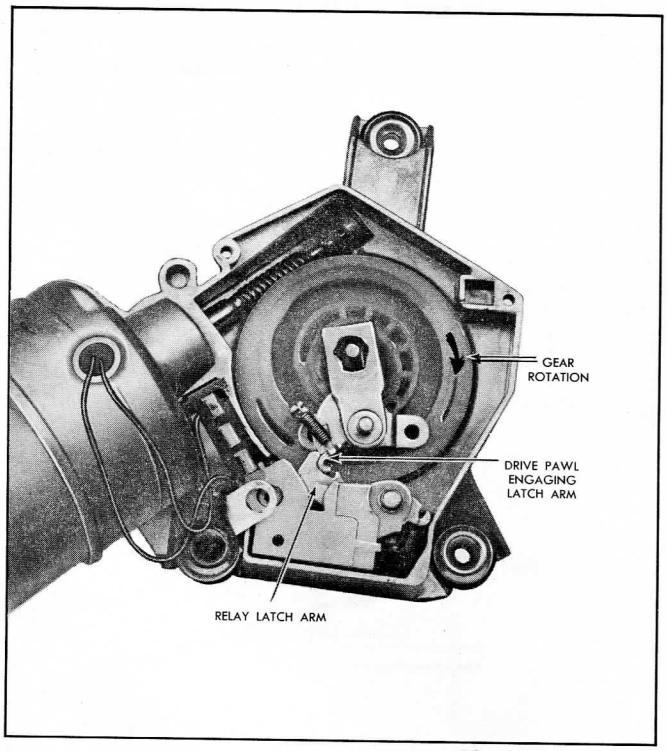

Fig. 12-24 Drive Pawl Engaging Latch Arm on Pontiac and Optional Tempest

is released from the relay switch coil and moves out into the path of gear assembly drive pawl (Fig. 12-23).

The relay switch contacts are still closed at this stage of operation, so circuit to the wiper motor is still completed. Thus the wiper motor and gear mechanism continues to run. The continuing rotation of gear assembly causes the drive pawl to eventually engage the latch arm (Fig. 12-24). 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. The relay switch contacts are still closed, however, and the motor continues to run and gear continues to rotate. Since the drive plate shaft extends through the gear shaft off center, a cam action again results. This cam action causes the drive pawl to move into the relay switch slot (Fig. 12-24) and push against the latch arm which, in turn, opens the relay switch contacts. This opens the circuit to the wiper motor and the wiper stops.

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

GENERAL DESCRIPTION—STANDARD TEMPEST AND FIREBIRD

The windshield wiper consists of a shunt-wound and series wound motor. The gear train consists of a helical gear at the end of the armature shaft. The

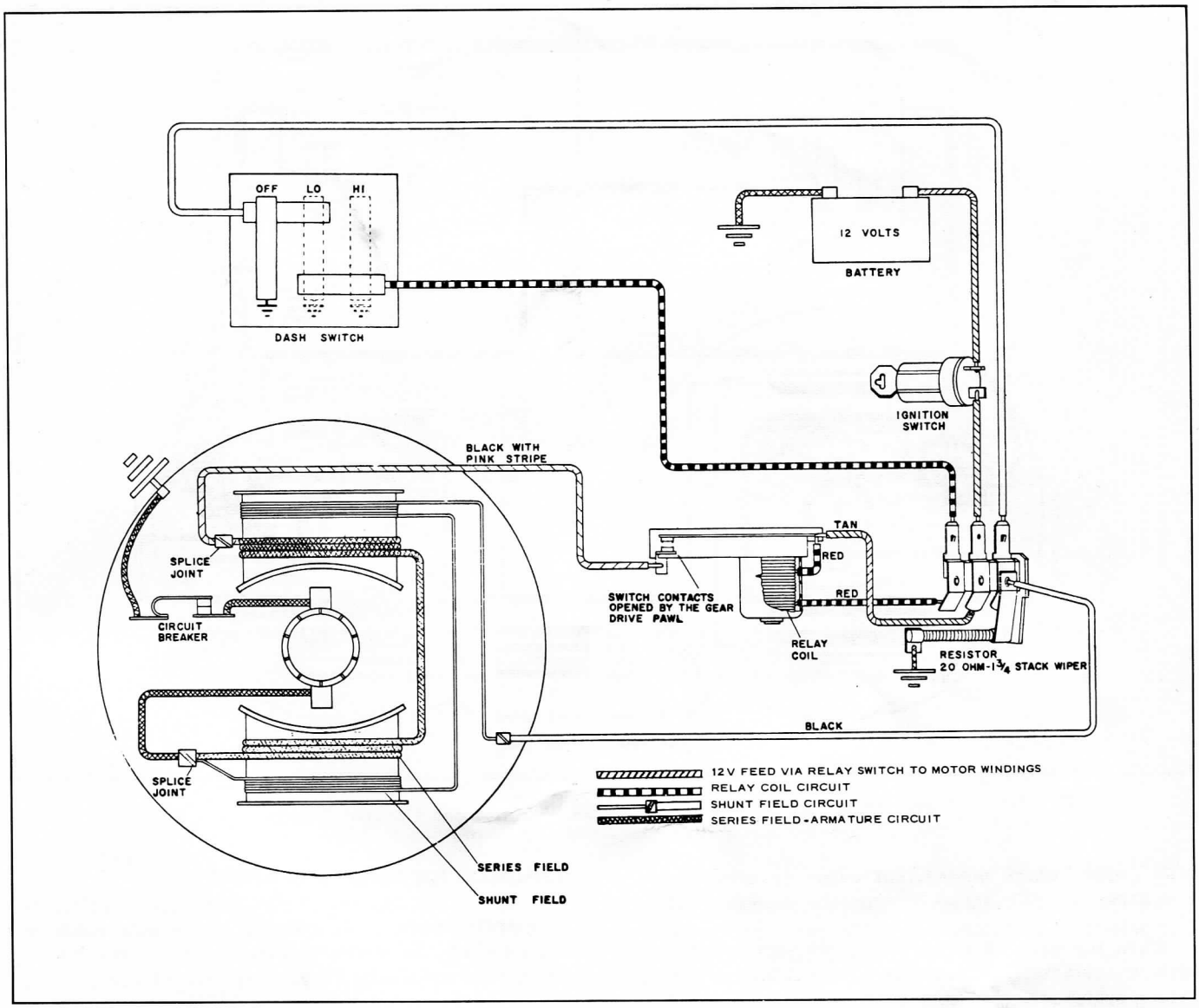

Fig. 12-25 Wiper Circuit in Off Position—Pontiac and Optional Tempest

helical gear drives an intermediate gear and pinion assembly, the pinion of which drives an output gear and shaft assembly (Fig. 12-31).

The mounting used for the two-speed wiper is shown in Fig. 12-24, 30.

OPERATING PRINCIPLES (Fig. 12-33)

LOW SPEED (Fig. 12-34)

When the dash switch is moved to the LO speed position (Ign. Sw. On) current from the battery flows through the series filed 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 and the wiper will operate at 34 rpm.

HI SPEED (Fig. 12-35)

Moving dash switch to HI speed position keeps the armature circuit closed to ground. The shunt field current must pass through a 24 ohm resistor located on the back of wiper terminal board, and then through the mutual lead that connects the armature circuit to ground through the dash switch. The wiper will run at approximately 65 rpm.

PARKING CIRCUIT (Fig. 12-28 and 12-36)

Moving dash switch to OFF position opens both armature and shunt field circuits to 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 dash switch back to wiper parking switch direct

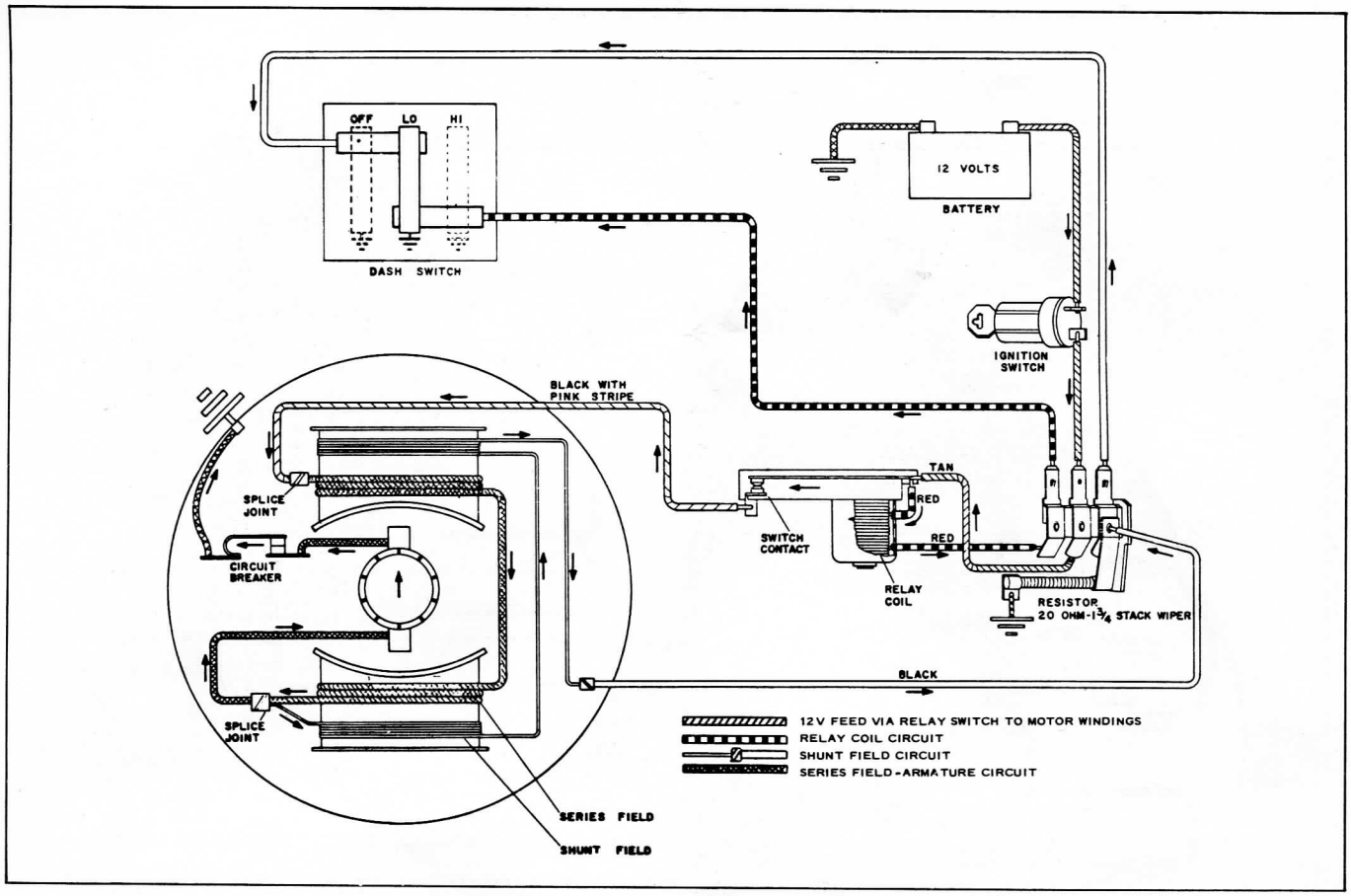

Fig. 12-26 Wiper Circuit in Low-Speed—Pontiac and Optional Tempest

to ground which means that wiper is actually operating in LO speed during the parking cycle.

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

TROUBLE DIAGNOSIS—WIPER ON CAR

This section covers only the wiper motor.

PRELIMINARY INSPECTION

Check the following items:

1. Body wiring properly connected to wiper terminal board and dash switch.

2. Wiper to fire wall mounting screw tight.

3. Dash switch securely mounted.

4. Fuse.

5. Pontiac models - With ignition switch turned on there is a 12 volt supply at center terminal of wiper terminal board. Tempest number two terminal (Fig. 12-37).

CHECKING THE WIPER OPERATION

Operate wiper independently of the car wiring or dash switch, as shown in Fig. 12-38. Check for Lo, Hi-speeds and if wiper shuts off correctly.

1. If wiper operates correctly, see trouble chart.

2. If wiper fails to operate correctly in step 1 disconnect wiper linkage from wiper motor and recheck for proper wiper motor operation.

a. If wiper motor operates correctly in step 2, check linkage for severe binding condition or breakage.

b. If wiper fails to operate correctly in step 2, remove wiper from car and check per instructions "TROUBLE SHOOTING-WIPER DETACHED".

CONNECTIONS TO OPERATE WIPER

Fig. 12-38 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.

NOTE: Specification table at end of this section lists current draw data.

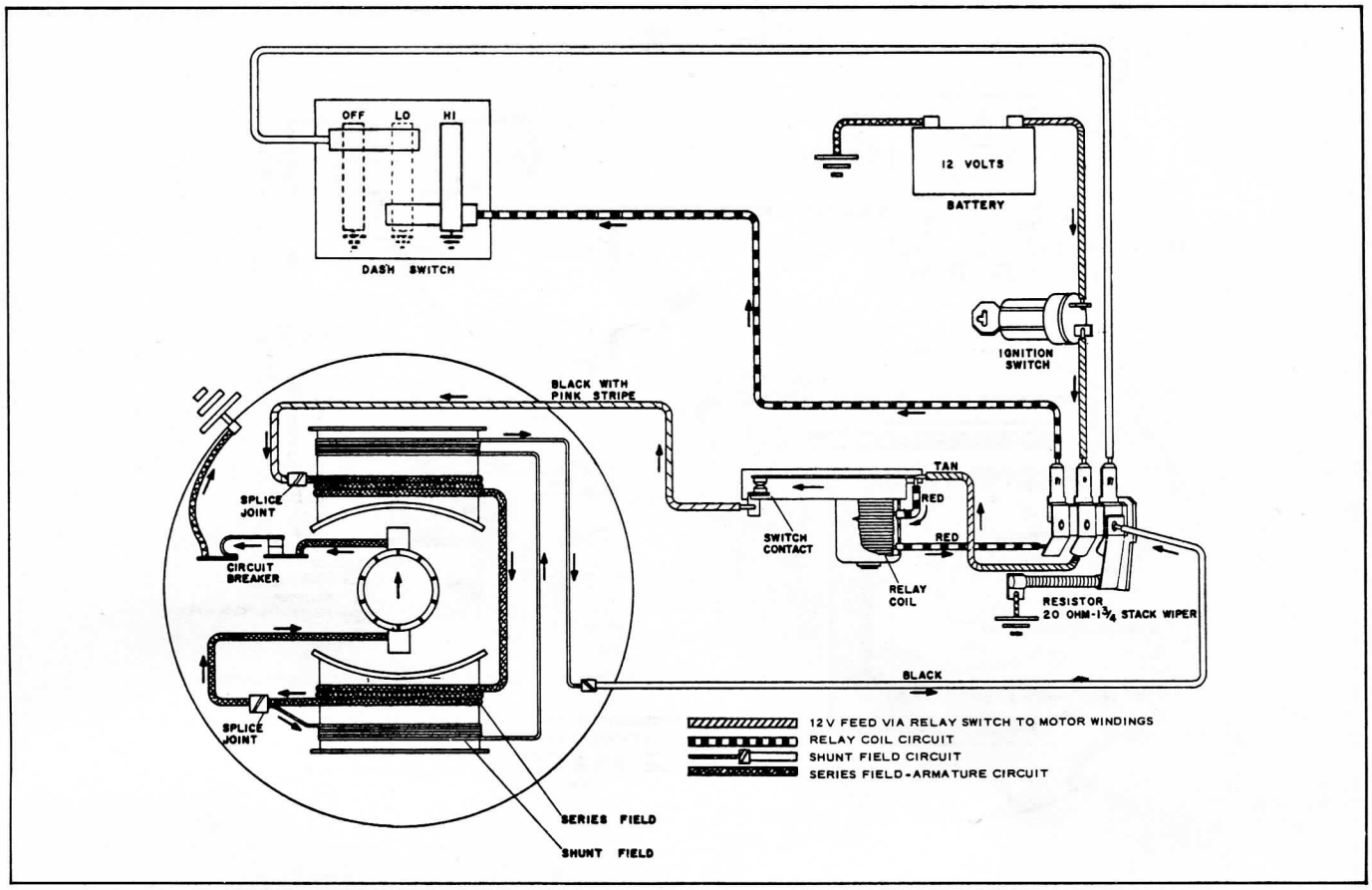

Fig. 12-27 Wiper Circuit in High-Speed—Pontiac and Optional Tempest

TROUBLE DIAGNOSIS—WIPER INSTALLED IN CAR—TEMPEST

WIPER INOPERATIVE

1. Make sure wiring harness is properly connected.

2. With ignition switch on, check for 12 volts at harness terminal that connects to number (2) terminal (Fig. 12-37).

3. To determine if dash switch or car wiring is at fault, disconnect harness from wiper motor and try operating wiper as shown in Fig. 12-37. If wiper fails to operate, remove body parts as required, disconnect transmissions 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 "WIPER DETACHED FROM CAR".

WIPER WILL NOT SHUT OFF

1. Determine if wiper has both LO and HI speeds, LO speed only, or HI speed only.

NOTE: Wiper must operate in LO speed during parking cycle.

2. Disconnect wiring harness from wiper motor and try operating wiper independently of dash switch as shown in Fig. 12-37.

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

Step 3 Diagnosis	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 switch and dash open.
	(2) Defective dash switch.

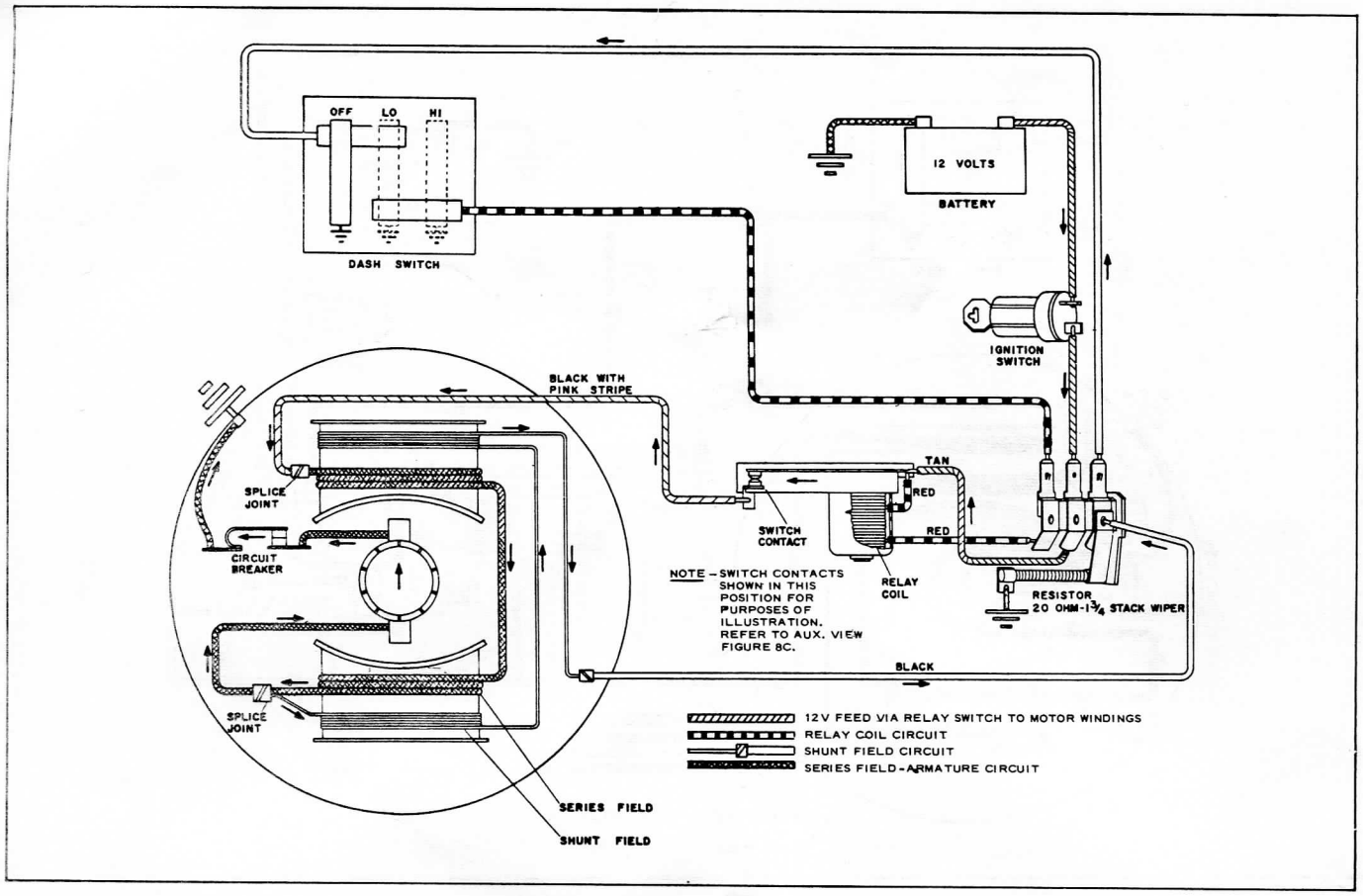

Fig. 12-28 Wiper Circuit in Park Position—Pontiac and Optional Tempest

If wiper still fails to operate correctly in step 2, remove it from car and check it per instructions under "WIPER DETACHED FROM CAR".

WIPER HAS ONE SPEED—FAST

Check for a defective dash switch or open lead between terminal No. 3 and dash switch.

BLADES DO NOT RETURN TO PARK POSITION WHEN WIPER IS TURNED OFF

1. Check wiper ground strap connection to car body.

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

WIPER SPEED NORMAL IN LO BUT TOO FAST IN HI

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

INTERMITTENT OPERATION

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

WIPER HAS ONE SPEED SLOW AND SHUTS OFF WITH DASH SWITCH IN HI SPEED POSITION

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

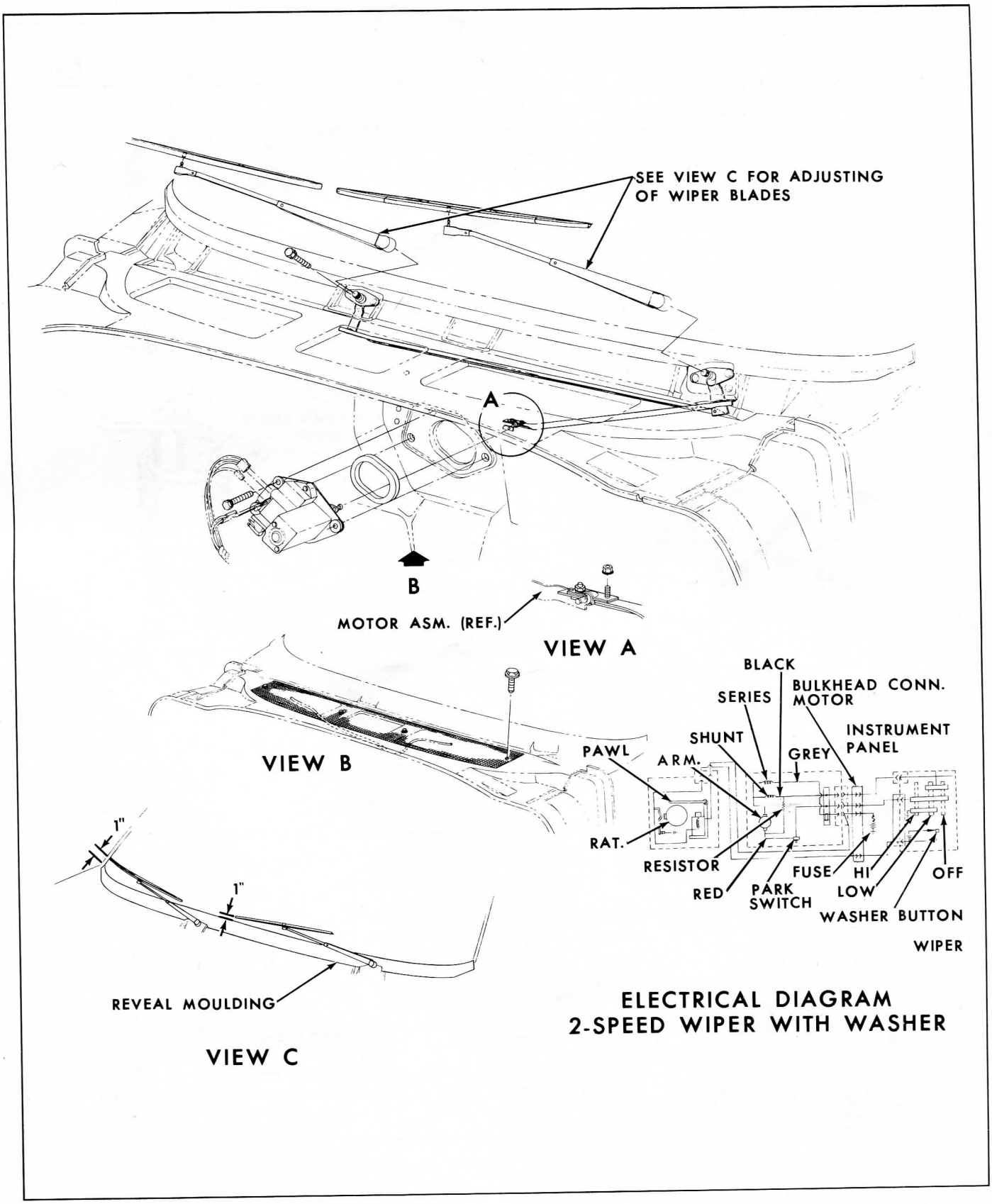

Fig. 12-29 Windshield Wiper System—Tempest (Standard)

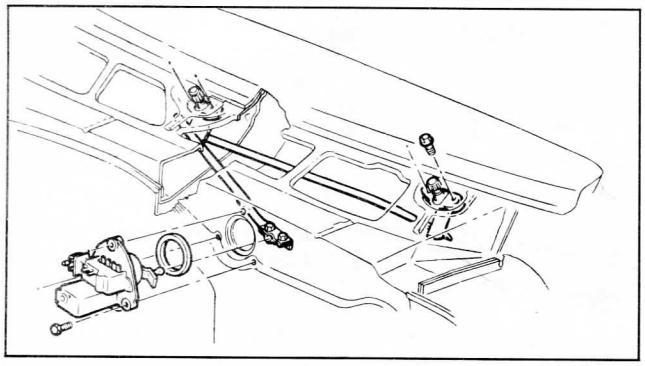

Fig. 12-30 Windshield Wiper System—Firebird

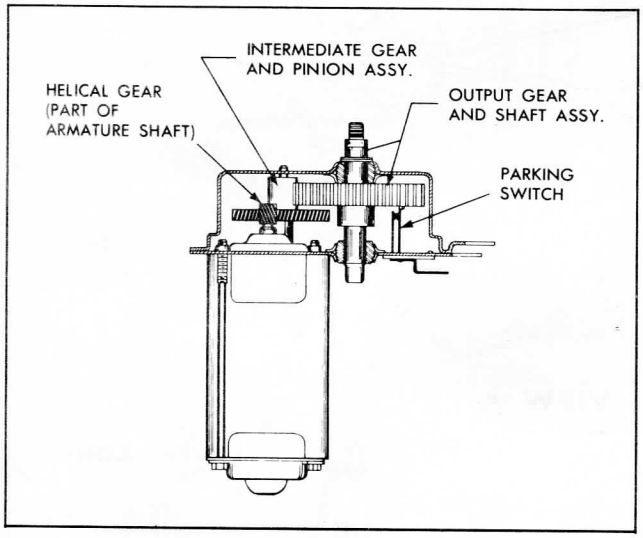

Fig. 12-31 Wiper Gear Train—Tempest and Firebird

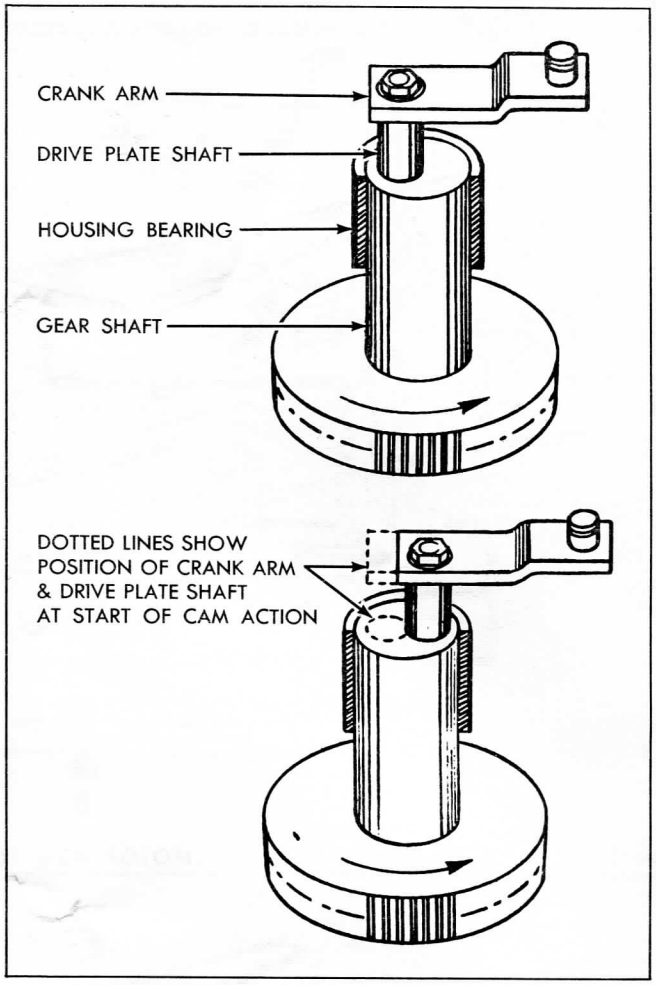

Fig. 12-32 Crank Arm and Drive Shaft Showing Cam Action—Pontiac and Optional Tempest

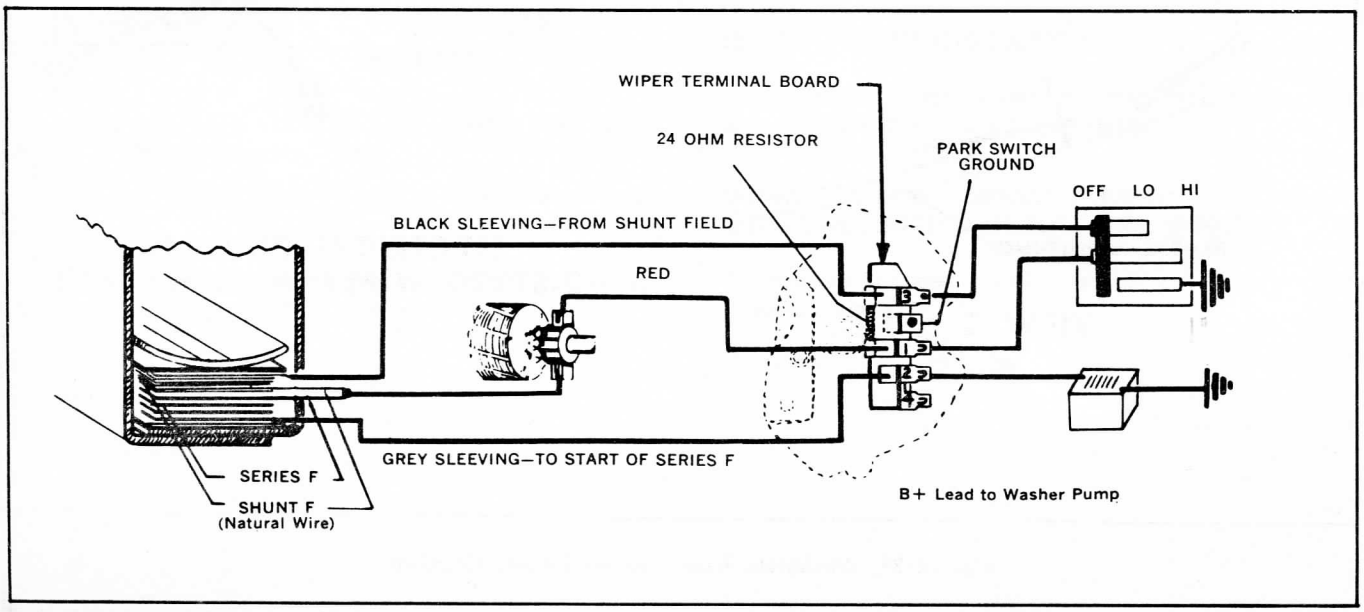

Fig. 12-33 Wiper Wire Schematic—Tempest and Firebird

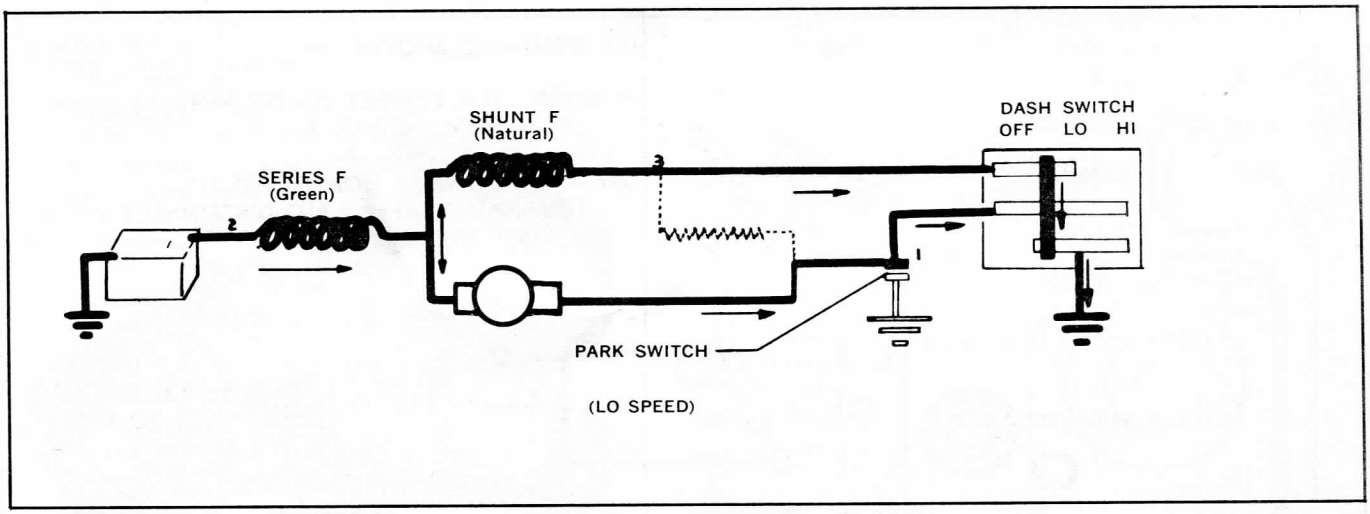

Fig. 12-34 Low Speed Circuit—Tempest and Firebird

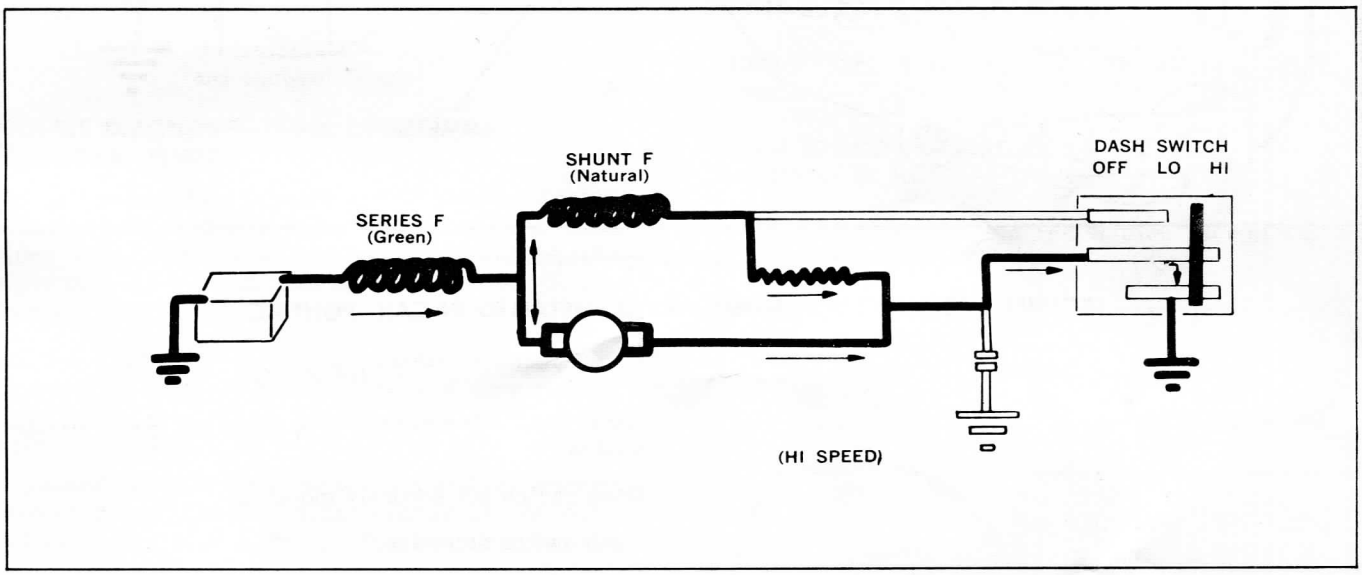

Fig. 12-35 High Speed Circuit—Tempest and Firebird

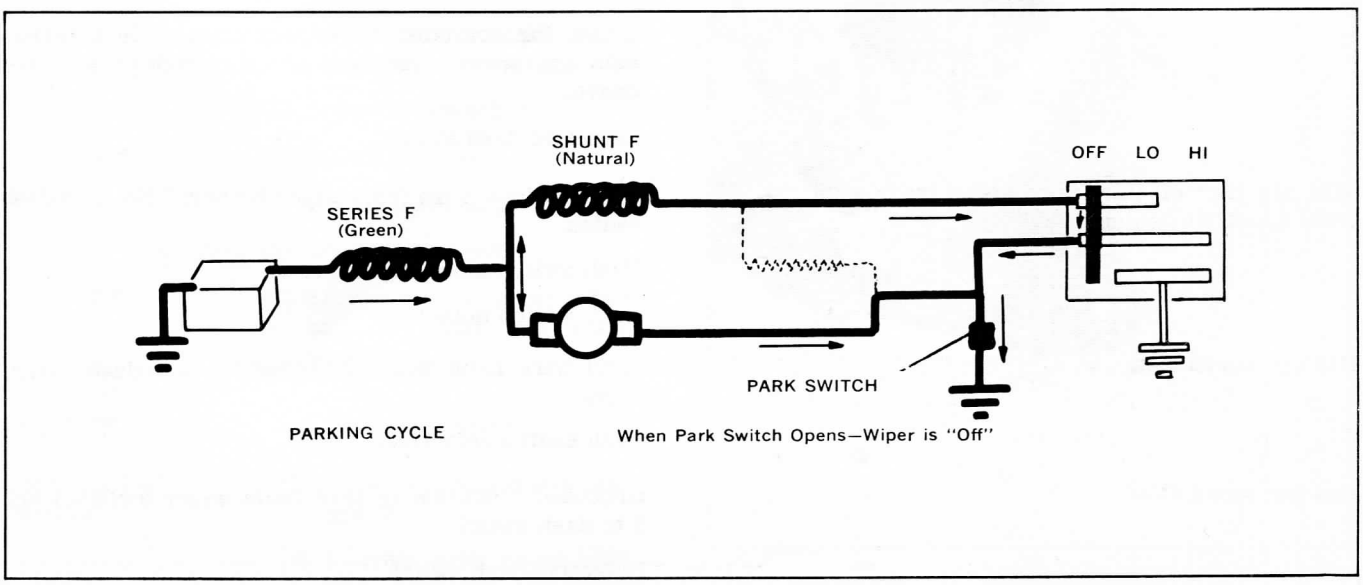

Fig. 12-36 Parking Cycle Circuit—Tempest and Firebird

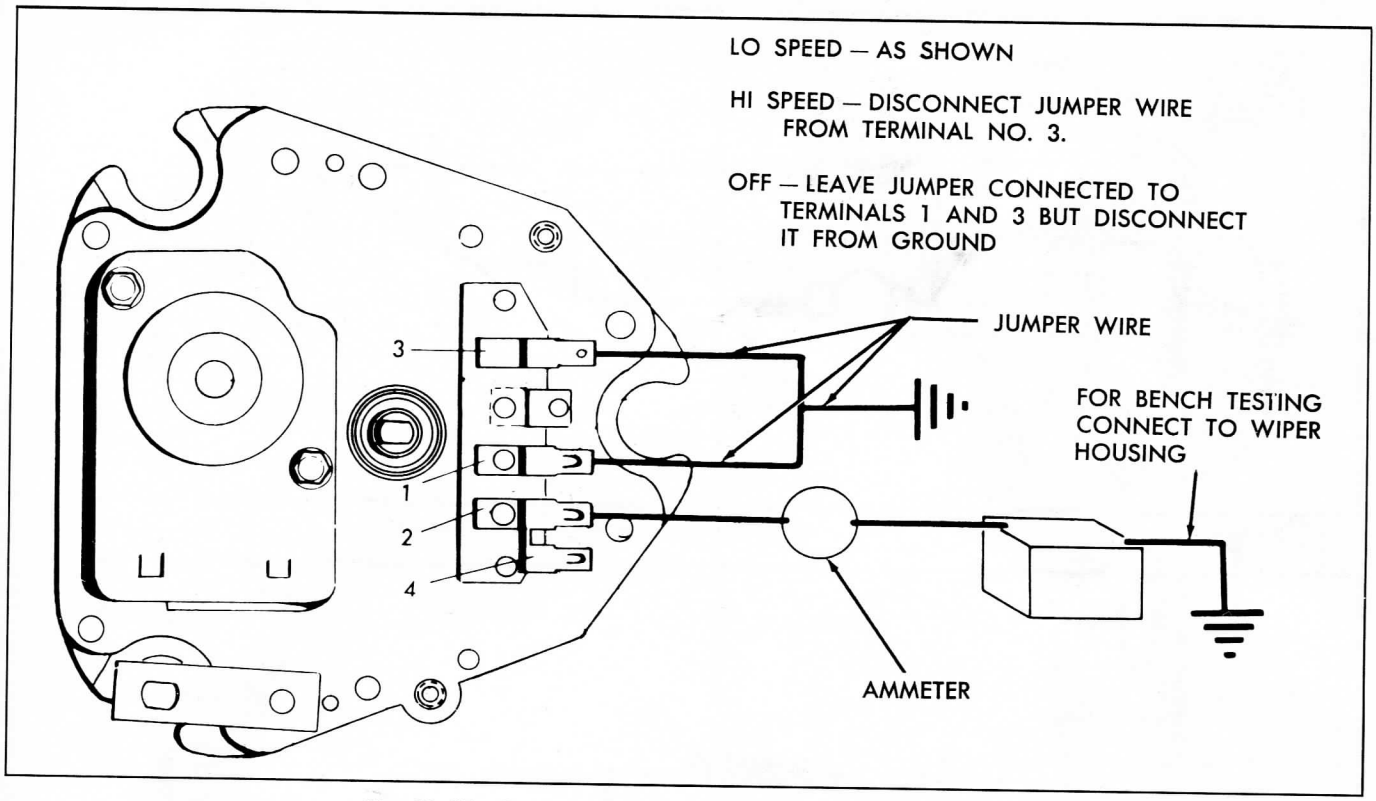

Fig. 12-37 Connection for Testing—Tempest and Firebird

TROUBLE SHOOTING DIAGNOSIS—WIPER INSTALLED IN CAR—PONTIAC

CAUSE	CORRECTION
Wiper inoperative.	Open lead wire from wiper terminal No. 1 to dash switch.
	Dash switch not securely mounted.
	Dash switch defective.
Will not shut off (blades make full wipe stroke).	Grounded condition in lead from wiper terminal No. 1 to dash switch.
	Check for corroded wiper terminals. Clean terminals and spread thin coat of waterproof grease over board.
	Defective dash switch.
Will not shut off (blades move up and down about 15° from lower windshield molding).	Open in lead wire from wiper terminal No. 3 to dash switch.
	Dash switch mounting loose.
	Dash switch defective.
Has one speed fast.	Lead wire from wiper terminal No. 3 to dash switch open.
	Dash switch defective.
Has one speed slow.	Grounded condition in lead from wiper terminal No. 3 to dash switch.
	Defective dash switch.
Intermittent operation.	Check for loose dash switch mounting.

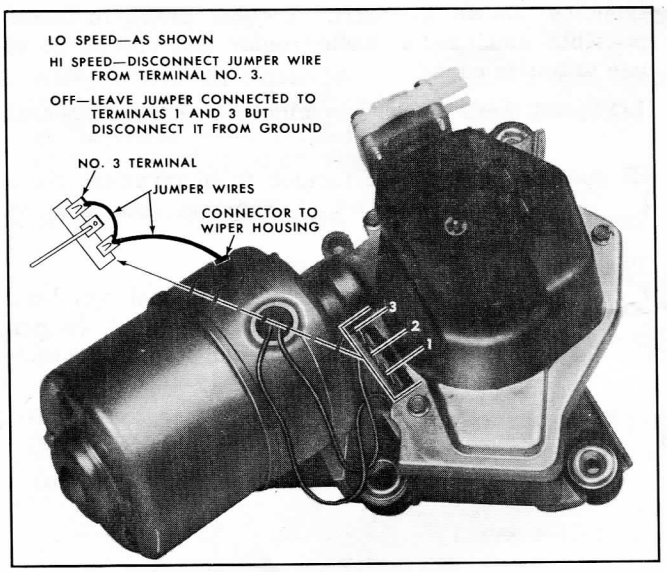

Fig. 12-38 Jumper Wire Connections—Pontiac and Optional Tempest

TROUBLE DIAGNOSIS—WIPER DETACHED FROM CAR—TEMPEST

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 instructions shown in Fig. 12-37.

NOTE: Be sure to use an ammeter capable of reading at least 30 amperes in feed wire circuit.

WIPER INOPERATIVE

Connect wiper to operate in LO speed and observe current draw. Current draw ratings shown below will provide a hint as to possible source of trouble.

Ammeter Reading (Amps)	Possible Trouble
0	(1) Loose solder connection at wiper terminal No. 2.
	(2) Loose splice joints.
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 wiper.

WIPER WILL NOT SHUT OFF	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.

WIPER HAS HI SPEED ONLY—See Possible Trouble in table above.

WIPER HAS LO SPEED ONLY—See Possible Trouble in table above.

WIPER CRANK ARM DOES NOT RETURN TO PARK POSITION when wiper is turned off (i.e., crank arm stops rotating immediately).

Check for dirty, bent or broken park switch contacts.

WIPER SPEED NORMAL IN LO BUT TOO FAST IN HI

Check for open 24-ohm resistor on back of wiper terminal board.

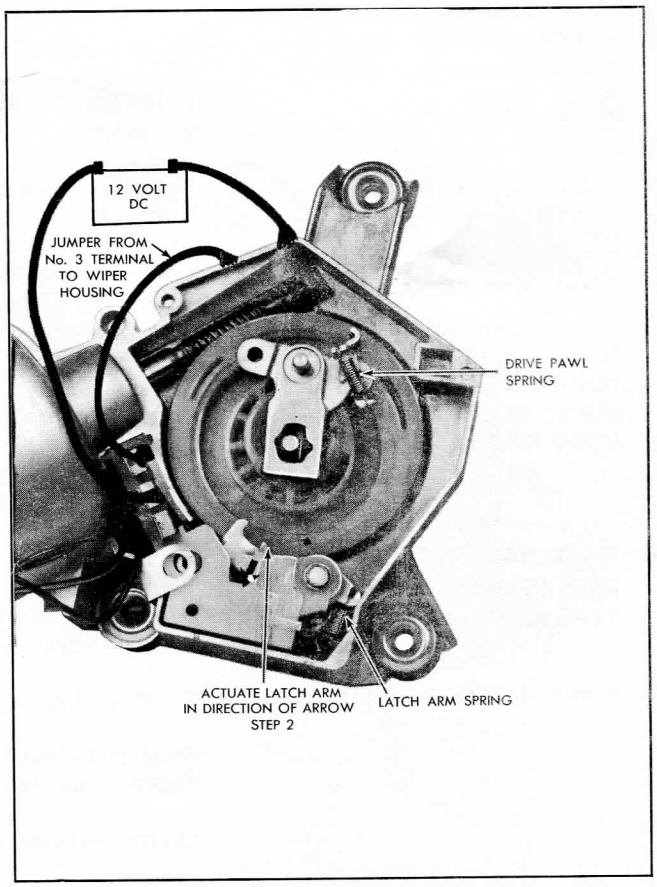

Fig. 12-39 Test Light Connections—Pontiac and Optional Tempest

INTERMITTENT OPERATION

Check for stocking brushes and loose splice joints.

TROUBLE DIAGNOSIS—WIPER DETACHED—PONTIAC

PRELIMINARY TEST

1. Try operating wiper as shown in (Fig. 12-41).

Check if wiper has LO and HI speeds and shuts off correctly.

2. Refer to Trouble Chart - Wiper detached and match up trouble found in step 1, with one of typical troubles shown in chart. Trouble chart indicates possible causes for each trouble and procedure to use to locate cause.

LO Speed - As shown (terminals 1 and 3 connected to ground).

HI Speed - Disconnect jumper from terminal No. 3 (terminal No. 1 remains connected to ground).

Park or Shut Off - Reconnect jumper to terminal No. 3 but disconnect it from No. 1 terminal. (Wiper gear mechanism should stop in position shown in Fig. 12-39 or 12-40.)

CONDITION	CAUSE	CHECKING PROCEDURE
1. WIPER INOPERATIVE (MOTOR DOESN'T RUN)	Open relay coil	A
	Circuit breaker open	
	Open armature	
	Motor series field open	
	Brushes sticking	
	Defective solder joints-relay switch	
	Binding condition-relay latch arm	
2. WIPER WILL NOT SHUT OFF (CRANK ARM ROTATES THRU 360°)	Relay coil-grounded	B
	Relay lead to terminal board grounded.	
	Relay latch spring disconnected or broken	
	Latch arm binding	
3. WIPER WILL NOT SHUT OFF (CRANK ARM MOVES BACK-FORTH IN A HORIZONTAL PLANE ACCOMPANIED BY A LOUD KLUNK)	Relay switch contacts shorting together	C
	Drive pawl spring disconnected	
	Wiper has one speed fast caused by open shunt field	
4. WIPER HAS ONE SPEED FAST (THIS USUALLY RESULTS IN TYPICAL TROUBLE 3)	Shunt field open	C
	Defective soldering at terminal No. 3 on wiper terminal board	
5. WIPER HAS ONE SPEED SLOW	Shunt field internally grounded	D
	Shunt field lead to terminal board (black) grounded	
	Shorted armature	
6. WIPER HAS EXCESSIVE SPEED IN HI; LO SPEED NORMAL	Open speed resistor	E
	Poor resistor ground connection	

CONDITION	CAUSE	CHECKING PROCEDURE
7. WIPER STOPS AT RANDOM (CRANK ARM STOPS ROTATING IMMEDIATELY AND DOES NOT RETURN TO FULL PARK POSITION)	Relay switch contacts dirty or broken	Replace relay switch assembly
8. INTERMITTENT OPERATION	Defective circuit breaker (weak)	F
	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	Armature end play tight	See wiper adjustment
	Gear assembly end play tight	
	Loose solder or weld joints	

CHECKING PROCEDURES—PONTIAC

PROCEDURE A (WIPER INOPERATIVE)

1. Remove washer pump to gain access to relay-switch assembly.

2. Connect 12 volt power source to wiper - hot side to center terminal, ground side to gear housing (Fig. 12-39). Do not connect jumper to terminal No. 1 and 3.

3. To determine if wiper circuit to relay switch is o.k., connect test light to relay switch terminal as shown in Fig. 12-39 step 3.

a. Test Lamp Lights-Circuit from terminal No. 2 to relay-switch o.k.

b. Test Lamp Doesn't Light-solder connections at terminal board or relay switch defective.

4. To determine if relay coil is open connect test lamp to wiper terminal No. 1, Fig. 12-39 step 4. If lamp doesn't light, coil is open or solder connection to No. 1 terminal is defective.

5. Test relay switch as follows: If gear mechanism is in full park position (Fig. 12-39) use small screw driver in switch slot and push latch arm down toward relay coil (Fig. 12-39 step 5). Next, remove small amount of insulation from black lead with pink tracer and touch test lamp to exposed wire.

a. Test lamp lights but motor doesn't run. Proceed to step 6.

b. Test lamp doesn't light. Relay-switch defective.

NOTE: Cover exposed wire with tape after test.

6. Disassemble motor section and check following:

a. Stuck brush.

b. Solder connections at brush holders.

c. Splice joints at field coil connections to leads.

d. Open armature.

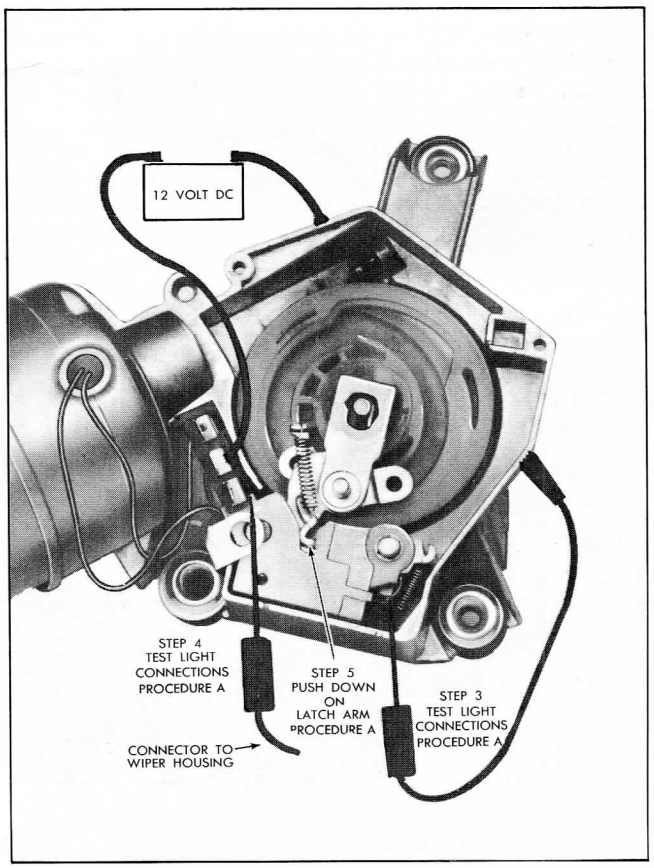

Fig. 12-40 Jumper Wiring for Bench Check—Pontiac and Optional Tempest

e. Series field ground connection on field lamina.

PROCEDURE B (WIPER WILL NOT SHUT OFF—CRANK ARM ROTATES THRU 360°)

1. Observe if relay latch arm spring is connected properly (Fig. 12-40).

2. Manually operate latch arm to check it for possible binding condition.

3. If items in 1 and 2 check out, connect power source to wiper and connect jumper wire from terminal No. 3 to wiper housing (Fig. 12-40). Do not make any connections from terminal No. 1. Manually actuate latch arm in direction of arrow (Fig. 12-40) 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 lead from coil to terminal No. 1. If red lead is not grounded, coil is probably grounded internally and relay switch should be replaced.

4. Check that drive pawl engages properly with relay latch arm (Fig. 12-24).

PROCEDURE C (WIPER WILL NOT SHUT OFF—RECYCLES)

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

1. Check that drive pawl and relay latch arm springs are properly connected (Fig. 12-40).

2. Check wiper for LO speed operation (Fig. 12-41). If wiper has HI speed only, check the following items:

a. Solder joint at No. 3 wiper terminal.

b. Splice joint - black lead with pink stripe to field coil leads.

c. Splice joint - black lead to field coil.

3. Check relay switch as follows:

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

b. Connect power source and jumper to wiper as shown in Fig. 12-40 and observe if test light goes out once for each revolution of gear or if light glows steadily. If light glows steadily, 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.

PROCEDURE D (WIPER HAS ONE SPEED SLOW)

1. Check for grounded condition in internal black lead that connects to wiper terminal No. 3. Refer to Fig. 12-41 for terminal No. 3 location.

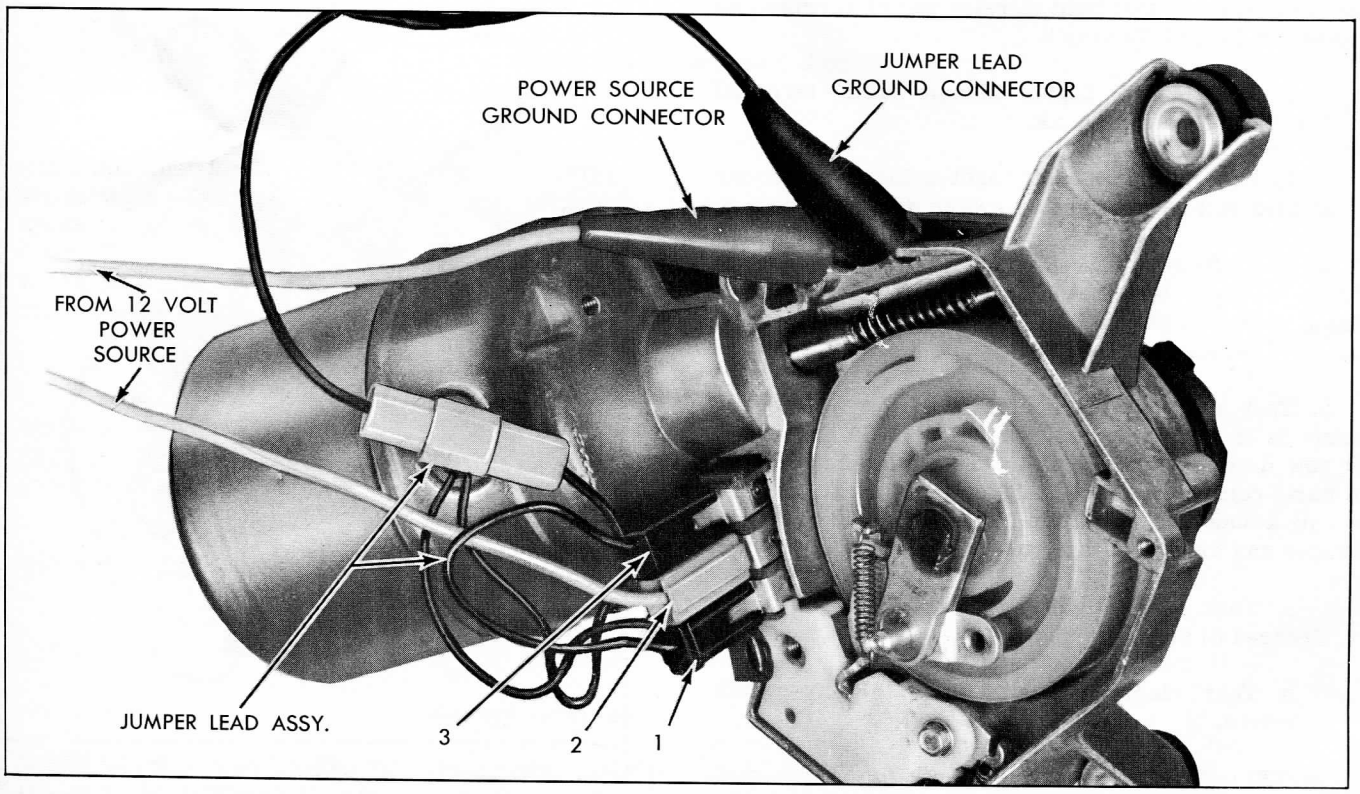

Fig. 12-41 Test Connections—Pontiac and Optional Tempest

2. Disassemble motor section of wiper and check for grounded field coil.

IMPORTANT: Occasionally field coils are loose on poles allowing them to slide into a position where they short on corners of poles. Center coils on poles and wedge them in a fixed position.

PROCEDURE E (WIPER HAS EXCESSIVE SPEED IN HI BUT LO SPEED NORMAL)

Crank arm rpm exceeds 70 at 12 volts.

1. Check for open resistor or the resistor ground connection.

PROCEDURE F (INTERMITTENT OPERATION)

1. Check solder connections at wiper terminal board.

2. Connect wiper to operate in LO speed (Fig. 12-41). Connect ammeter (Range 0 - 30 amps.) in feed wire circuit to wiper and observe current draw. Allow motor to run until it becomes hot.

a. 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.

b. If current draw exceeds 5 amps. proceed to steps 3, 4 and 5.

3. Adjust armature end-play as required and recheck current draw.

4. Adjust gear end-play as required and recheck current draw.

5. If adjustments in steps 3 and 4 fail to correct excessive current draw conditions, disassemble motor section of wiper and check armature on growler for shorted or grounded condition.

WIPER SPECIFICATIONS

Operating Voltage Pontiac	12-14 VDC
Operating Volts Tempest	12 VDC
Crank Arm Rotation (looking at Crank Arm)	Counterclockwise
Crank Arm Speed (rpms) (No Load):	
LO	40 Min.
HI	70 Min.
Current Draw - Pontiac	
Bench Check (No Load)	3.1-4.5 Amps.
Installed in Car	3.5-5.0 Amps.
Current Draw-Amps.: Tempest	
No Load (LO Speed)	4.5 Max.
Installed in Car—(Dry Glass)	5.0 Max.
Stall	12 Max.

WINDSHIELD WASHER PUMP

DESCRIPTION—PONTIAC AND TEMPEST OPTIONAL EQUIPMENT

The windshield washer pump is equipped with a four-lobe rotor cam. It consists of a relay, pump assembly, valve assembly and related parts assembled in a casting which attaches directly to the wiper gear box.

OPERATION—PONTIAC AND TEMPEST OPTIONAL

When the washer pump assembly (Fig. 12-42) is mounted on wiper correctly, a pin on the drive plate fits into the slot of washer rotor cam.

Thus when the wiper is operated this rotor cam is always turning with wiper gear.

WIPER ON—WASHER OFF

As the rotor cam rotates, it actuates a spring-loaded lever and pin assembly to which a ratchet arm is attached.

Note that a tang on the piston actuator plate is resting against a ramp on the lower surface of the ratchet wheel. This, in effect, holds the piston actuator plate in a lock-out position. With actuator plate in this position and the wiper running, the cam-follower merely moves back and forth in the elongated slot of the piston actuator plate and no pumping action can occur (Fig. 12-43).

The ratchet wheel, which, if rotated, would move the ramp away from the tang of the actuator plate releasing the pump action, is prevented from rotating

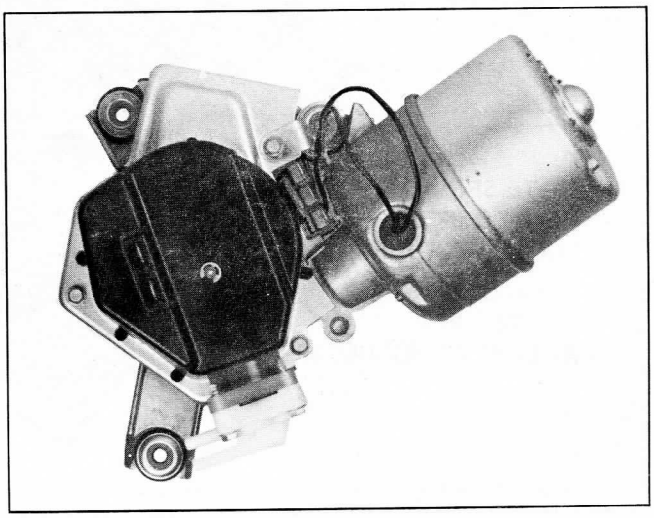

Fig. 12-42 Washer Pump—Pontiac and Optional Tempest