

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

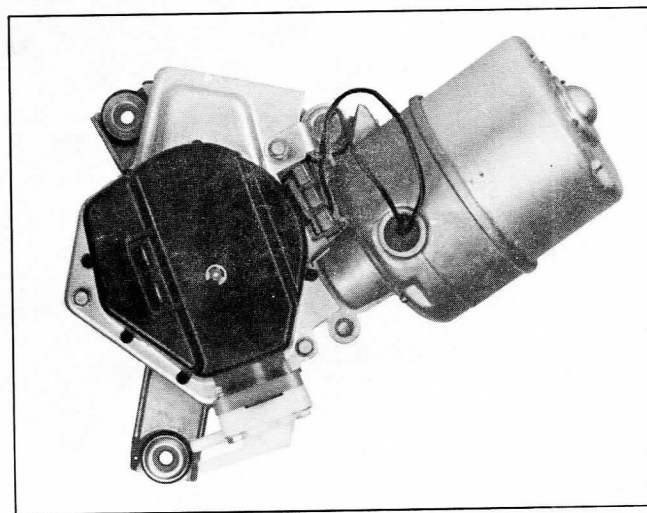


Fig. 12-42 Washer Pump—Pontiac and Optional Tempest

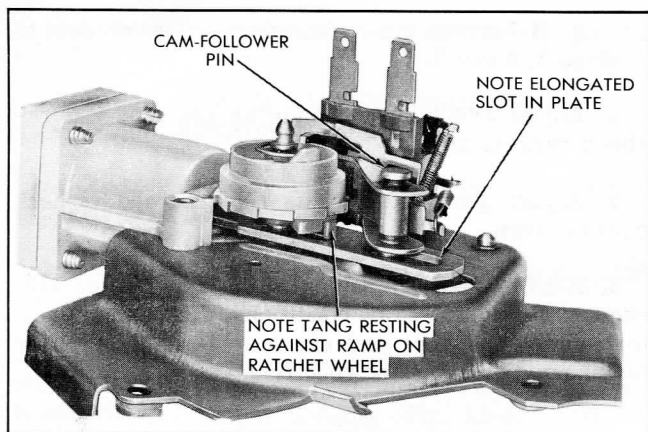


Fig. 12-43 Washer in Park Position—Pontiac and Optional Tempest

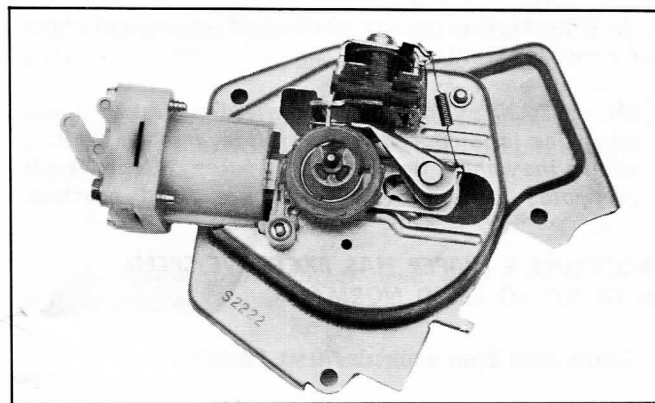


Fig. 12-45 Pump Running—Pontiac and Optional Tempest

as follows: The relay assembly, consisting of a coil and armature, is constructed in such a way that the ratchet wheel pawl extends through an opening in the relay armature (Fig. 12-44), preventing it from engaging the ratchet wheel teeth.

#### WIPER ON—WASHER ON

When the washer button on dash is pushed in to start washer, the circuit to washer pump relay coil is closed to ground. This energizes the relay coil which pulls in the relay armature.

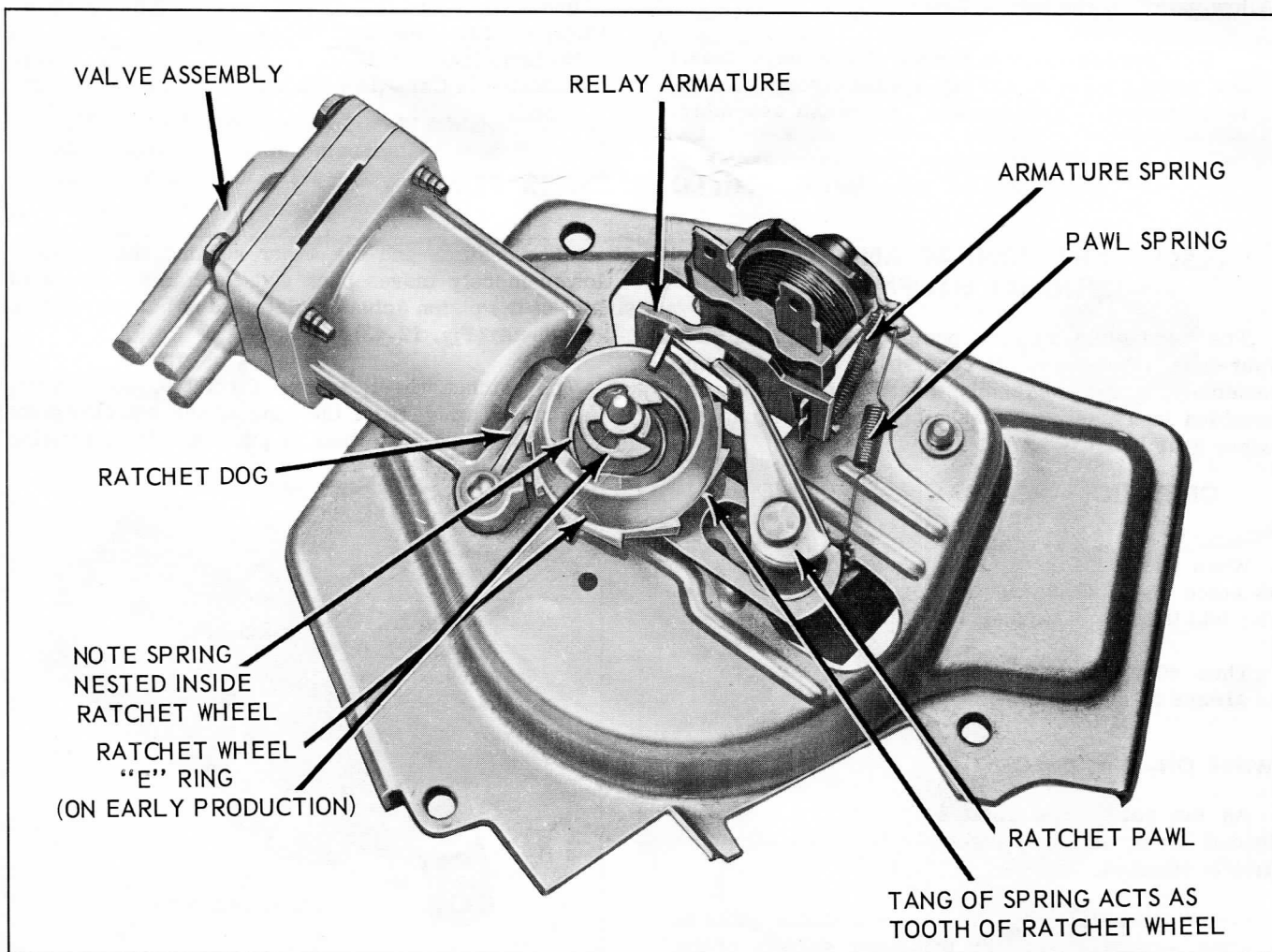


Fig. 12-44 Washer Pump Assembly—Pontiac and Optional Tempest

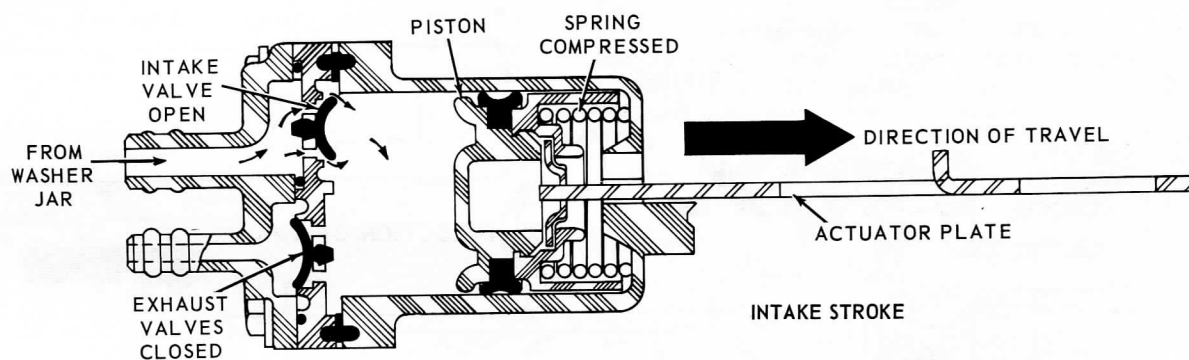
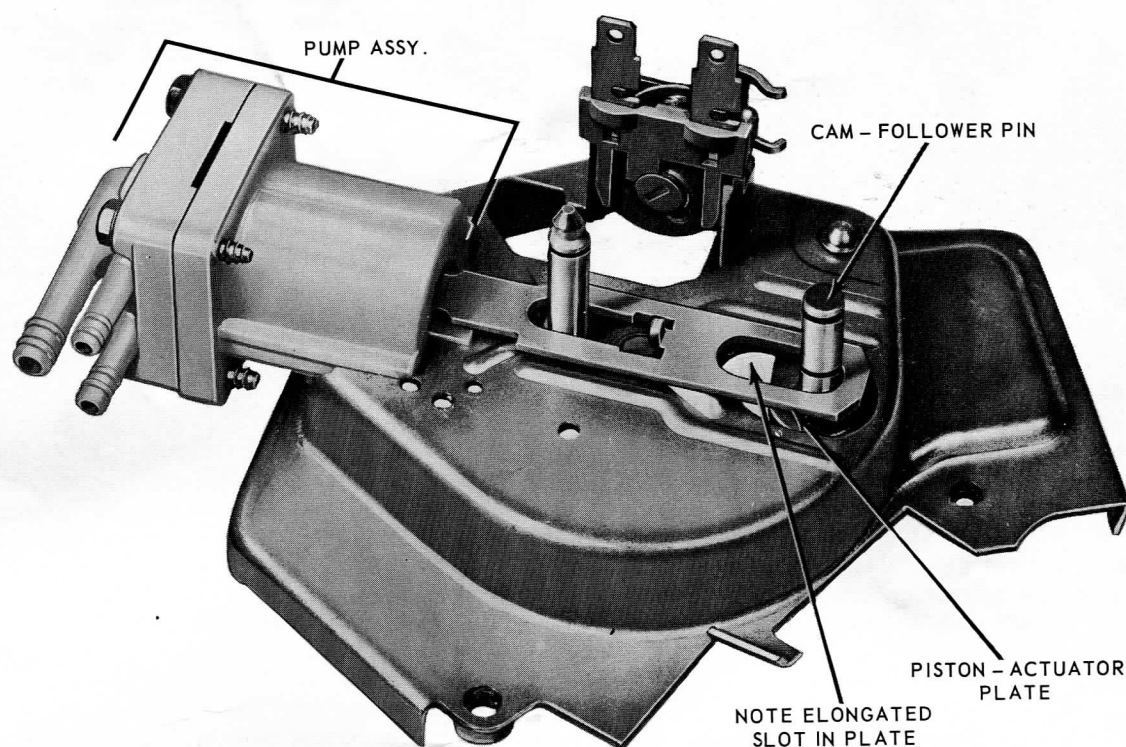


Fig. 12-46 Intake Stroke—Pontiac and Optional Tempest

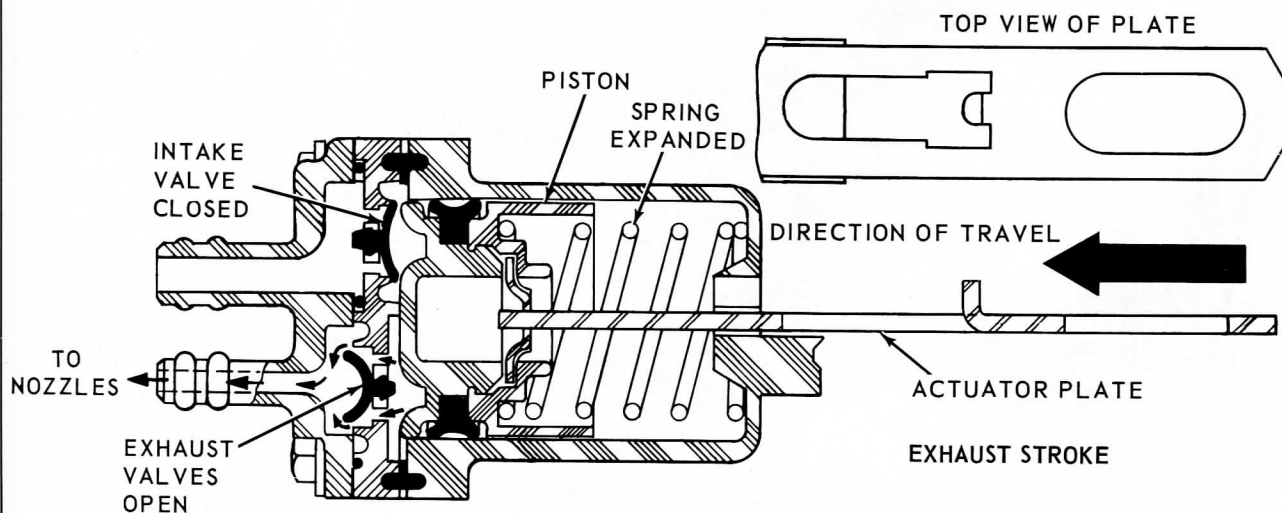
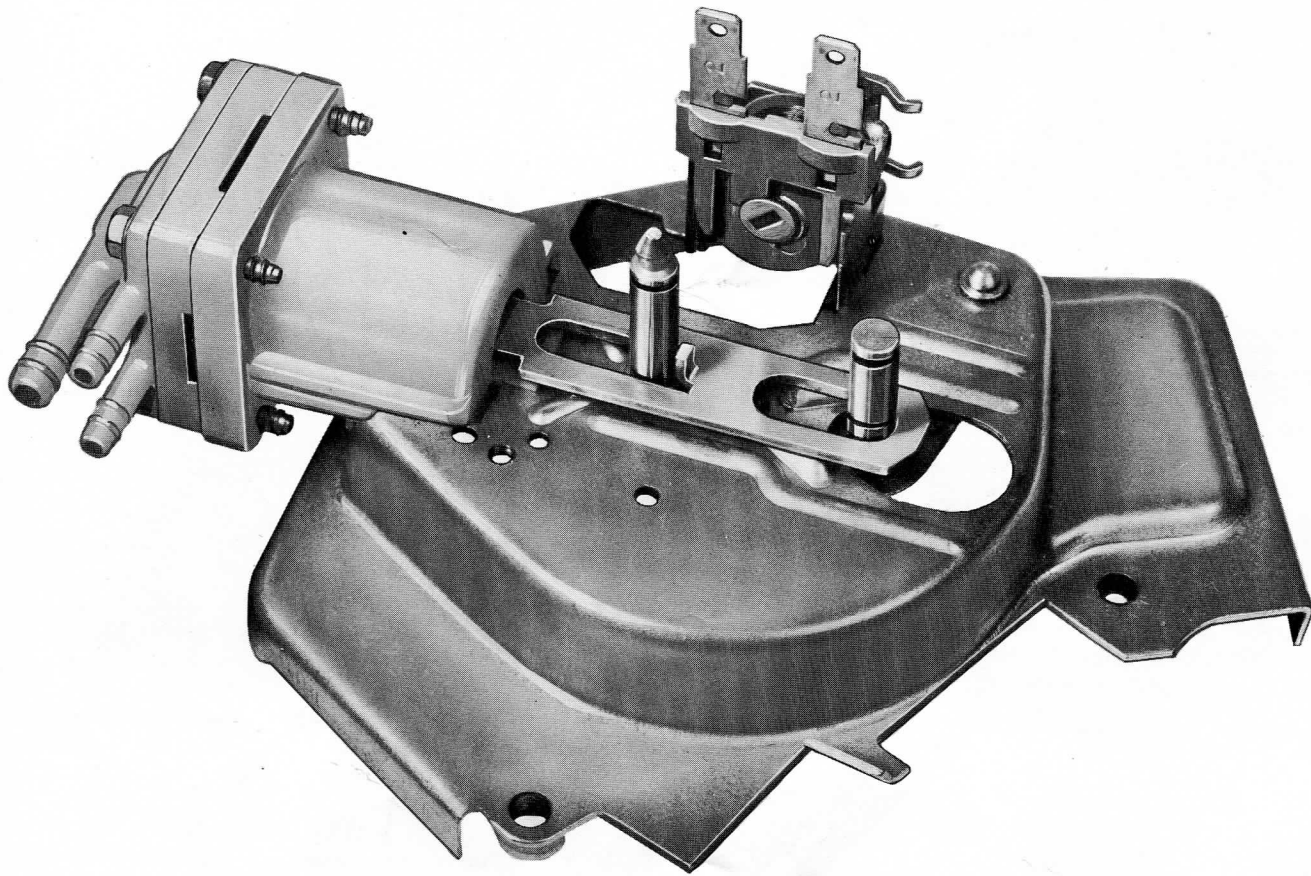


Fig. 12-47 Exhaust Stroke—Pontiac and Optional Tempest



When relay is energized, the relay armature is pulled suddenly toward the coil, allowing the ratchet wheel pawl to drop out of the relay armature opening and engage the teeth of the ratchet wheel.

The ratchet wheel pawl, which is actuated by the same cam-follower pin that moves the piston actuating plate, begins to rotate the ratchet wheel. Rotating the ratchet wheel one tooth moves the ratchet wheel ramp away from the tang of the piston actuating plate permitting the piston spring to expand which in turn forces the piston toward the valve assembly resulting in the first exhaust stroke.

The intake and exhaust strokes are accomplished as follows. The actuator plate being spring loaded, moves in a direction toward the valve assembly creating pressure between the piston and valve assembly. This pressure "build up" forces the two exhaust valves open compelling the washer solution to flow to the nozzles. (Only one exhaust valve opening is shown in Fig. 12-47.) At the same time the tang on the actuator plate moves against the ratchet wheel pin ending the exhaust stroke. As the rotor cam continues to rotate, each lobe (4) actuates the cam follower pin which in turn pulls the actuator plate back compressing the piston spring. As the piston moves away from the valve assembly, a vacuum is created in the cylinder which opens the intake valve, drawing washer solution into the cylinder, Fig. 12-46.

Thus the intake and exhaust stroke cycle will occur four times for each revolution of the wiper drive gear while the washer pump is operating.

The wash cycle is terminated automatically by the programming action of the relay, ratchet pawl, ratchet wheel and ratchet wheel dog. The 10th cycle of the ratchet wheel (the wheel utilizes 12 teeth to rotate 360°) ends the pumping of the piston. On the 11th cycle the actuator plate is pulled back and the piston completes the last intake stroke. Concurrently the tang on the piston actuating plate comes to rest on the ramp on the lower side of the ratchet wheel.

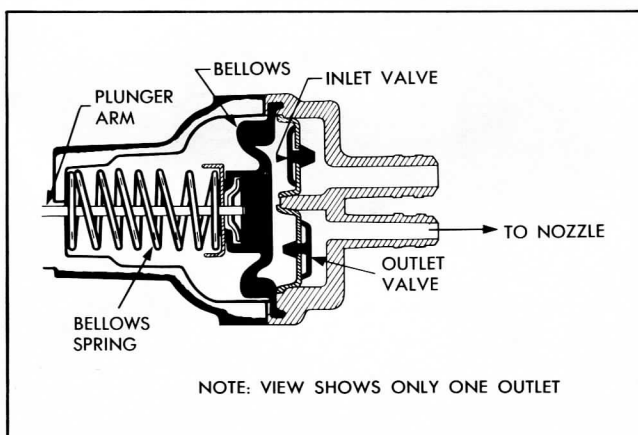


Fig. 12-48 Exhaust Stroke—Tempest and Firebird

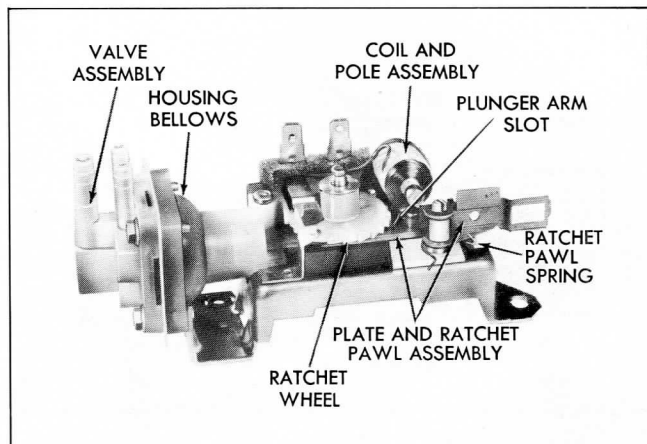


Fig. 12-49 Washer Pump Assembly—Tempest and Firebird

Note that the tooth for the 11th cycle is the spring located inside the ratchet wheel. This spring allows the actuator plate tang to position itself on the ramp without the possibility of binding against the side of the ramp.

On the 12th and final cycle the leg on the relay armature rides up a ramp located on the outer surface of the ratchet wheel. When the leg reaches the top of the ramp, it moves over the top edge of the ratchet wheel. This action allows the ratchet wheel pawl to re-enter the armature opening preventing further rotation of the ratchet wheel until the next time the relay coil is energized from the dash switch. Fig. 12-45 shows the position of armature leg while pump is idling.

### DESCRIPTION—TEMPEST AND FIREBIRD

The pump is a positive displacement type, employing a small bellows, bellows spring and valve arrangement. The pumping mechanism is actuated by a pin driven by wiper. The programming (starting and completion of a wash cycle) is accomplished electrically and mechanically by a relay assembly and ratchet wheel arrangement. (See Fig. 12-49.)

Explanation of pump operation follows:

#### WIPER ON—WASHER OFF

When the washer pump is mounted on the wiper correctly, a cam follower on the lower side of the pump engages with a 4-lobe cam (Fig. 12-51). The cam follower is part of a spring-loaded plate and ratchet pawl assembly. Thus, with wiper running, the cam follower actuates the plate and ratchet pawl assembly back and forth in a horizontal plane. Another pin, attached to upper side of plate and ratchet pawl assembly, extends through a slot in the bellows plunger arm. This pin moves freely back and forth in slot while the pumping mechanism is in "lock-out" position and no pumping action occurs.

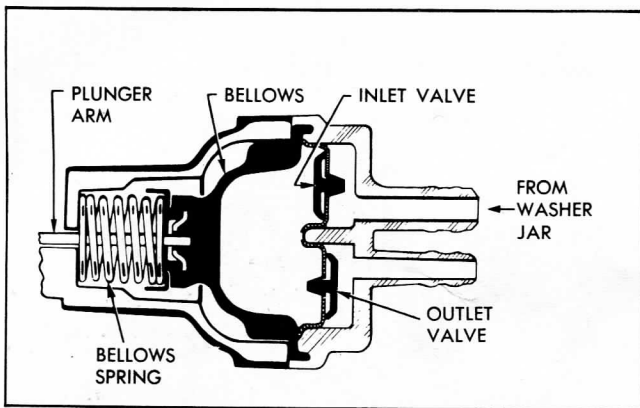


Fig. 12-50 Intake Stroke—Tempest and Firebird

The pump is in lock-out position when relay holding contacts are open and a tang on plunger arm rests against widest part of eccentric ramp located on lower surface of ratchet wheel (Fig. 12-51). The tang holds the bellows plunger arm in a retracted position (bellows spring compressed) allowing the plunger arm actuator pin on plate and ratchet pawl assembly (Fig. 12-56) to move freely back and forth in 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 coil is energized by the dash switch washer button.

#### TURNING THE WASHER ON

Depressing the dash switch washer button closes the washer pump relay circuit to ground. (Refer to Fig. 12-54).

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

With washer relay coil energized, the ratchet pawl, which is normally held away from 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 wiper is on, now starts to rotate ratchet wheel (Fig. 12-55).

When the ratchet wheel has been rotated one tooth, two simultaneous functions occur: (1) the eccentric ramp on ratchet wheel is moved away from plunger arm tang, releasing 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 ratchet wheel has been turned through 360° or 21 teeth at which time ratchet wheel ramp will again open contacts (Fig. 12-51).

#### PUMPING CYCLE

##### (EXHAUST HALF OF PUMP STROKE)

With pumping mechanism released from its "lock-out" position, the bellows spring expands and collapses the bellows forcing water out two outlet valves (Fig. 12-48). The plunger arm, which is attached to bellows, is pulled forward with bellows and back edge of plunger arm slot moves up tight against plunger arm actuator pin. (Refer to Fig. 12-49 to identify plunger arm slot and 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 the pin actuates the plate and ratchet pawl assembly.

##### (INTAKE HALF OF PUMP STROKE)

Pulling the plunger arm back compresses the bellows spring (Fig. 12-50) 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.

#### COMPLETION OF WASH CYCLE

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

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

2. As the ratchet wheel rotates the tang on bellows plunger arm starts to ride up eccentric ramp on the

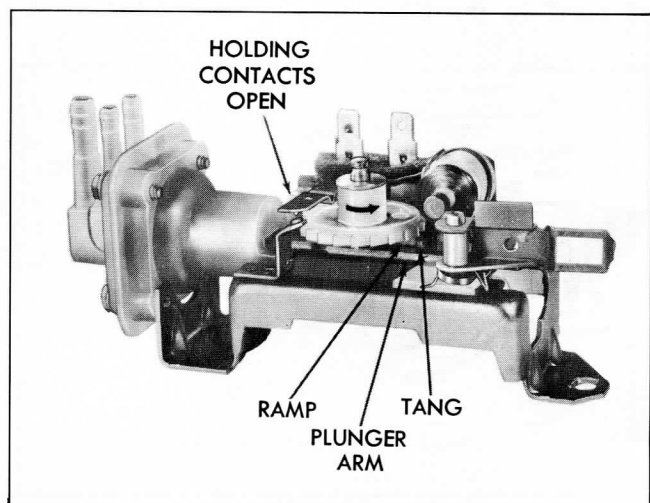


Fig. 12-51 Washer Pump—Tempest and Firebird

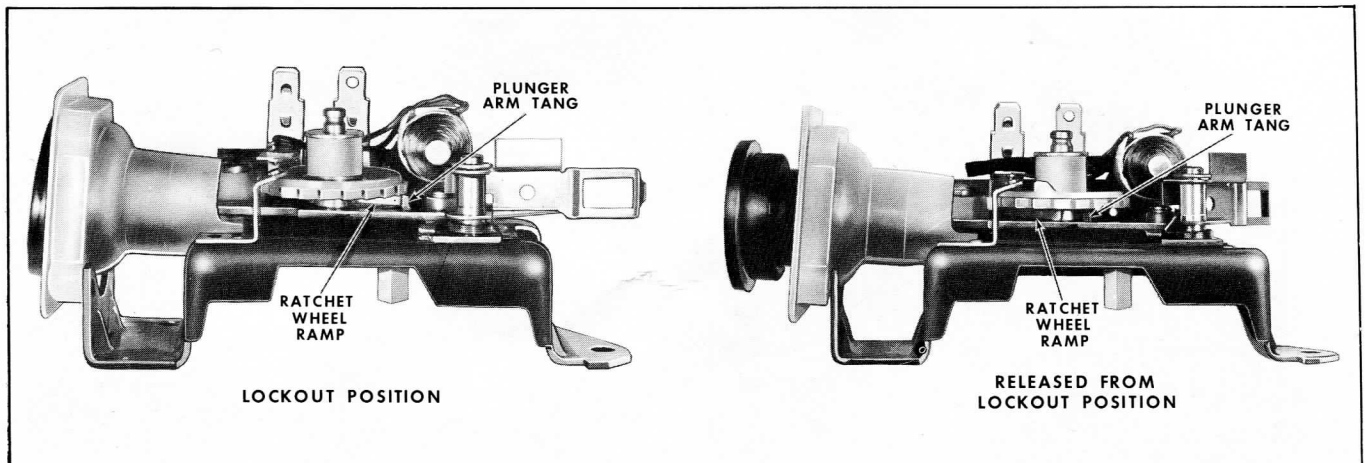


Fig. 12-52 Pump in "Lock-Out" Position—Tempest and Firebird

lower surface of the ratchet wheel. The full "lock-out" position of pumping mechanism is reached when the tang is up on widest part of ramp (Fig. 12-51). The tang reaches the "lock-out" position at the same time relay coil holding contacts open (Fig. 12-52).

### CHECKING PROCEDURES

#### CHECKING THE WASHER PUMP ON THE CAR

##### WASHER PUMP INOPERATIVE

1. Check the following items:
  - a. Jar has adequate quantity of water solution.
  - b. Hoses are not damaged and hose connections are tight.
  - c. Screen at end of jar cover hose is not plugged.
  - d. Electrical connections to washer pump and dash switch.

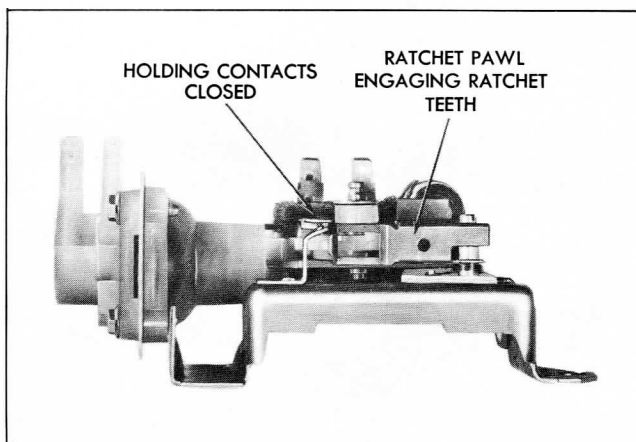


Fig. 12-53 Pump Contacts and Ratchet Pawl—Tempest and Firebird

e. Nozzles are not plugged.

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

3. Pontiac models - If correct voltage reading was obtained in step 2, start wiper first, then connect 12 volt supply to one wiper terminal and ground other. If washer relay "click" is heard, an inoperative dash switch is indicated.

4. Tempest models - If correct voltage was found in Step No. 2, connect a jumper wire from terminal No. 1 to ground (Fig. 12-54) 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.

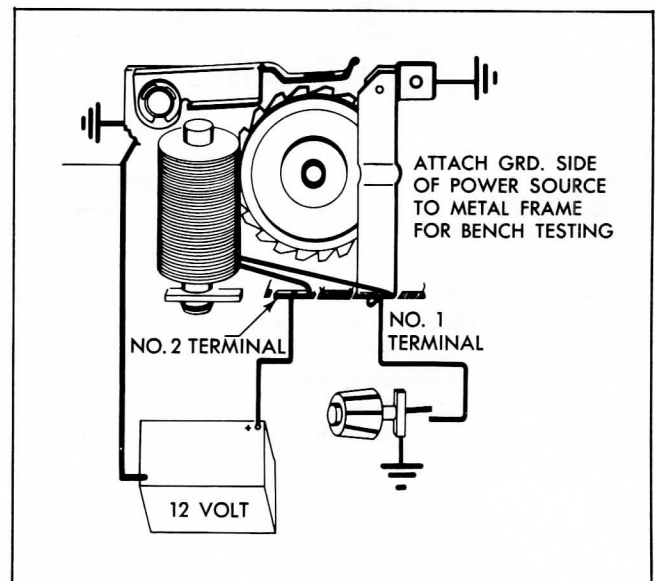


Fig. 12-54 Pump Wiring Circuit—Tempest and Firebird



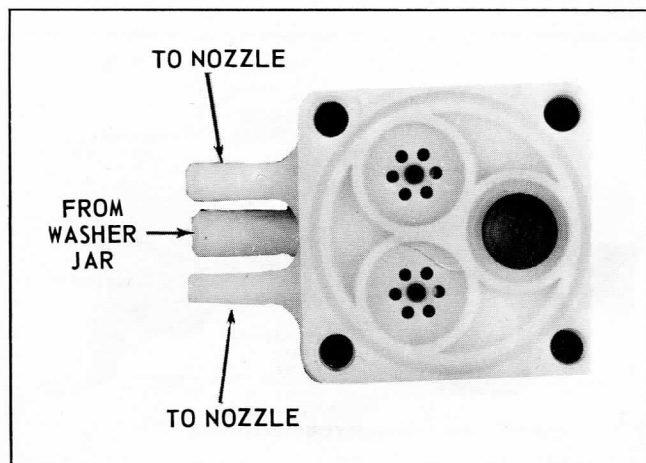


Fig. 12-55 Valve Assembly

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

6. If relay "click" is heard in step 2, 3 or 4 listen for the soft clicking as the pump ratchet wheel is rotated. If "soft clicking" is not heard, the pump mechanism is faulty and should be removed from the wiper motor and checked.

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

#### WASHER PUMPS CONTINUOUSLY WHEN WASHER IS ON

1. Disconnect wiring from washer pump. If pump shuts off, trouble is located in wiring or switch.

2. If pump fails to shut off in step 1, remove pump assembly from car for further checking.

#### WASHER PUMP DETACHED—PONTIAC

1. Connect 12 volt supply to one washer terminal and ground other. Manually rotate rotor cam and observe if relay armature pulls in. Failure of relay to pull in indicates an open relay coil or poor solder connections.

2. If relay pulled in, in step 1, manually rotate rotor cam (counterclockwise looking at rotor) through complete cycle (ratchet wheel rotated through 360° or 12 teeth), carefully observing if performance matches that as explained under washer operation. Binds or any other type of malfunction can usually be located in this manner.

#### WASHER PUMP DETACHED—TEMPEST

##### CHECK PUMP OPERATION AS FOLLOWS

1. Remove washer pump cover and connect 12 volt

power supply to washer pump as shown in Fig. 12-54. Connect jumper wire from terminal No. 1 to ground. Turn ratchet pawl to the position shown in Fig. 12-54. 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 actuate plate and ratchet pawl assembly to turn ratchet wheel one tooth. Observe if relay holding contacts close (Fig. 12-53) and pump plunger arm is released from its lock-out position. (Fig. 12-51 shows plunger arm in 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, continue to manually actuate plate and ratchet pawl assembly until ratchet wheel has been turned through 360° or 21 teeth. After ratchet wheel has been rotated 21 teeth, holding contacts should be opened by a hump on wheel and pump plunger arm should be in lock-out position (Fig. 12-51).

#### CHECK VALVE ASSEMBLY AS FOLLOWS

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

2. Attach a hose individually to each of 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, valve is defective.

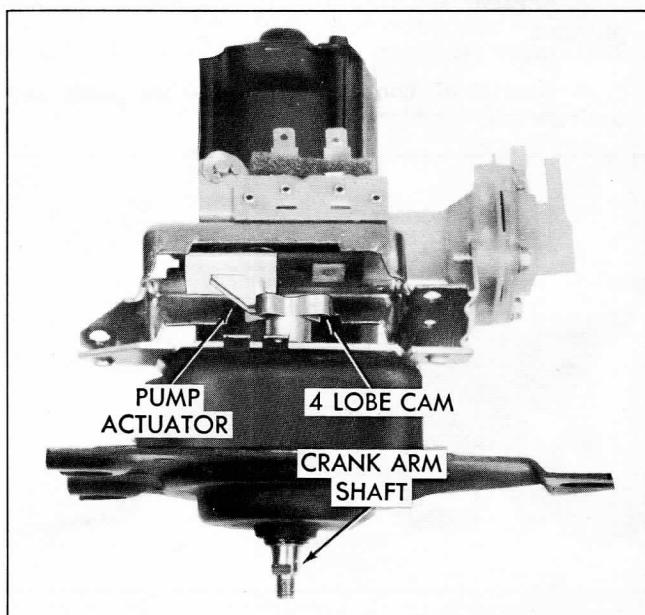


Fig. 12-56 Washer Pump Drive System—Tempest and Firebird