27
WINDSHIELD WIPERS AND WASHERS

WINDSHIELD WIPER OPERATION:

There are three major components to a wiper motor assembly, as used in a TR250 or a TR6: the motor, a rotary to linear motion converter mechanism, and a parking switch.

The motor is a 12 volt DC, 2 speed motor, rated at 14 watts. The motor in the TR 250 is an electromagnetic field type, while the motor in the TR6 is a permanent magnet type motor.

The mechanism to convert rotary motion to linear motion is very straight forward, and its functionality is apparent from a visual inspection of a disassembled motor assembly. **Photo 1** below shows this mechanism.

The parking switch in a TR6 is a simple SPST, momentary switch, operated by a cam on the wiper arm drive gear, and is also shown in **photos 2 & 3**, page 137. The TR250 used a metal plate mounted to the housing assembly, and a contact arm mounted on the drive gear. The contact arm makes contact with the metal plate, maintaining a ground connection to the motor, until the wiper arms are in the park position. See **photos 4 & 5**, page 137.

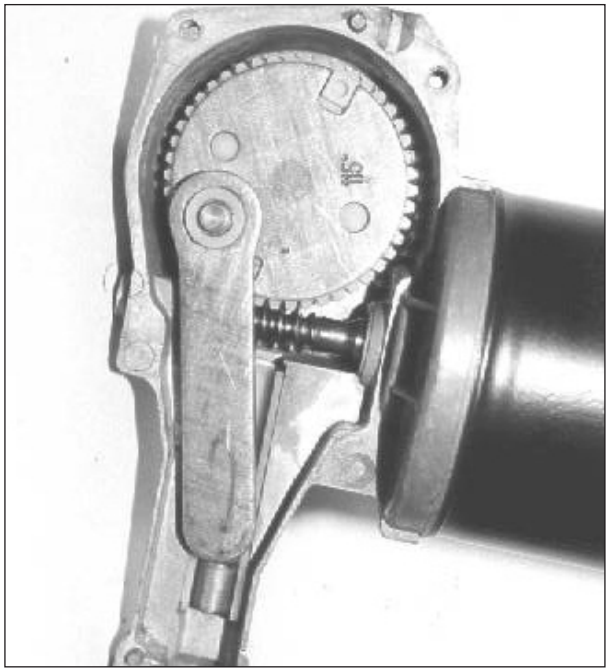


PHOTO 1

WIPER ELECTRICAL CIRCUITS:

TR250:

Power is applied to the wiper motor at all times when the ignition switch is on, and the motor is grounded by the operation of the dash switch. As soon as the wiper blades move to some position other than the park position, the parking switch inside the wiper applies ground to the motor. Thus, when the dash switch is turned off, the motor will continue to operate until the blades reach the park position, the ground is interrupted, and the motor stops

NORMAL OPERATION: Refer to **figure 1** below. With the dash switch in the low speed position, switch terminal "S" is connected to ground, the motor field windings are grounded, and the wipers are operating. The position of the insulated segment with respect to the park switch is immaterial, as the motor is already grounded by the dash switch; if the wipers are not in the park position, the park switch just provides an additional ground path. The current path in this condition is shown by the heavy lines. ***Note:*** the parking switch and insulating plate are not as drawn here. In actuality, the plate is fixed, and the switch contact rotates. It's easier to visualize when drawn this way in a two dimensional representation.

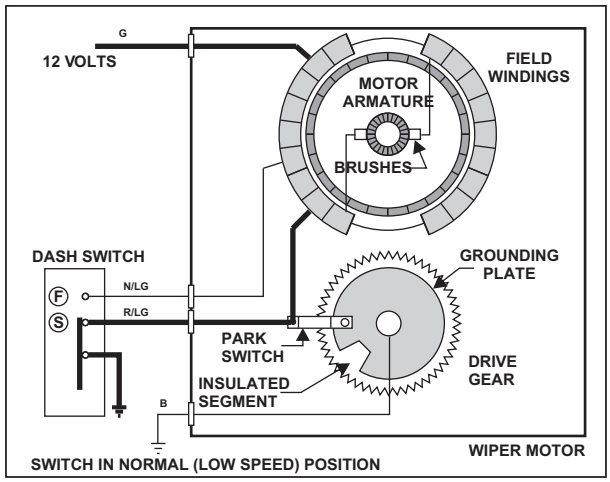


FIGURE 1

HIGH SPEED OPERATION: Refer to **figure 2**, next page. In this mode, both terminal "S" and terminal "F" of the dash switch have been shorted to ground. The wiper switch has actually shorted out a portion of the field winding, reducing the field strength. Though an

explanation of why is well beyond the scope of this manual, reducing the field strength actually increases the motor speed. While this seems totally contradictory to common sense, it is true.

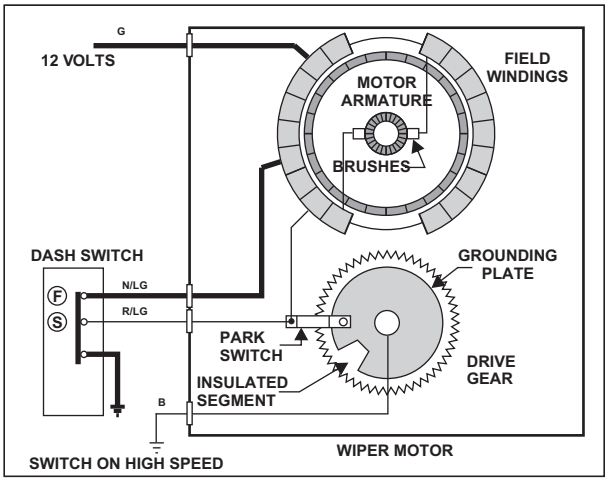


FIGURE 2

WIPERS OFF, BLADES NOT IN THE PARK POSITION: Refer to **figure 3** below. With the dash switch off, the ground path is through the park switch. As long as the wipers are not parked, the motor will continue to run, as if in the low speed position. The current path in this condition is shown by the heavy lines.

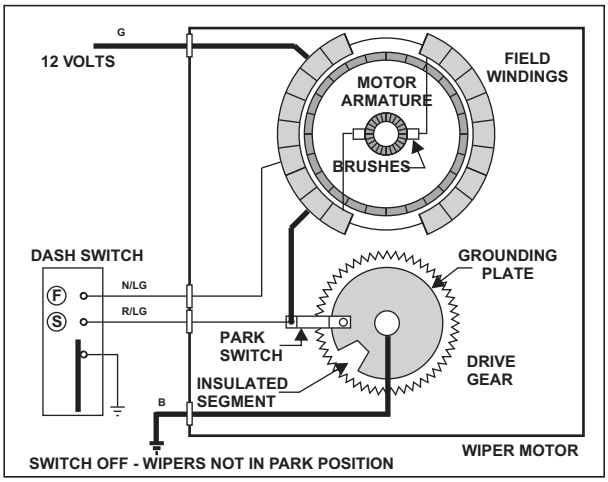


FIGURE 3

WIPER SWITCH OFF, WIPERS IN PARK POSITION. Refer to **figure 4**, top right. With the dash switch off, and the park switch open, there is no ground path for the motor. When the park switch opens, the blade motion stops and the wipers are parked.

TR6:

NORMAL OPERATION: Refer to **figure 5**, right. This diagram is for an early TR6, but the principles are the same for the later models, only the physical configuration of the switch has changed (see **figure 15**). In this mode of operation, the dash switch is in the normal, or low speed, position, and internally, terminal 2 of the switch is connected to terminal 3. Current flows through the motor as shown by the heavy line. The operation of the parking switch has no effect in this mode, as terminal 4 of the dash switch is not connected to any other terminal.

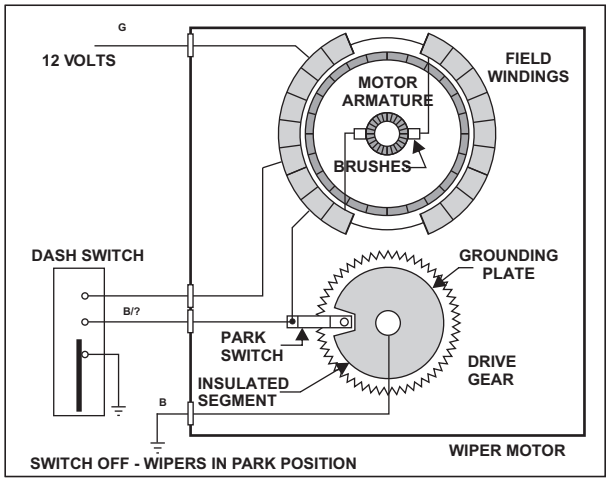


FIGURE 4

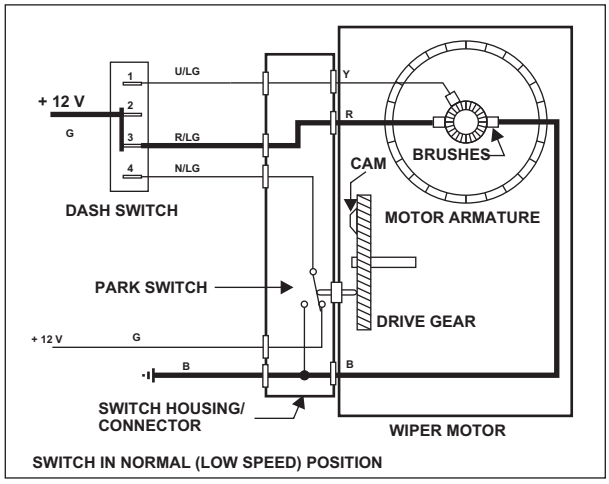


FIGURE 5

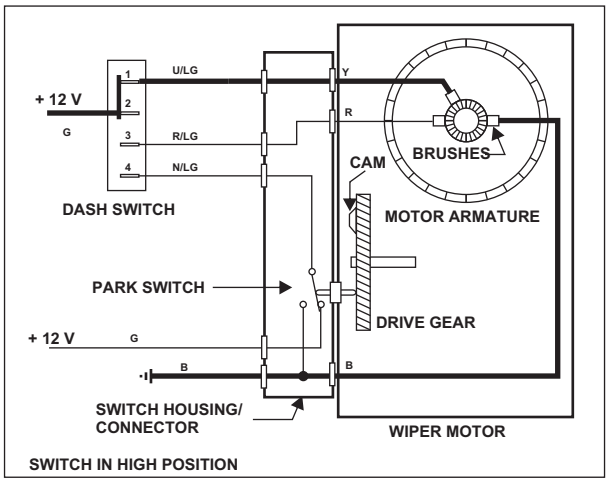


FIGURE 6

B). HIGH SPEED OPERATION: Refer to **figure 6**. In this mode, the dash switch is in the high speed position, and current flow is as shown. This is basically the same configuration as the normal mode, except the power flows through the high speed brush rather than the normal speed brush. Internally, terminal 2 of the dash switch is connected to terminal 1.

C) WIPERS OFF, BLADES NOT IN THE PARKED POSITION: Refer to **figure 7**. With the dash switch off, power is supplied to the motor through the contacts of the parking switch, and the motor continues to operate. Until the drive gear rotates to the point where the cam operates the switch plunger, the motor will operate at the normal, or low speed, just as if the dash switch were still on.

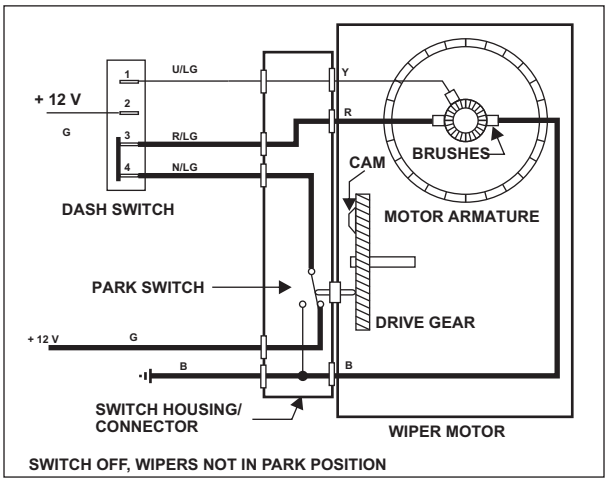


FIGURE 7

D) WIPERS OFF, BLADES IN THE PARKED POSITION: Refer to **figure 8**. When the drive gear has rotated to the point that the blades are in their parked position, the cam button on the drive gear depresses the parking switch plunger, operating the switch. Now, rather than the 12 volts as before, ground is applied to the low speed brush, shorting out the armature windings.

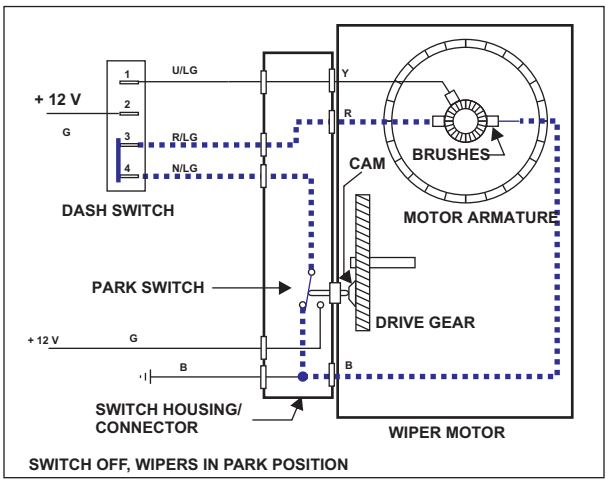


FIGURE 8

The magnetic field that had built up in the windings when 12 volts was applied will now discharge through the switch contacts, in very much the same manner as the operation of the primary windings in the ignition coil.

This discharge current, shown as a heavy dotted line, will be in the opposite direction as the normal current flow, and will tend to reverse the rotation of the motor. Because the windings are now short-circuited, the discharge takes place very quickly, and the reversing energy lasts just long enough to stop the motor. The energy in the discharge is such that the motor will stop immediately! In fact, if you are holding the motor while testing this operation, hold on tight, because it stops so quickly that it will jump out off your hand if you are not careful.

TROUBLE SHOOTING:

TR250:

A) WIPERS DON'T WORK AT ALL:

Step 1) Verify that the problem is electrical, and not mechanical - binding in the wiper wheel boxes, etc., before proceeding with the electrical tests. This may be difficult to do, but, if it is a mechanical problem, you may be able to notice a slight movement, or feel a slight jerk, of the motor and/or the wiper mechanism as the motor tries to operate.

If it is determined to be an electrical problem, the next step is to determine if there is power at the “green” fuse. The windshield wiper receives power from the this fuse, along with the windshield washer, turn signals, gauges, back up lights, brake lights, and heater fan, so if ***ANY*** of these items work, then you have power at the fuse. If ***NONE*** of these items work, then you need to go to the power distribution chapter and resolve the power issue before proceeding. If you have power, then you can proceed with the troubleshooting steps.

Step 2) With the ignition key on, use your voltmeter or a test lamp to check for voltage on the green wire at the wiper motor. If you have voltage, proceed to Step 2. If not, there is a break or a bad connection in the green wire between the wiper motor and the fuse box, which will need to be repaired.

Step 3). With the ignition key still on, use a short piece of wire to ground the red/light green wire at the wiper motor. If the wiper motor operates, go to Step 4. If not, the wiper motor is defective, and you will need to repair or replace it.

Step 4). Locate the R/LG wire at the back of the dash switch for the wipers. Using a short piece of wire, and with the ignition key still on, ground this wire to a good ground point. If the wipers work, the dash switch is defective, or there is a break or bad connection in the black grounding wire to the switch. Go to step 5 . If not,

there is a break or a bad connection in the R/LG wire between the switch and the motor, which must be repaired.

B).WIPERS WORK ON ONE SPEED ONLY:

Step 1). With the ignition key on, use a short piece of wire to connect the appropriate from the wiper motor to a good ground. If only the low speed works, ground the terminal with the N/LG wire. If only the high speed works, ground the R/LG wire. If the motor doesn't work in the proper speed when the terminal is grounded, the wiper motor is defective, and will need to be repaired or replaced. If it does work, go to Step 2.

Step 2). Locate the appropriate wire at the back of the dash switch for the wipers - N/LG if for a high speed problem, R/LG for low speed. With the ignition key on, connect this wire to a good ground. If the wiper motor now operates properly, the dash switch is defective, and must be replaced or repaired. If not, there is a break in the wire between the switch and the wiper motor.

C) WIPERS WORK, BUT WON'T PARK:

Step 1). Using a short test lead with alligator clips on each end, connect the wiper motor ground terminal (with the black wire) to a good ground point, and operate the wipers. If the wipers now park the ground connection is faulty, and must be repaired. If not, the parking switch assembly inside the wiper motor is bad, and must be repaired or replaced.

TR6:

A) WIPERS DON'T WORK AT ALL:

Step 1) Verify that the problem is electrical, and not mechanical - binding in the wiper wheel boxes, etc., before proceeding with the electrical tests. This may be difficult to do, but, if it is a mechanical problem, you may be able to notice a slight movement, or feel a slight jerk, of the motor and/or the wiper mechanism as the motor tries to operate.

If it is determined to be an electrical problem, the next step is to determine if there is power at the "green" fuse. The windshield wiper receives power from the this fuse, along with the windshield washer, turn signals, gauges, back up lights, brake lights, and heater fan, so if ***ANY*** of these items work, then you have power at the fuse. If ***NONE*** of these items work, then you need to go to the power distribution chapter and resolve the power issue before proceeding. If you have power, then you can proceed with the troubleshooting steps.

Step 2). With the ignition key on, use your voltmeter or test lamp to determine if there is power available on the green wire at the back of the wiper switch on the dash. If you have power, proceed to step 3. If not, there is a break or a bad connection in the green wire between the wiper switch and the fuse box, which must be repaired.

Step 3). With the ignition key still on, operate the wiper switch to the low speed position, and check for power on the red/light green wire at the back of the switch. If you have power here, proceed to step 4. If not, the wiper switch is bad, and must be repaired or replaced.

Step 4). Remove the plug from the wiper motor. With the ignition key on, turn the wiper switch to the normal position, and check that 12 volts is present at the plug terminal with the R/LG wire. If you have power here, proceed to step 5. If not, there is a break or a bad connection in the R/LG wire between the dash switch and the wiper plug, which must be repaired.

Step 5). With the plug still off the wiper motor, check for ground continuity on the black wire. If you are using a voltmeter, wedge the positive voltmeter lead between the positive battery post and the cable clamp, and touch the tip of the negative lead to the black wire in the plug, if there is ground continuity, you will read battery voltage on the meter. If you are using a test lamp, fasten the alligator clip on the test lead to the positive battery post, and touch the tip of the lamp to the black wire in the plug. If the ground connection is satisfactory, the lamp will light.

If the ground connection proves to be good, then your wiper motor will have to be repaired or replaced. If the ground connection is faulty, there is a break or bad connection in the black wire somewhere that will need to be repaired.

B) WIPERS WORK ON ONE SPEED ONLY:

Step 1). Remove the electrical plug from the wiper motor, turn the ignition key on, and turn the wiper switch to the speed position for the speed that is not working. Using a voltmeter or a test lamp, check for voltage on the appropriate wire in the plug -- R/LG for low speed, U/LG for high speed. If you have voltage here, the problem is inside the wiper motor, which will need to be repaired or replaced. If not, go to step 2.

Step 2). Replace the wiper plug, keep the ignition key on, and the wiper switch in the position for the non-working speed. Locate the appropriate wire at the back of the wiper switch, and check for the presence of voltage on this wire. If you have voltage, there is a break or a bad connection in this wire, between the switch and the wiper plug. If not, the switch is bad.

C) WIPERS WORK, BUT WON'T PARK:

Step 1). Remove the electrical plug from the wiper motor and turn the ignition key on. Using a voltmeter or a test lamp, check for presence of voltage on the green wire. If you have voltage here, proceed to step 2. If not, there is a

break or a bad connection in the green wire circuit between the wiper motor and the fuse, which will need to be repaired.

Step 2) Replace the plug and turn the dash switch to either the normal or the high-speed position. Using a voltmeter or a test lamp, check for voltage on the brown/light green wire. Voltage should be present at all times EXCEPT when the wiper blades are in their normal park position. That is, the voltage should turn off as the blades pass through the park position, and turn back on again as the blades leave the park position. There should be a long on, followed be a short off, long on, short off, etc. It may be difficult to measure the voltage on this wire. You may need to use a fine needle to pierce the insulation, and check the voltage at the needle. If you have the on-off voltage on this wire, proceed to step 3. If not, the park switch is not operating properly and will need to be replaced, or the grease has hardened inside the motor, not allowing the plunger to release as it should. You may be able to repair this switch, but it will be a lot more difficult than the other switches. If it's a plunger problem, cleaning is quite simple. All of the old grease should be removed from the gear housing and replaced.

Step 3). Locate the N/LG wire at the dash switch for the wipers, and repeat the tests in step 2. You should see the same on-off voltage action here as well. If not, there is a break in the N/LG wire between the wiper motor and the switch. If you do have the correct voltage here, the dash switch is bad, and will need to be repaired or replaced.

WIPER MOTOR REPAIR:

If the above tests show that the wiper motor assembly is faulty, either the motor itself or the parking switch, repairs are often possible. There are three electrical components to consider - parking switch, brushes, and the armature.

PARKING SWITCH: New parking switches for the TR6 are readily available at a reasonable price. This switch is a sealed unit, and would be quite difficult to get apart to repair, so a replacement would be the best choice here. To remove the switch, slide it away from the motor to release the clip, shown in **photo 2** below, or, remove the two securing screws as shown in **photo 3,** top right, depending on how your particular model is made.

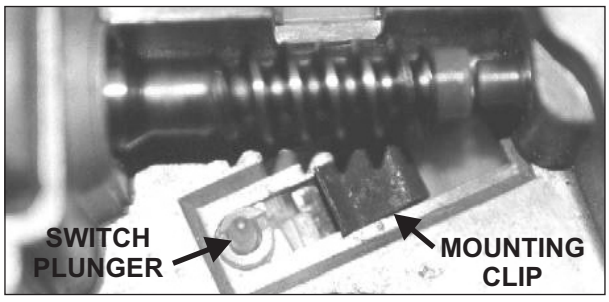


PHOTO 2

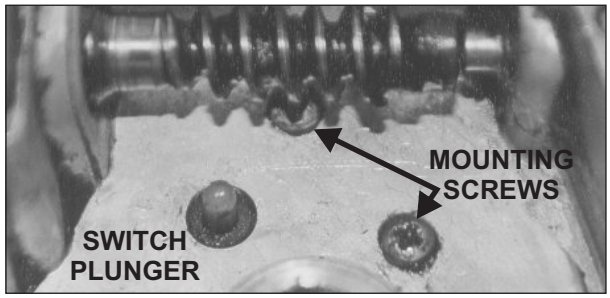


PHOTO 3

This switch (grounding contact) is no longer available for the TR250, but it should be fairly easy to make one. See **figures 4 & 5** below for details.

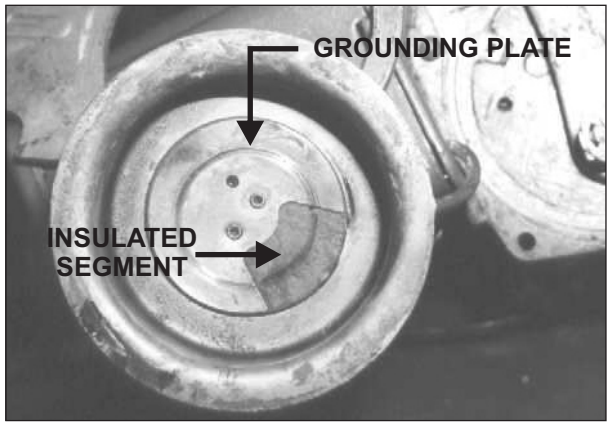


PHOTO 4

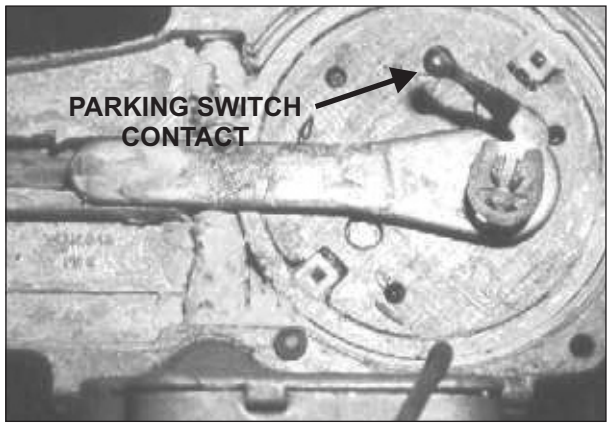


PHOTO 5

BRUSHES: examine the brushes, shown in **photos 6 & 7**, next page, for signs of excessive wear or other damage. If the are worn out or broken, new brush assemblies are also available, and at a reasonable price. Removal and replacement of the brushes is a straight forward operation, and will be obvious from an examination of the unit.

ARMATURE: inspect the commutator rings, **photo 8**, next page, for signs of damage. If they are scored, you may be able to salvage them by polishing the scoring out with fine emery cloth.
Inspect the armature winding, and the winding

connections to the commutator for signs of damage. Chances are, if there is any damage, you will have to replace the armature, but it may be possible to make repairs if the damage isn't too bad. Of course, if you really want to, you can buy the proper wire from a motor repair store, and rewind the armature, making sure to make the windings exactly as original, Check with your motor repair shop for the correct type and size of wire to use, showing them your old armature as a guide.

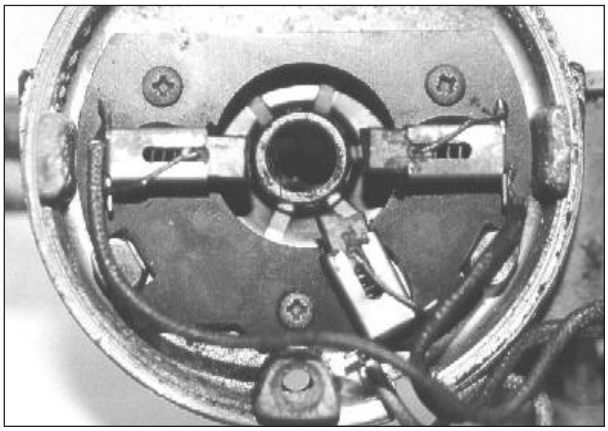


PHOTO 6

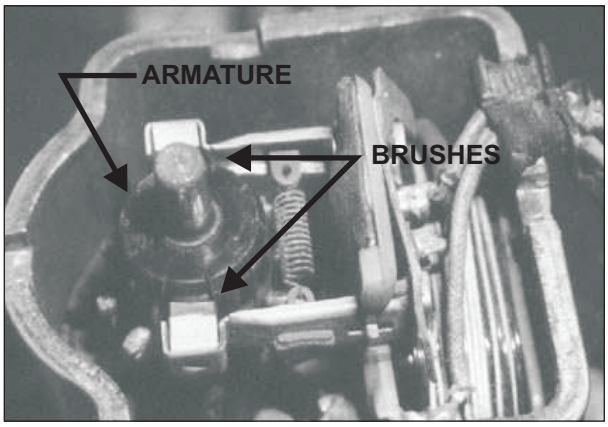


PHOTO 7

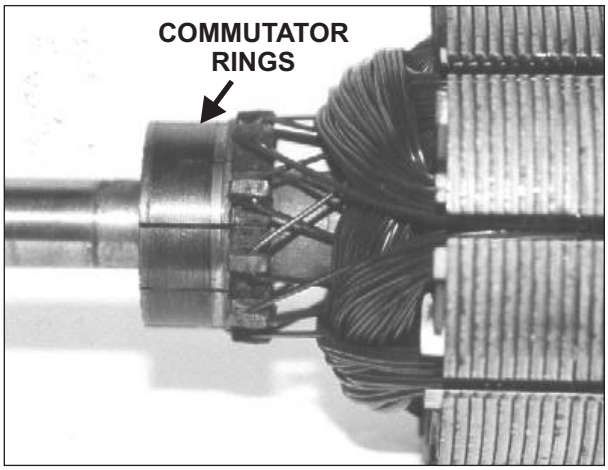


PHOTO 8

When you reassemble the unit, make sure to put a small drop of oil on the end of the armature shaft that goes into the small felt bearing at the bottom of the motor housing, and liberally grease the drive gears and the wiper linkage with a good grade of grease.

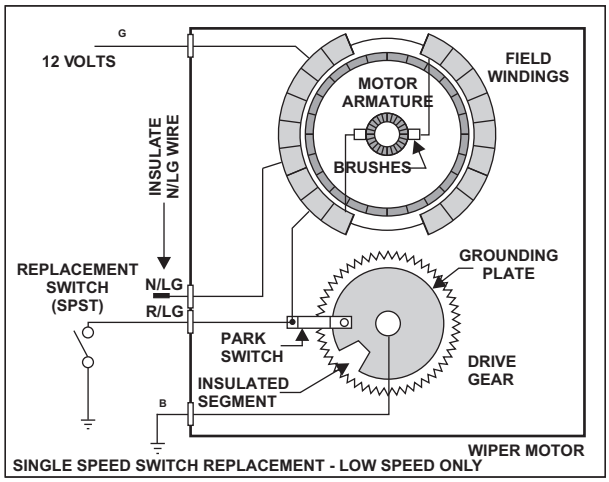


FIGURE 9

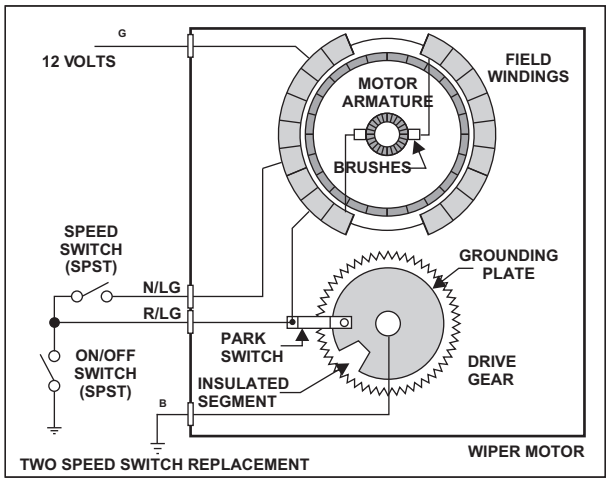


FIGURE 10

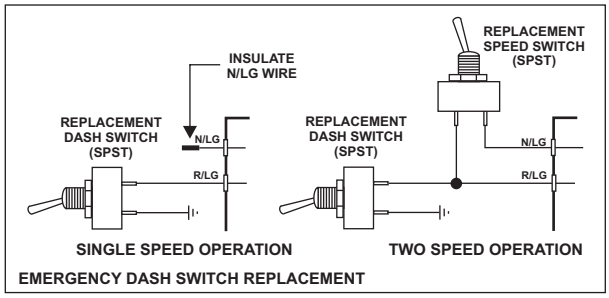


FIGURE 11

EMERGENCY SWITCH REPLACEMENT:

If it turns out that your wiper switch is defective, and is beyond repair, you may want to rig up an emergency repair. If so, follow the diagrams in **figures 9 through 14** , above and belowbelow. You will be using the existing

wiring, so wire sizing is not a concern, but make sure the switches are rated at least 10 amp. For the SPDT switch used for the TR6, don't use the typical switch as found in most auto parts stores, as these nearly always have a "center off" position, i.e., ON-OFF-ON. The switch required for this application has only two positions: ON-OFF. If you should use one of the ON-OFF-ON type, it will work, but you will need to pass through the center OFF position when switching the wipers on or off. With the switch in the OFF position, neither the motor nor the park function will work.

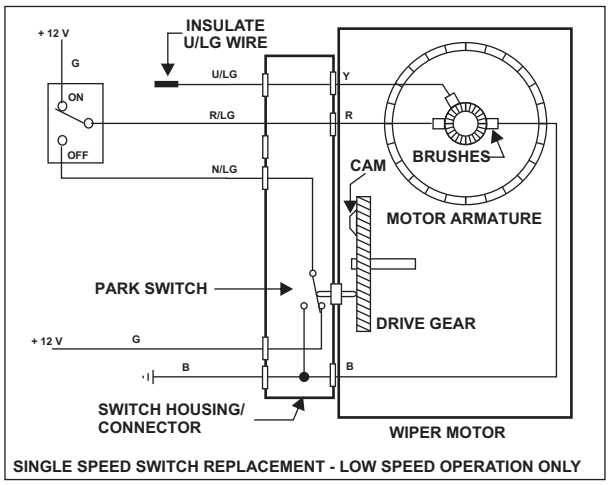


FIGURE 12

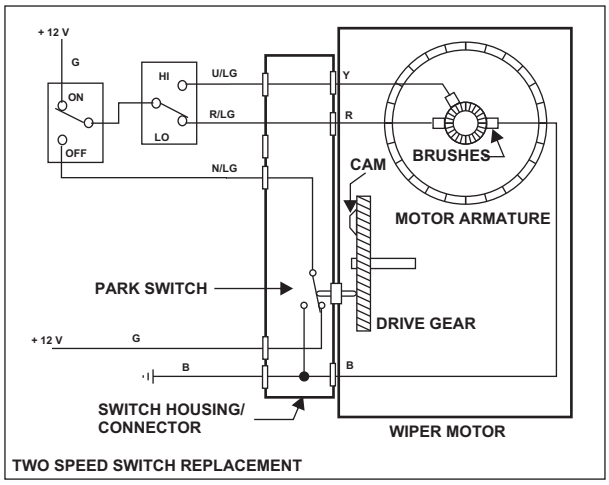


FIGURE 13

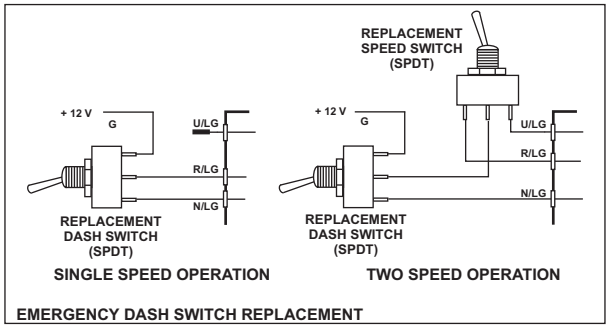


FIGURE 14

CONVERTING FROM RH TO LH OPERATION (OR VICE VERSA):

TR6: If you have a wiper motor from a RH drive car, converting it to park for LH drive is quite easy, and takes only a few moments. Refer to **photo 9** below. After you've removed the plastic drive gear, use a small screwdriver to pry the parking switch cam out, and replace it in the two holes on the opposite side of the gear. The wipers will now park on the correct side of the car.

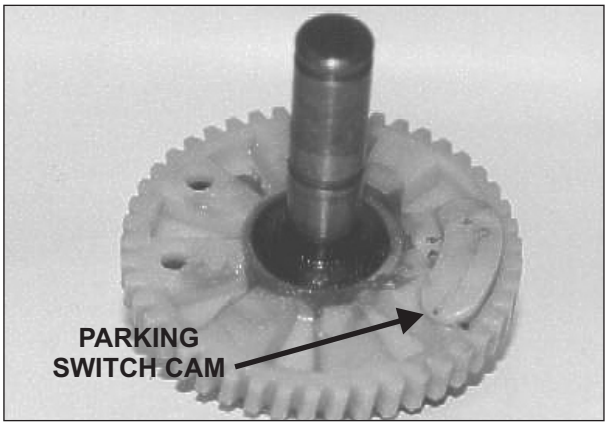


PHOTO 9

TR250: Resetting the parking position on a TR250 couldn't be any easier. Just loosen the cover and rotate the hat 180 degrees and re-tighten the cover. See photo 10 below for details.

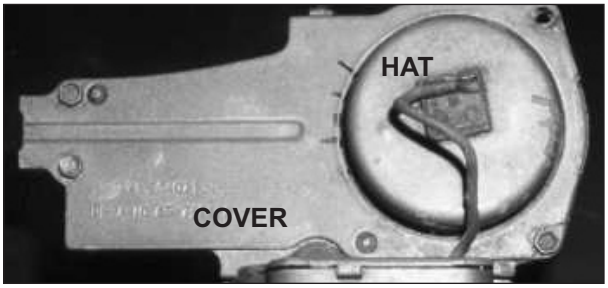


PHOTO 10

USING A WIPER MOTOR FROM ANOTHER MAKE:

For the most part, a Lucas wiper motor from another make will work quite well in a TR250/TR6. If you have an un-repairable wiper motor, you might just be able to use an MGB motor, as an example. The biggest difference between a Triumph motor and the MGB motor is the "sweep" range of the wiper blades. On a TR250/TR6, the blades sweep through a 115º range, while on the MGBGT, they sweep through a 105º degree range. I'm not sure what the range is on an MG Roadster, but whatever it is, the same situation exists. Notice the degree markings on the two gears in **photo 11** next page. Just swap the 115º TR 250/TR6 gear into the MGB unit, and you're done.

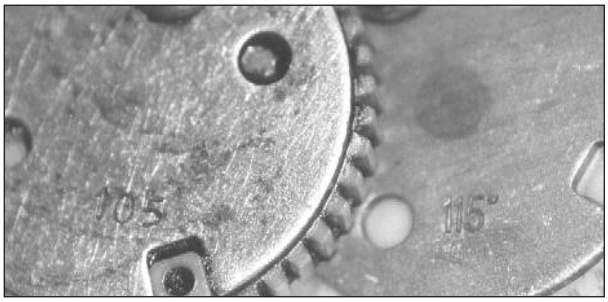


PHOTO 11

WINDSHIELD WASHER:

The windshield wiper circuit is quite simple, consisting of nothing more than a simple momentary, SPST switch, and the washer motor - push the switch and the washer motor operates, release the switch, and it quits. See **figure 15** below for wiring details.

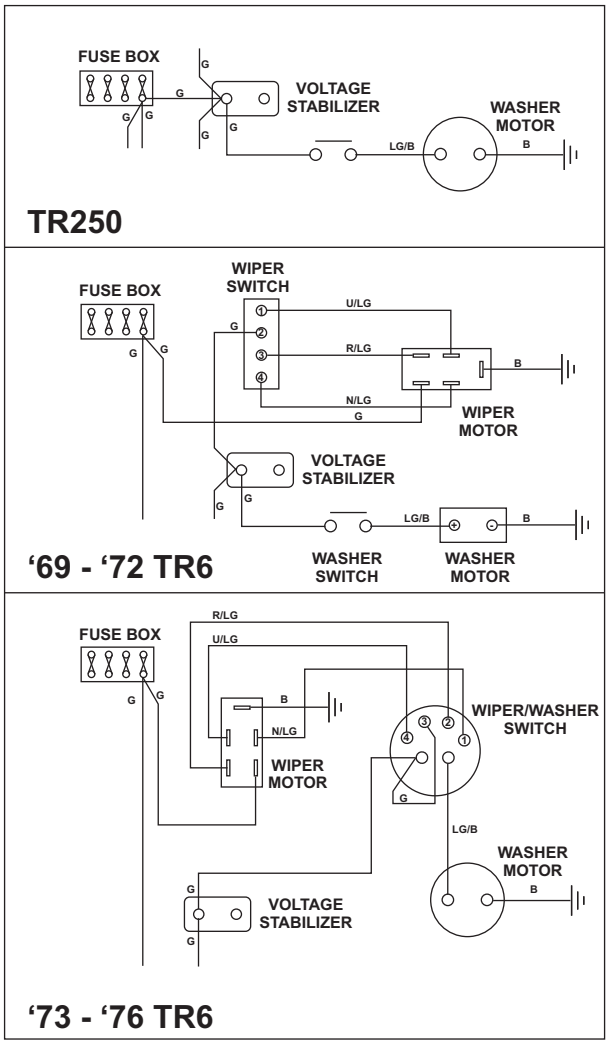


FIGURE 15

TROUBLESHOOTING:

The windshield washer motor gets its power from the "green" fuse, same as the wipers. Before proceeding with the washer troubleshooting steps, ensure that power is available at the green fuse. Refer to the wiper troubleshooting instructions for more info on checking for power at this fuse.

Step 1). With the ignition key on, have someone operate the washer switch while you monitor the light green/black wire at the washer motor. Using your voltmeter or test lamp, you should see 12 volts on this wire when the switch is operated. If you have power here, proceed to step 2. If not, proceed to step 3.

Step 2). Using a short piece of wire, jumper from the motor terminal with the black wire to a good ground. If the motor now operates, you have a break or a bad connection in the ground wire, which will need to be repaired. If not, the motor is bad and will need repair or replacement.

Step3). If you did not have power on the LG/B wire at the motor, locate the same wire at the back of the dash switch, and check for voltage there. With the key on, you should have 12 volts here when the switch is operated. If you don't proceed to step 4. If you have voltage, there is a break or bad connection in the LG/B wire between the switch and the washer motor.

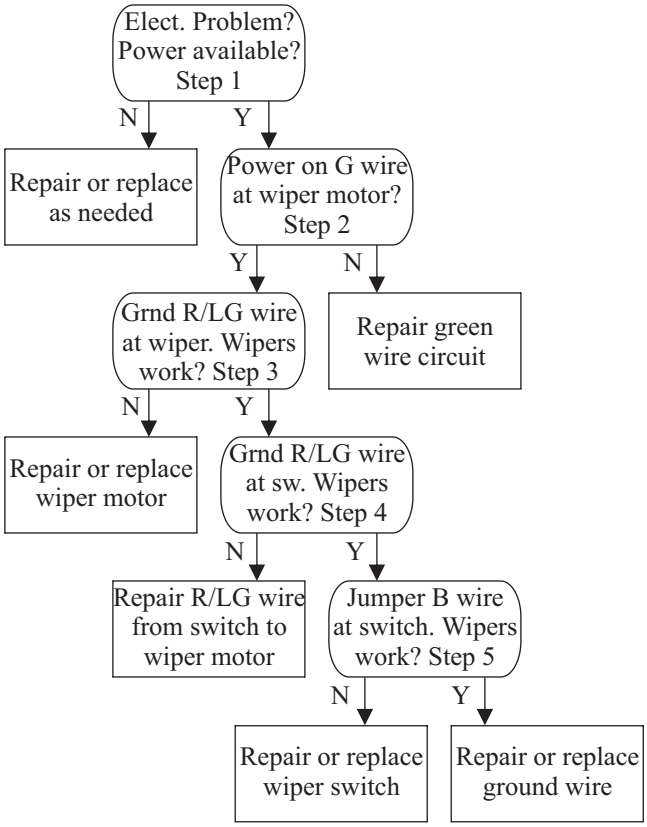
Step 4). With the key still on, check for 12 volts on the green wire at the switch. If you have voltage here, the washer switch is bad, and must be repaired or replaced. If not, there is a break or bad connection in the green wire.

Note: if you have a '73 -'76 model, and the wipers work, you have power on the green wire at the combined wiper/washer switch, but the short jumper between the two sections of the switch is your problem. It is either loose, or there is a bad connection at the switch. This bit of knowledge might reduce the amount of searching required to find the problem with the green wire.

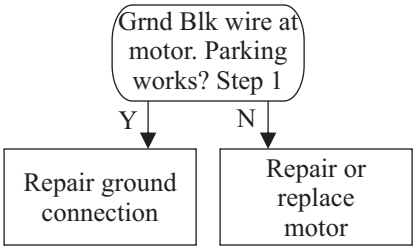
TROUBLESHOOTING FLOW DIAGRAMS

TR250

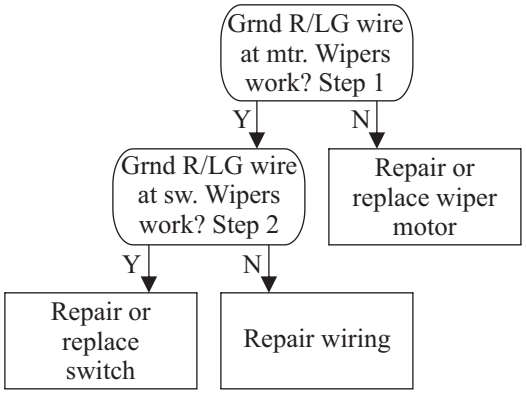
WIPERS DON'T WORK AT ALL



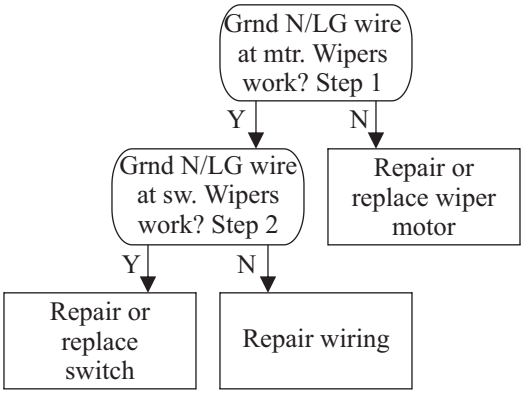
WIPERS WORK, BUT DON'T PARK



WIPER WORK ONLY WITH SWITCH IN LOW SPEED POSITION



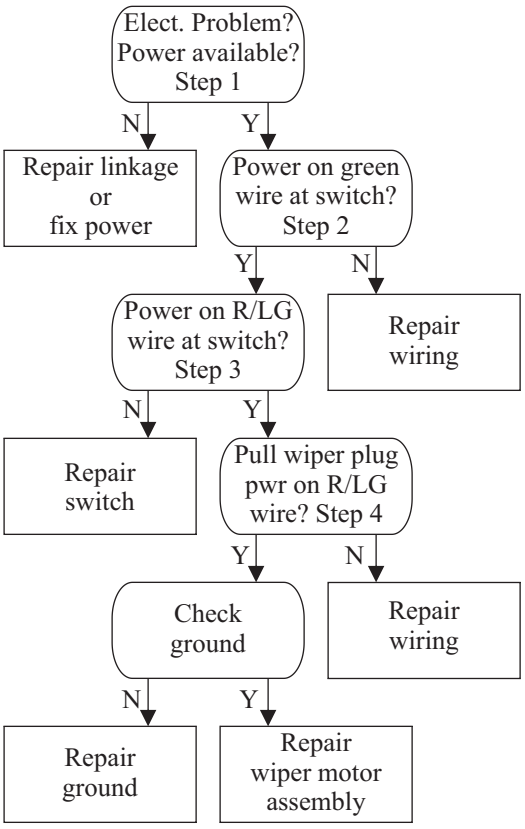
WIPER WORK ONLY WITH SWITCH IN HIGH SPEED POSITION



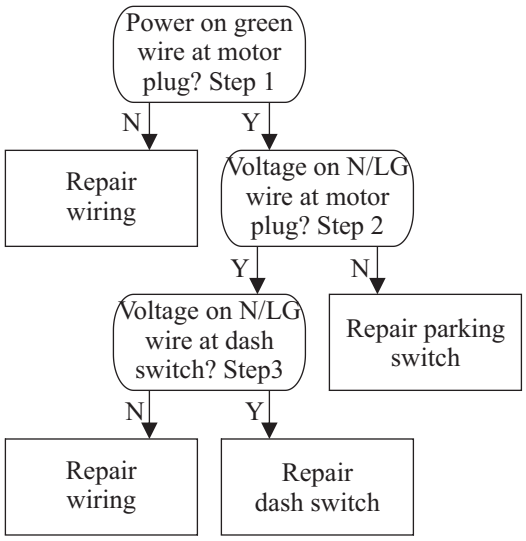
TROUBLESHOOTING FLOW DIAGRAMS

TR6

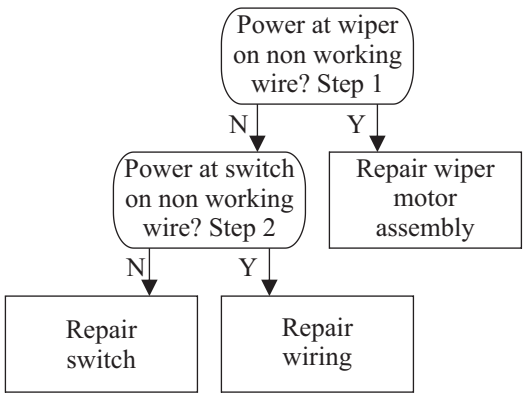
WIPERS DON'T WORK AT ALL



WIPERS WORK, BUT DON'T PARK



WIPERS WORK ON ONE SPEED ONLY



WINDSHIELD WASHER