

# Fitting two-speed wipers with an intermittent option to a TR

I could not find much information when I started. All I had was a somewhat worn-out original Mini wiper unit. That gave me two speeds but no intermittent. The intermittent part is controlled outside the motor through an electronic component. Hella had an intermittent unit you could buy overseas but it was looking like \$150 to \$200 to get my hands on one. I decided to do it all myself and save some money.

This document will go through all the investigation and creation I had to do to get it all working. Aside from the motor itself, the total cost was under \$100. The motor cost \$75 to repair plus a lot of cleaning and painting. Most of the time was spent in problem-solving so hopefully, this will save some other owners the trouble.

## General Points

A few general points before I start. I may repeat them as I go through each component, but it is good to get them in your head before you start to do the work.

- A wiper motor works by earthing either the high or low-speed armature circuit. The wiper switch connects the motor to earth. It does not provide power to the motor. The motor receives power constantly but only operates when one of the two circuits is earthed.
- The park mechanism is an earth that works on a rotating metal disk on the back of the main gear. The main gear is nylon so is nonconductive. There is a finger in contact with the rotating disk. It connects to the body of the motor and hence earth. The rotating disk has a cutout. When the wheel rotates and the finger hits the cutout, the earth is broken and the motor stops.
- I used a TR headlight switch for the wiper switch. It allowed me to retain the existing knob except it now pulls out two notches rather than one. The problem is that as the headlight switch, one notch turns on parkers and two notches turn on headlights but does not turn off parkers. As a wiper switch, one notch turns on low speed but two notches turns on both high and low speed. I needed to deal with that.
- Can you go for just intermittent wipers without two speed? Yes, you can. I will work on a wiring diagram to make that happen.
- Get as many colours of wire as you can. It will make your job much easier if you can, use different colours for the different components. I hit a few auto spares stores as well as electronics stores before ending up with red, black, yellow, green, blue, white and purple. Surprisingly I could not find grey.

## How Wipers Work

The wipers have a single power supply and are activated when the other end of the circuit is earthed. In other words, there is constant power to the wiper motor.

Within the motor are two armatures. One is for low speed and the other for high. Each has its own earth wire. To have low-speed operate, you earth the low-speed wire. To have high-speed operate you earth the high-speed wire. The knob on your dash for a standard TR single-speed wipers connects the single armature wire to earth.

So how does the wiper park itself when you turn it off? It is slightly different from the standard TR single speed wipers but the principle is the same. The low speed is connected to an earth within the motor through a rotating disk. To park the wipers you want the main gear wheel to stop in a particular position. With two speed wipers, there is a metal disk on the main gear with a cutout. The wheel is in contact with a copper finger. When the wheel rotates so that the finger hits the cutout, the line to earth is broken and the motor stops.

The low-speed wire has two paths to earth. The switch that turns on low-speed and the earth switch through the rotating disk. You can turn off the low-speed circuit at the wiper switch but the current continues to flow to earth through the disk until it hits the cutout.

## How do Intermittent Wipers Work

Intermittent wipers work by providing a pulse of current for a second or two to the low-speed circuit. This starts the main gear wheel rotating out of the notch in the park circuit. When the burst finishes, the park mechanism does the rest to complete one cycle.

## Wiper Motor

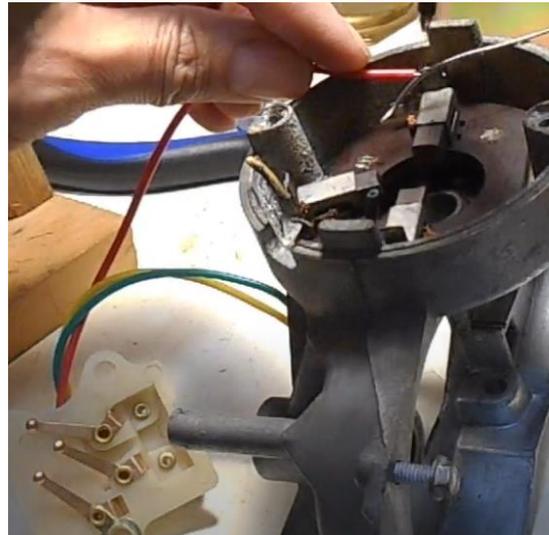
I believe there are a number of two speed Lucas motors out there, but I have one which has four inputs on a plug. You can use individual crimped connectors which I did, or find a plug. Good luck. I have seen one which has four inputs but instead of a rectangular plug, it has a small notch at the top. This is to earth the motor. I cannot comment on that one.

Most old motors have a few problems. The three basic problems are:

- The contact plate under the nylon gear is corroded and you will probably have to get a new plate. You can see the corrosion on the right of the plate in the image below. The cutout is at nine o'clock. On the right is a new ring. To install, you bend the tabs so they go through the gear and then bend them over on the other side.



- The copper fingers that run on the plate are worn out. These are part of the plug. A new unit needs to be soldered into the motor body.



I won't go into the repair of the first two. There is a fantastic video on YouTube that covers these. The repair is straight forward only requiring a little soldering. The video is an Australian produced video: <https://www.youtube.com/watch?v=iqbudmy2CRQ>

I spent a lot of time tracking down parts. The two parts I needed were the circular plate and the copper fingers. I finally found them at Minisport Australia. They cost me \$75 including postage.

- The brushes are worn.



If you need brushes, I was not able to find these online. I think it may be a case of finding brushes that are close in size and sanding them down with some sandpaper. It is going to be a complicated job. They are part of the mounting plate, and it is not easily removable. The video covers the problem but has no solution.

I had a problem with a missing spring but was able to find one out of a pen. The brushes are just OK so I was able to use them.

## Wiper Motor Mounting

The wiper motor mounting will not fit the two-speed motor. You have to extend the mount to fit the new motor. Fortunately, this is not too difficult. I found a piece of aluminium and pop-riveted it to the existing mount. There are three mount points. The single mount point goes in the mounting bracket, and the double points go in the extension.



A problem you may encounter is that the mounting bracket has three attachment points to the body. One is a stud that goes through the firewall and has a nut behind the glovebox. Usually not a problem. The other two fit into captive nuts which are between the underside of the inner guard and the guard itself. When I took the bolts out, they had probably never seen the light of day for sixty years. One stripped. I had to put a nut under the captive nut in a space about 20mm wide.

The best way to put a nut under the captive nut is to get a ring spanner and put a piece of masking tape under the ring. Put a nut in the ring and it will be held in place by the masking tape. You can poke it in the narrow gap and eventually get it under the bolt.

When attaching the mounting, you also need to connect an earth wire from the motor. I put this under one of the two mounting bolts. This is what enables the wipers to park. The other end goes on a cover-plate screw.

The motor is mounted on rubber washers to absorb torque on startup. It is insulated from the rest of the car. The mounting washers, which are like grommets, could be purchased online but I got by using some rubber tap washers.

## Wiper Switch

You actually need two switches. One switch has off, low and high for normal use. The second turns on intermittent wipers. The intermittent wipers will also have a rotary switch to adjust speed.

The wiper switch has three positions. Off, low-speed and high-speed. There are many options as to how you set this up. I decided to use the TR headlight switch for off, low and high. It was purely a cosmetic decision as it fits in where the existing on/off wiper switch goes.

An easier option would be to use a three-position switch with a simple off, low, high. The downside of course is finding a place for it without it looking odd.

Using the headlight switch has a problem as previously mentioned. It is not just off, low and high. It is:

- Off
- Low (parkers)
- Low and high (parkers and headlights).

I did not investigate somehow modifying the switch and that may be possible with some surgery. I managed to overcome the issue with the use of relays.

## Intermittent Switch

You have to turn the normal wiper high/low-speed switch off for the intermittent wipers to work. You cannot for example turn on high speed then get them to operate intermittently. You need another switch to turn on the intermittent circuit.

All this can be achieved by using a relay. The wiring diagram will illustrate how this works.

So where to put the intermittent switch? I decided to do another mod to the car for the switches. I built a centre console in the car just behind the gearstick. It houses my phone and four switches. I can use my phone for navigation and see it with a quick glance down.



I ran a charger to the phone area. I wired up a cigarette lighter socket under the dash and bought a plug-in USB plug. I run a USB charging cable to the phone under the carpet.

The console has four rocket switches. I already had a switch out of sight under the dash to turn on interior lights. I have one on each side and one in the boot. I re-routed the wiring to the centre console switch. Similarly, I had a switch to turn on driving lights, or actually to have them turn on with high-beam so I routed that to the console. That leaves one more switch but I am not sure what I will use that for.

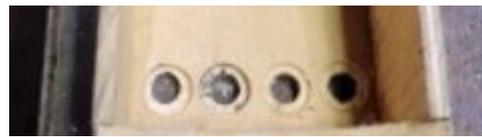


I already have a box behind the new console with a fold-down drink holder on the front. I use it for "T" handle and glasses plus other bits and pieces.

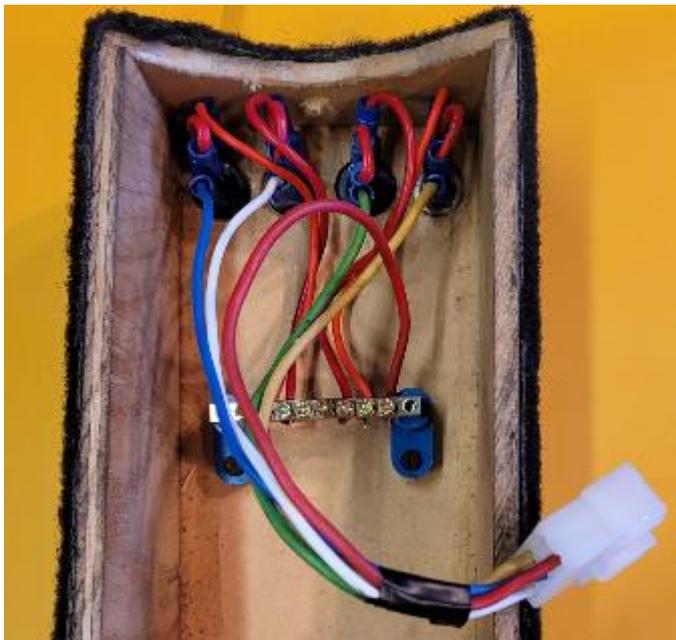


To make the box, I cut out cardboard templates for the front and back in cardboard. The main reason was to get the curve on the tunnel right. When I was happy with the template, I cut out the ends with a jigsaw. Used plywood. The rest was just making the sides and top to fit. I had some vinyl that I had used to make all the flat panels and dash so covered the top in the vinyl.

I had to recess the holes for the switches as there was not enough thread to go all the way through the plywood. It is something that is best done before drilling the holes using a spade bit. I had to do it after I drilled the holes when I found out they would not fit. Just put a block of wood on the underside to centre the spade bit and clamp everything in place. Fiddly, but can be done.



To cover the sides I used carpet. I had some leftover carpet so cut a long strip and progressively glued it around the box. The join is in the front where it cannot be seen. The carpet was glued one side at a time. I didn't try to fit exactly. It overlapped top and bottom. Once dry, I trimmed with a sharp knife.



I used a terminal block under the box to make all the connections. I installed a plug to connect to a wiring harness going back to where all the bits come together. That way I can unplug the console if I want to remove the tunnel.

## Intermittent Control Box

All that is needed is a circuit board that can provide that pulse on for one or two seconds, and a way to regulate the frequency of the burst.



I found one on the Internet out of the UK. It is not specifically for intermittent wipers but it does the job. It was not expensive. The freight was about as much as the unit. The number was MX041-1. The maker is Maxx Tronic.

There is a Hella unit designed for Intermittent wipers but it is very expensive, and not available in Australia when I checked.

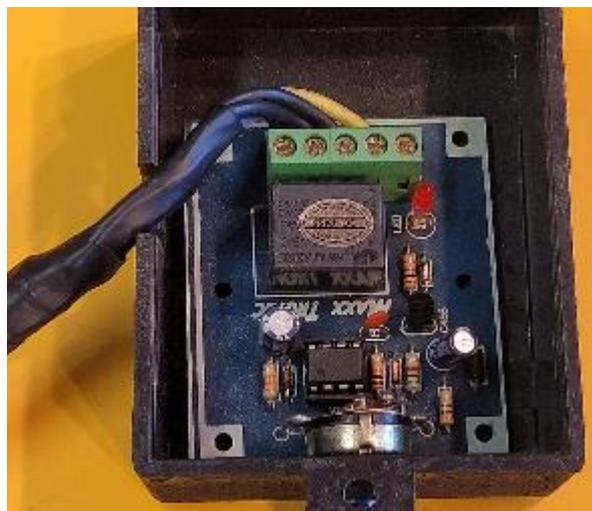
The unit has five connections at the back. They are:

1. +
2. -
3. NO (Normally Open)
4. C (Common)
5. NC (Normally Closed)

Normally open means when no power is applied, or between cycles the link to the common is open. When one of the cycles happens and the board pulses on for a second or two, this connection is closed. Normally closed is the opposite.

The + and – are the power to the circuit. At the front is a rotary switch to adjust the frequency of the pulses. There is also a red light on the board which comes on when the board switches on during the frequency bursts.

All this is housed in a small plastic box courtesy of Jaycar. You will need to drill a hole in the front of the box to fit the rotary switch. You will also need to pick up a knob to push on the rotary switch. All are readily available.



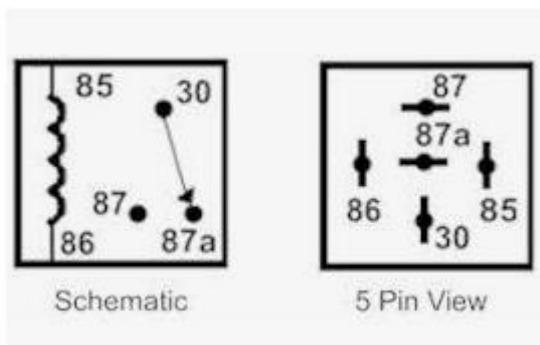
I decided to mount it on the support between the dash and the firewall just near the centre console of the car. If you turn the box upside down, the flanges on each end can be attached to the support. I decided to make a small extension about 12 mm to the flange to make it easier to mount. The shaft of the rotary switch is very close to the flange so it is a tight fit. It also moves the box back just a bit so it is not so likely to catch on anything. I already have a radio fitted in that area so it slots in beside the radio.



## Relays, Connections etc.

An ideal place to mount the three relays, connections and bring all the components together was behind the glovebox. I cannot guarantee it will work for other TRs because years ago, I made an aluminium glove box so it may be a slightly different size. I found however that you don't need a lot of room, and it is really easy to work if you take out the glove box.

A quick digression to refresh your memory on relay wiring if you have not done it for a while. You will need relays with five spade connectors.



85 and 86 are the power supply that activates the relays. 30 is the common.

When the relay is not activated, 30 is connected to 87a and 87 is open.

When the relay is activated 30 is connected to 87 and 87a is open.

So 87a is NC (Normally Closed) and 87 is NO (Normally Open).

I have three components in the central control area.

1. Three relays are wired into various other components. I mounted them on a strip of aluminium so there was a single mounting point.  
There is a plate on the firewall which covers where the pedals would go for left-hand drive. It is held on with bolts and captive nuts. In most cars, those bolts have probably never been removed. I removed one and replaced it with a longer bolt so that there was more thread on the inside of the car. I then used a nut to secure the three relays in place.

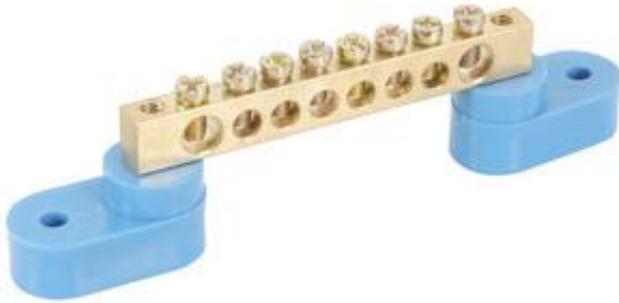


2. Wires are coming from the wiper switch, the intermittent switch, the wiper motor, the relays and the power supply that had to be connected. I decided to use a joining strip to connect everything. There were 12 connections on the strip and they all ended up being used.

Once again, I used one of the cover plate bolts to mount the strip.



3. There was a multitude of earth wires and I had to decide where to put the eight or ten earth wires. Back to Jacar.



They had just the thing and I was able to use existing mounting points on the car just below the joining strip. It provided eight holes and I only had to have a single earth wire. I connected this to one of the extended mounting bolts after checking it was a good earth.

## Putting it Together

Since most of the connections were screw type, I started by wiring up all the relays leaving enough wire to reach the connection block. I then mounted the relays in the car. I then started on the other components.

I wired up the motor which I had not installed at that point. I decided to put in a plug near the motor, and create a wiring loom to run back to the connector. I could then install the motor on the motor mount.

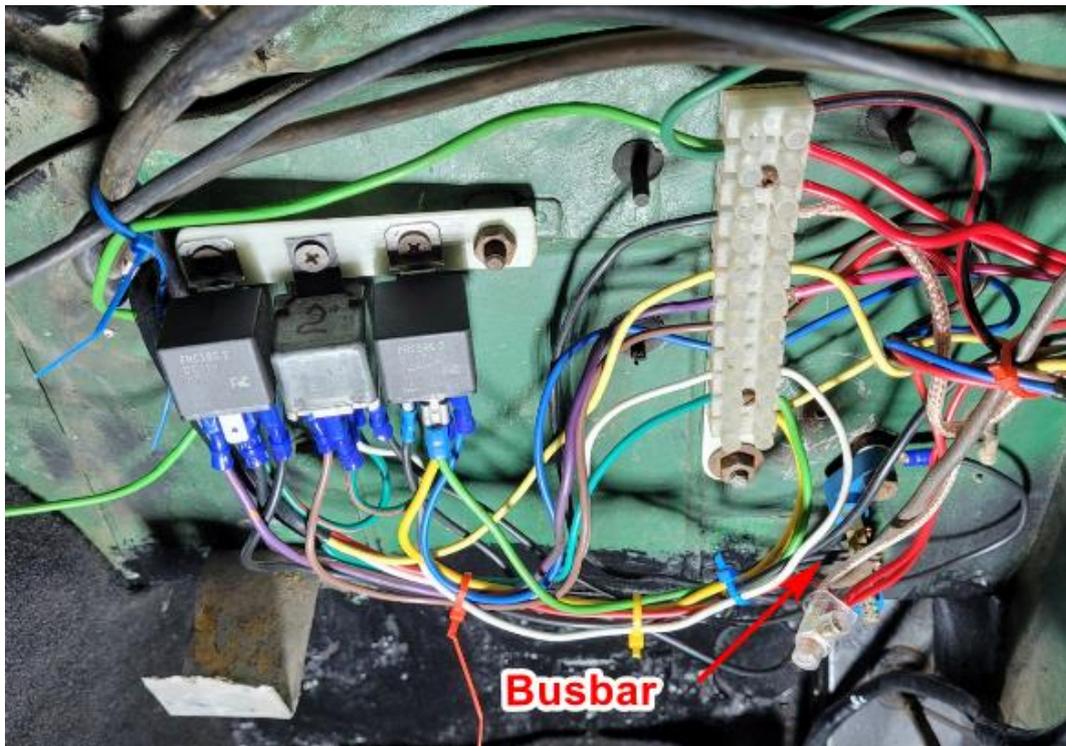


I replaced the normal wiper switch with a headlight switch and created another bunch of wires to come back to the connector.

I installed the centre console and ran a wiring loom under the carpet, up the firewall, and back to the connector.

I installed the intermittent box under the dash and ran a wiring loom back to the connector.

I ran a power supply to the connector from the ignition key switch.



The busbar for the earths is not clearly visible. It is in the bottom right corner of the pictures. The black wires lead into the busbar.

It was a relatively straight forward process to connect everything together based on the wiring diagram I had created. When it was all in place, I tried it out and found only one glitch. I had made one mistake in the wiring diagram with the intermittent wiring. It was obvious once the problem happened, and easy to rectify.



Even with all the wiring, it still gave me room to put back a speaker I had for the radio and fit the glove box. It's amazing how much you can fit in a TR.



## Relay Operation

There are three relays numbered left to right as one, two and three.

**Relay One.** The relay is only activated when intermittent wipers are turned on. The intermittent switch provides power to both the intermittent board so that frequency pulses can be sent to the wiper motor, and to relay one to disconnect the wiper switch earth which is 87a on this relay.

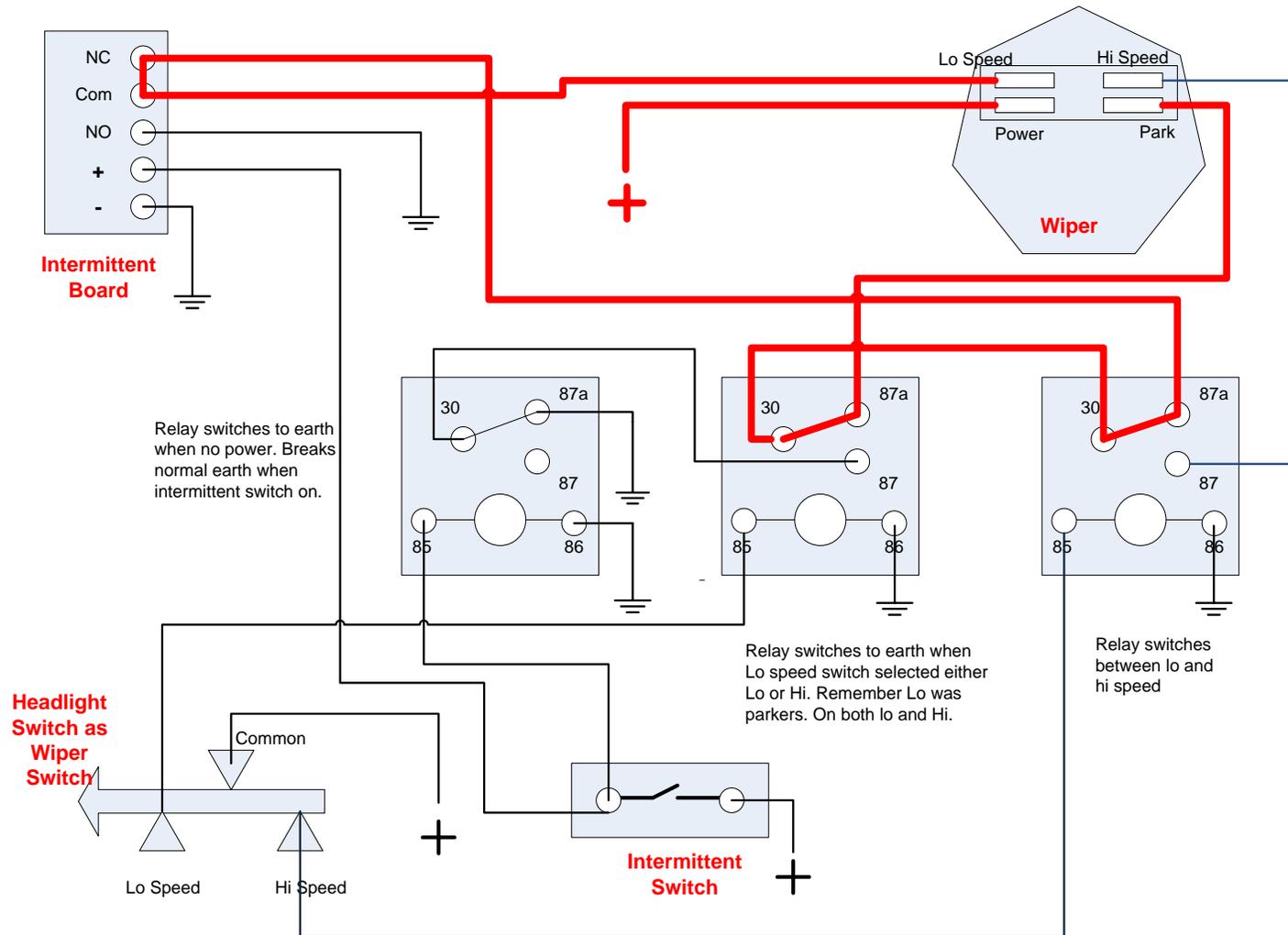
**Relay Two.** This relay is activated by the low-speed circuit on the wiper switch. Remembering this is a headlight switch and low speed uses the parker circuit, low-speed is active in both on positions. This relay is activated regardless of whether the first or second position in the headlight switch is selected.

What it does is connect relay three to relay one when activated. Since relay one is normally connected to earth unless the intermittent switch is activated, it connects the common terminal on relay three to earth if the headlight/wiper switch is turned on either first or second position.

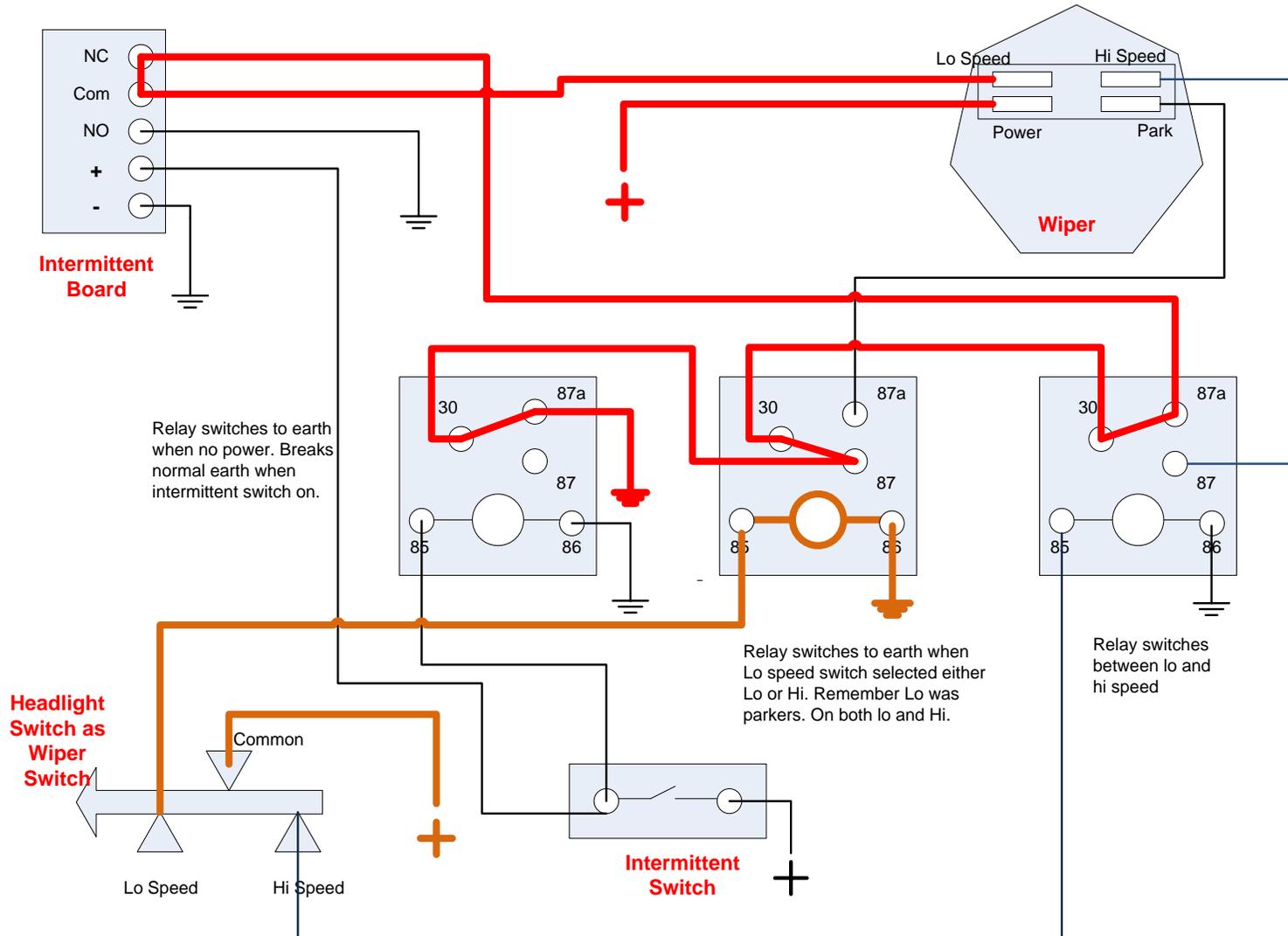
**Relay Three.** When not activated, relay three connects the low-speed connection on the motor to earth. It does this by connecting the wire from the motor low speed through the intermittent board common to the NC (normally closed) connection to 87a on relay three (also a normally closed connection) through the common to relay two and relay one to earth. It sounds a long way to do it, but the low speed is used for several things including intermittent wipers and parking the motor.

The relay is activated by high-speed (position 2) being selected on the wiper switch. When this happens the connection to earth for low-speed wipers is broken, and the connection to high-speed wipers is activated.

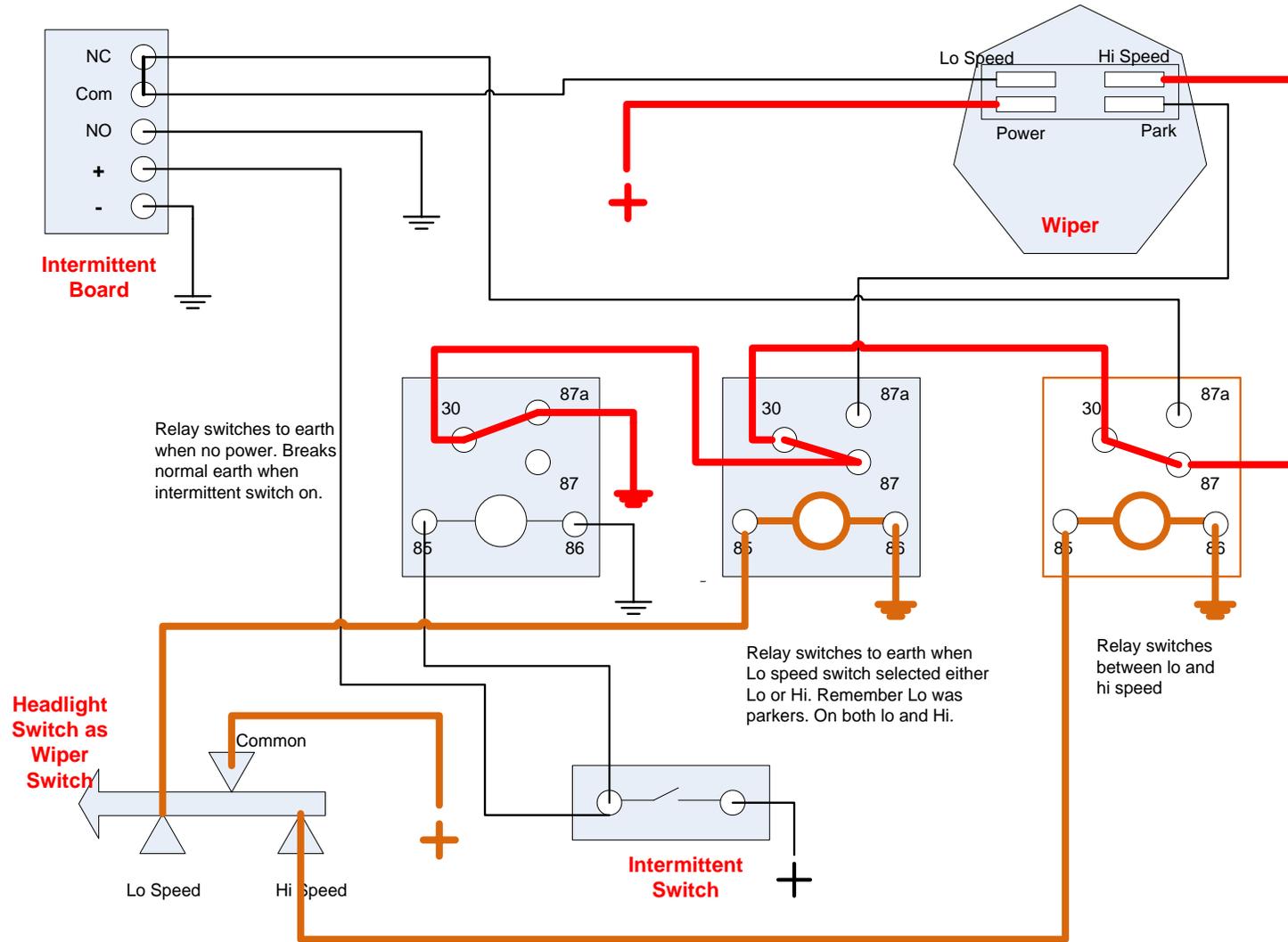
Operation – Wiper switch off. Intermittent switch off.  
 Low-speed wiper motor connected to park.



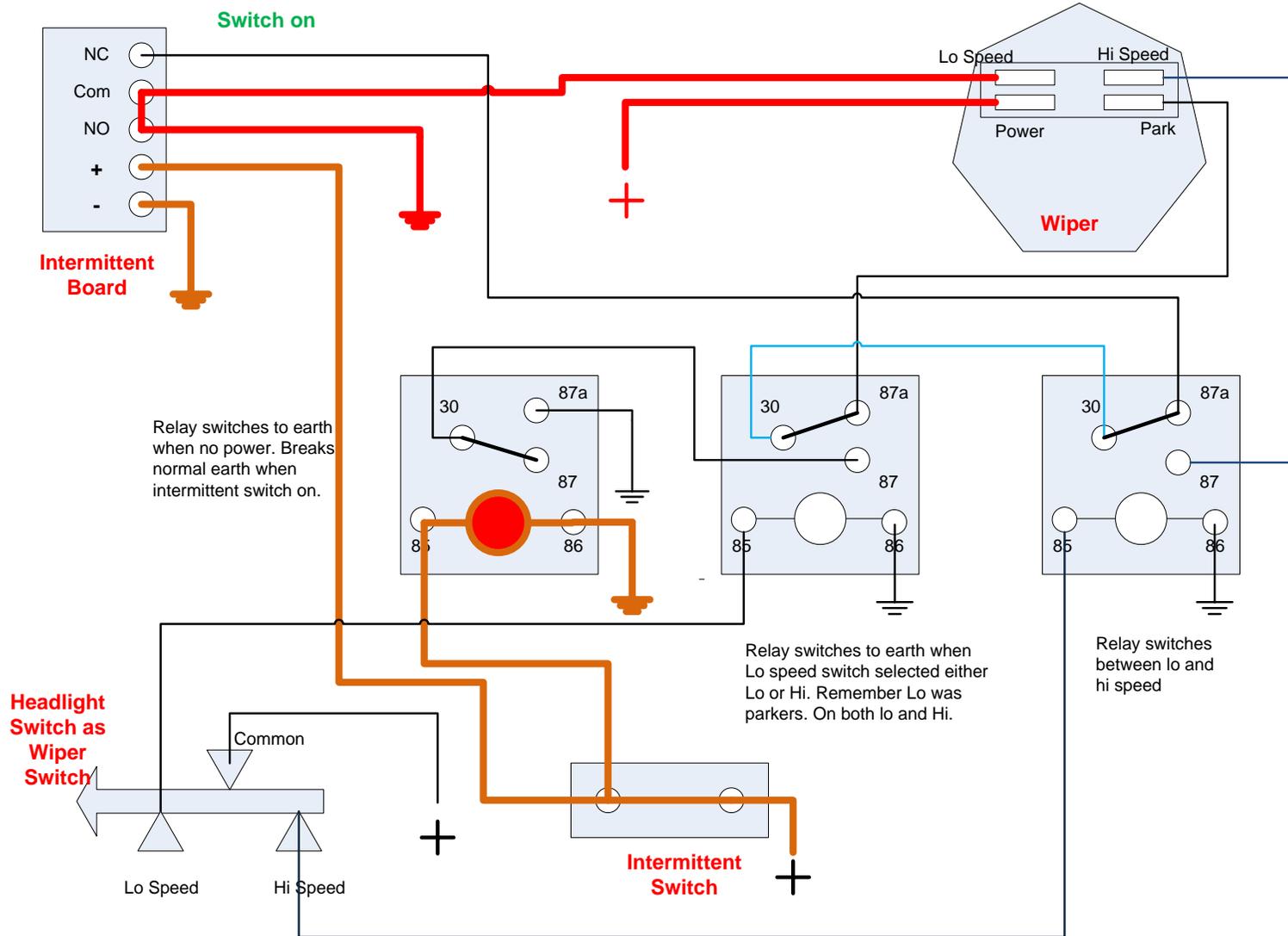
Operation – Wiper switch switched to low and intermittent switch off  
 Low speed connected to earth by the second relay.



Operation – Wiper switch switched to high and intermittent switch off  
 High speed connected to earth by relays two and three.



Operation Wiper switch on and intermittent switch on. Pulse of power through the circuit board  
 All the wiper switch operations isolated by relay one. Low speed earthed through the intermittent board.



Operation Wiper switch off and intermittent switch on. The motor is started by the pulse of power.  
 The park mechanism now completes one cycle for the motor.

