

The ER-6, an electrifying conversion!

Di Paul Martin

Paul already told us about the conversion of his [E-Fire](#), but the previous article misses the sad end of the car. After four years and 16,000 miles of happy electric driving, the E-Fire was involved in an accident who irreparably damaged it. Luckily, both the driver and the electric drivetrain and batteries walked away without a scratch, leaving him the wish for a classic EV.



This is the story of a resurrection – an electrifying conversion!

In spring of 2019 I bought a 1973 Triumph TR6. Referred to in [a famous Top Gear episode](#) as *the blokiest bloke's car ever built*.

I'd always admired the TR6, but it was always out of my price range – and this one popped up at a price that was too attractive to pass up. The body and chrome were solid, more or less, and the frame had been restored by an amateur, but was solid enough. The engine was in great shape, though it had some issues as all 47 years old cars do. It had a 4 speed manual transmission without the expensive, rare overdrive, which meant that the engine was spinning too fast at highway speeds, which didn't bode well for long term longevity. I struck a deal and drove the car home, with my wife in the chase car, our Prius C. And I took it right to my favorite British car mechanic. He might as well have just asked for my wallet at that point...

But on the plus side, “she who must be obeyed”, who had only warmed to the E-Fire in the later days, liked this car straight away.

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A couple grand's worth of repairs later, I was wondering if the money pit had a bottom... I managed to get it out for one nice Toronto Triumph Club rally drive, and its 2.5 L straight six was happy to gobble up premium gasoline, make a satisfying roar and enough power to have no problems keeping up. But the car is under-geared – perfect for rally driving and roaring around the English countryside, but not much use on the highways in and out of Toronto. The thoughts of driving it up to the farm for the weekend were dashed – it would just cost too much for fuel, even if we could stand the stink of the untreated exhaust – 1973 was the last year before the emission controls really started in earnest.

The final straw was the transmission's decision to puke out its entire inventory of oil and then commit suicide, near summer's end. I parked it, disgusted by the thought of having to pull that transmission to repair it. I just couldn't bring myself to the task and expense of continuing what was likely the spending of good money after bad.

But then it struck me: I had a perfectly good electric drivetrain occupying a good fraction of my garage, salvaged from the E-Fire. Converting the car would likely be cheaper than fixing it... and I had managed, via a complaint to the Financial Services Commission of Ontario, to find an insurer who would insure a converted version. What was holding me back?

That sweet engine... it just seemed such a shame to pull it!



I tried to find someone to buy it, to no avail. So I took video of it running, starting, idling, running at high RPM, the oil pressure, the exhaust etc., and started making plans for a conversion in the winter when the car would need to be in the garage anyway. But still, I hesitated.

Finally I broke down and pulled it. I started during the break between Christmas and New Years, carefully removing the engine and transmission and other bits for the benefit of other TR6 enthusiasts.



When I did the E-Fire project, my son was young enough to be interested. He's now a strapping 17 years old, an able second pair of hands, but with interests that run to video games and entirely away from cars. So I'd be alone on this one- but this time with the benefits of experience and 3.5 years of driving and maintaining the E-Fire behind me. I took the E-Fire project almost like a second job and was determined to take my time on this one, enjoying it more. And there was more to enjoy – because there was very little “car cancer” to try to cure this time, whereas the E-Fire was a case of multi-metastatic car cancer from top to bottom. I had burned through 2 full pounds of welding wire just doing repairs before I was done on that thing! The welder was basically unused on this project aside from making some brackets and battery boxes.

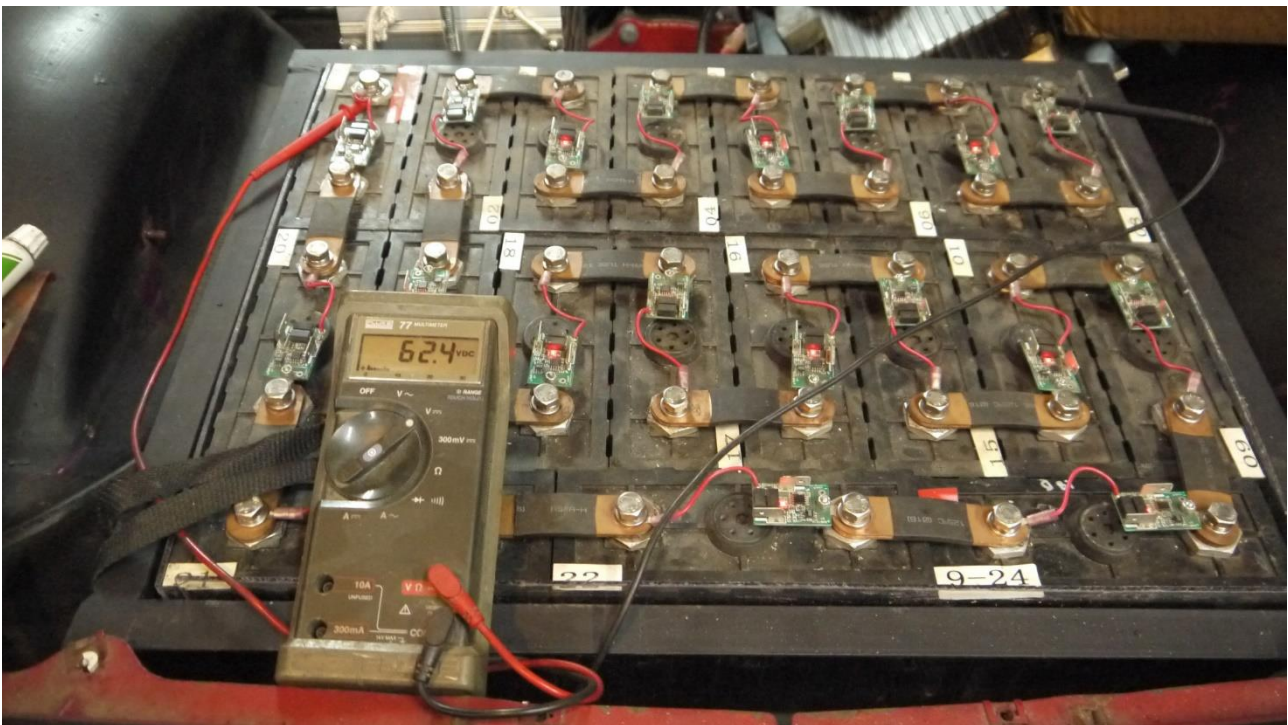
The TR6's big cast iron engine is a heavy, huge beast, and removing it left a lot of room – but less efficient room than under the hood of the E-Fire as well as much less convenient to work on. The Spitfire's hood takes the fenders with it like a mini E-type Jaguar, but the 6 has a conventional engine bay which was much less fun to work in.



The drivetrain fit was a pleasant surprise. I was able to use the same Toyota transmission and my AC50 3 phase induction motor, the mounting bracket and even the transitional driveshaft without modification. A small adapter plate was all that was required to connect the old driveshaft to the TR6 differential – a much heavier and more robust affair than that in the E-Fire, so hopefully more durable against the high forward and reverse torques of the electric drivetrain.



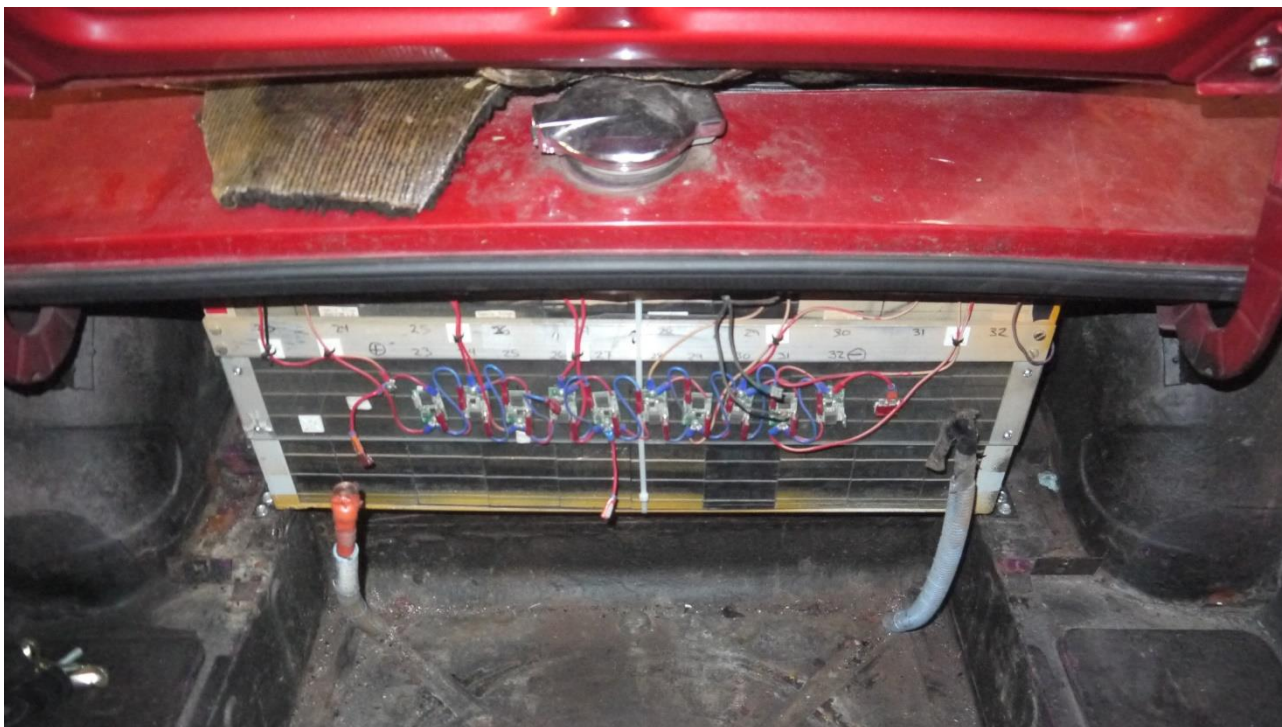
The basic configuration would be the same as last time: 33 rather than 32 LiFePO4 prismatic cells, each 180 Ah and about 1/2 kWh (for a total of about 19 kWh, and 106 V nominal, 119 V peak). The front pack was set a little lower than in the E-Fire, but further ahead than I'd have liked. The geometry of old cars leaves you with poor choices sometimes, but since the batteries had come through the E-Fire crash without problems, I had some confidence that I'd be fine this time too. A small 4-cell pack was put a little further back for better weight distribution – and as a pack I could pull as an emergency 12V battery for house UPS if required. The complete rear pack from the E-Fire dropped right into the same place, replacing the old gas tank and its 80 pounds of gasoline, separated again from the driver by pressboard covered with vinyl. The chrome flip top filler cap was kept as “bling” – chrome in good condition is one of the appeals of these classic cars.



Front pack wiring in progress: the little boards on top of the cells are BMS alarm trip modules which alarm on high or low voltage – essential protection equipment for expensive Li ion batteries.

The COVID 19 tragedy struck when I was in the middle of the project and had the side benefit of providing 7.5 hours every single week of time that I no longer had to waste driving to work and back on the GTA's notoriously congested highways. I put the time to good use!

Wiring went smoothly. The main conductors between the front and rear packs were re-used as were all the heavy 0 gauge jumpers which connected up the main DC power. I was able to re-use most of the wiring in my original junction box without modification. Basically all the work from the E-Fire conversion was useful on this project too – most of what I re-did, I did to improve the reliability of my crimping and the neatness of my work so the car looks prettier at car shows.



I call this yoga pose "upward facing electrician".

The dashboard had been ruined by a previous owner's attempt at furniture refinishing. I had to thickness plane and re-veneer the dash, as well as changing the size of the gauge holes to fit my Intellitronix gauges. It took every clamp in my shop to glue this up, but the result is very pretty.



The configuration of the rest of the components was basically the same as in the E-Fire, and you can read about the details [there](#). I basically had to buy only some wire, crimp connectors and wire ties for the build. I sold a few hundred dollars worth of parts to a friend whose TR6 was damaged in a fire in his driveway, so one project feeds another. This is the first car project I've done where a major change has generated a profit – but the real benefit will be if I can find someone to buy that engine! It's still for sale – but you'll have to come to Toronto to pick it up, as a 500 pound engine isn't something I'm going to put in a Fedex package for you!



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There were a few things I needed to change from the E-Fire. One was the Curtis “potbox”, a mechanical potentiometer used in golf carts and the like as an accelerator position sensor. These units are in theory rated for a million cycles, but in reality they get ragged and jerky after a year or two of driving as you wear a “flat spot” at common speed settings. I replaced it with a Honeywell hall effect sensor which I hope will have more longevity. The other was that the TR6 had engine vacuum assist for the hydraulic brakes, being a heavier and more solid car. I had to fit a vacuum storage vessel and a small 12V diaphragm pump to pull the necessary vacuum. The “power brakes” on the car are really provided by regenerative braking, still sensed by a potbox on the slop in the brake pedal just like on the E-Fire. That arrangement can be defeated by a switch on the dashboard for safety in wet weather, as it rearward biases the braking which can be dangerous on a rear-wheel drive car.



So far the ER-6 is a very enjoyable drive! It is quieter, more comfortable and much more stylish than the E-Fire, but without its sexy Michelotti curves – I do miss those. It’s noticeably heavier so the acceleration is less zippy and I expect the watt-hours per mile energy efficiency to drop a bit. I won’t be commuting in this one – surviving one total write-off collision in a roadster with my life, much less uninjured, is not something I want to risk trying a 2nd time.

It’s been a gratifying project, and Ontarians will breathe cleaner air again as I park my Prius – and I can again enjoy stopping at gas stations only for coffee!