Remobilisation of a 1937 Morris 8 Sports Episode 5: Starter Motor Dilemma

The Author in a relaxed moment

Hi, my name is Alister (Al) Gardiner. This is another episode in the trials and tribulations of our Morris 8 "remobilisation". I hope readers might find something of interest amongst the content. My apologies if it is all a bit ho-hum to the more accomplished of you. For feedback I can be contacted on 0279 222 242, or at grannybigal@xtra.co.nz.

Topics

The topic of this instalment covers my starter motor nightmare - did these things ever work at 6V?

Still to come:

- additional instrumentation and electrics - LEDs, turn indicators and 12V
- upholstery trim - a bit of individuality on the door pockets
- starting issues - how can some things so simple be so difficult?
- my car battery – a custom solution using the ubiquitous 18650 lithium ion cell

Trying out the engine

I had no idea of the condition of the engine and other mechanicals. Once I got ready to start work on the car I just had to see if I could get it started (as you do). I had already made the decision to stick with 6V electrics, and so early on I bought a brand new (pretty expensive I thought) 105Ah 6V battery and connected it up. I checked out that I had a spark and fuel. Tried a couple of turns with the starting handle and while it was quite stiff, there seemed to be reasonable compression so I gave the starter a pull. It barely turned over, just managing that whir-pause-whir–pause sound at about 1rpm. So, I suspected that either there was some serious resistance (rust?) in the motor, or problems with the connections between the battery and starter motor. There was only about 4V at the starter motor and the cables looked a bit light, so I beefed them up, and made sure the bolted connections were all clean and tight. I tried again with the same result. To check for high resistance from the moving parts of the engine I took all the plugs out and tried again. It cranked freely, but at a relatively slow rate. So this appeared to show that the motor was generally free and that the problem lay with the electrics.

However, I noticed one weird effect with the engine which I have not encountered before. It appears to have a high "break-free" starting torque compared with other old cars I have owned. I expect some limiting resistance as a result of dispersal of the oil film on the sliding parts, but this is quite pronounced. Once freed and after a few rotations the engine turns over reasonably well, but it only has to be stationary for a few tens of seconds for this limiting resistance to build up again. Initially I was worried about rusted cylinders and rings causing this effect, but having since partially dismantled the engine to inspect it I now know that this is definitely not the case. I have wondered if this is a characteristic of the cast crankshaft main bearings as opposed to the prefinished shell type. Whatever the cause, it does not help the starter motor any!

Time to get the test instruments out

By this time I had had the battery for a while, so I took it back for testing. It was still up to spec, giving over 400A at 5.0V. At near stall (my then normal starting condition!) the starter motor drew about 160-175A and voltage at the battery side of the manual starter switch was about 4.5 - 5 V.

With a 6V system there is not a lot of voltage headroom, but at this current, 1 - 1.5V drop through the cables and connections seemed acceptable. I connected an old 12V battery which delivered a full 6.0V at the starter motor terminals, and it would still only just grind over slowly. At this stage I was forming the opinion that the starter motor was faulty in some way. The series resistance within the motor appeared to be too high, not allowing sufficient starting current to flow and develop the necessary torque. Is it possibly a 12V motor? What should the locked rotor torque be? It must be either the starter switch or starter motor which is limiting the current. So out came the starter motor with its integral starter switch assembly.

The fitted starter motor with integral manual switch and 3-hole mounting flange.

This then fully disassembled, and bearings, etc., checked and cleaned. All seemed to be in order. There was a little bit of play in the bearings, but nothing excessive. The current return path from the ground side brush through the end plate, motor frame and mounting flange appeared to be somewhat corroded, so this was rectified. Brushes were half worn, but looked fine. The engagement pinion and ring gear on the flywheel seemed to be in reasonable condition. The starter motor spun up to high speed when connected unloaded to the battery, taking about 27A at ~5V. Back it went into the car, but the result was again the same.

Time for a rethink

Only a little more torque would be needed to kick the motor over. I found out on-line that early Morris Eights had 80 teeth flywheels with 10 teeth starters (mine), while later cars had 9 teeth starters. There is also some suggestion that a 102 teeth flywheel was used, maybe in the stationary and auxiliary applications for which these motors were popular. I couldn't see any mismatch that would cause my low starting torque problem.

Maybe the starter motor has a shorted turn, or the brushes need replacing after all. So out it came again, and off to an auto-electrician. New brushes, replacement bearings, and a clean bill of health (although apparently no one has a "growler" anymore). Back into the car, and the result was still the same.

Closer examination of the starter motor, with more thinking

This is getting tedious, but this starter motor is not going to get the better of me. After all, I'm an electrical engineer; I eat starter motors with my Weetbix. The big question looms again - is this a 12V starter motor? So back to the internet for more on-line searching. As seen from the photos, the starter motor has a 3 bolt flange with a cable operated pull switch mounted on the motor body. It appears that this is a Lucas M35G of some form, although some blogs claim the M35G had a 2 bolt mount and so can't have been used on the 918cc side valve engine. Lucas lists both M45G and M45-G1, but I don't know what the difference is between them.

If one can believe the data from:

https://mgaguru.com/mgtech/books/pdf,Lucas_starting_motors.pdf

a 6V M35G starter motor was fitted to the 1937 Morris 8 (Lucas part no. 25032). The diagrams show that there was a 3 bolt flange version, maybe also with the piggy-back manual starter switch fitted, but if so the details for this appear to be lost in time. The above document also identifies the manual switch assembly on my motor as Lucas part no. 76439. I still don't know if there was a 12V version of the M45G. I can find no identifying markings on the motor body.

What to do now?

The chances of tracking down a fully functional direct replacement starter motor looked slim, and anyway I'm still not sure if it is actually faulty.

Unfortunately I could find no design value for the locked rotor torque of the 6V M35G, so cannot make a useful assessment as to its status by measuring this definitive parameter. In fact, after much searching all I could find was a locked rotor figure for the Ford Model T FA starter of 13 lb-ft. at 580A (3V). More typically this starter would make 8lb-ft at around 160A and 160rpm. Generally it seems that a good 6V starter motor should crank OK at 4.5V or lower and the motor should be able to take 300A or more at this voltage. So not enough current means not enough torque. Makes sense. But why? Is it a 12V starter motor?

I don’t know. OK, so let’s get a measure of the torque I am getting. So out the motor came again.

Bench testing the starter motor

I set it up on the bench and took more measurements. I found a locked rotor torque of about 1.72 lb-ft. at 114A (3.3V). This figure is about 20% of the Model T starter motor locked rotor torque spec. Again, this suggests that the current drawn is too low.

So I re-disassembled the motor and measured all the intersegment resistances of the armature, and of course the field coils, looking for any small variation between like windings. Nothing to suggest any faults.

I locked the rotor again and applied 10A to the motor terminals. I measured the dc voltage drop across every component in the current path (7 elements). I won’t bother with the details, but all looked normal to me, as the field windings contributed about 20%, and the armature about 56%. The drop across the brushes in total was about 20%, with 15% coming from the upper brush set. This might be considered a bit high, but since the brushes had just been replaced, I assumed they would get better as they bedded in. At 6V, the measured resistance should allow up to 250A to flow, but at a more realistic 4.5V, only 180A. This is in the range of my own current measurements and just confirms that it looks and acts like a 12V starter motor. So I reassembled and reinstalled it.

And so it goes on

You are probably falling asleep or skipping paragraphs by now so I won’t bore you with more details of this saga. I decided to give up on 6V supply at this stage and move to plan B. This was to try starting the car with a 12V battery. This is easy to do because the starter circuit with its manual switch is completely separate from the rest of the 6V electrics.

With a 12V battery the starter motor cranked over at brisk pace. At 10V the cranking current was about 100A. Without too much more trouble the engine fired and ran intermittently, emitting clouds of blue smoke. This didn’t surprise me because I had squirted oil down the plug holes in the past. The engine ran erratically and eventually died. After cleaning the plugs it would start again, but they quickly oiled up and one by one again stopped firing. However, at least I knew it would run – sort of.

Subsequently I put quite a lot more work into the motor and the fuel and ignition systems, but I will report on this later.

Starter motor status as of now

I still do not have an answer. At 12V it works perfectly, but at 6V it lacks the initial torque to get the engine cranking. Once turning over, the current drops, allowing the voltage applied to the motor to rise. With the engine warm, it could just be started with a good 6V battery, but the cranking was still rather laboured. To all intents and purposes it appears to be a 12V starter motor. However this is highly unlikely, as I don't think 12V models with the integrated manual switch were ever made.

So, I reluctantly decided to put the issue aside and accept the reality that I would in the short term at least have to carry a separate 12V battery just for starting.

I have recently read where someone else, faced with a similar problem, added a second 6V battery which normally operates in parallel, but when starting it is temporarily changed to a 12V series configuration with a foot switch. A practical solution, but it does mean that two 6V batteries are required. I have now developed a more sophisticated solution to get 12V, but more about that in a later issue. One reason that I am reporting these issues is that they may resonate with others in the Morris 8 community and useful knowledge can be shared. Please don't hesitate to contact me if there is anything that you can contribute to my learning on any of the topics that I discuss.
That's it for this this instalment -more next time.