



Editorial

The May NKLG club meeting arrived with Roger D still on holiday and with no other volunteer Editor stepping forward, it was suggested that I should have yet “another go”.

By the time this newsletter reaches you, the Leeds Castle “Motors by the Moat” car show has been and gone. However, I can report the Leeds show was blessed with good weather and the NKLG turnout was excellent with some fourteen cars on display.

The NKLG “display team” all arrived at 8.15 a.m. as agreed and I was informed that later in the morning the traffic tailback was all the way back to the M20 junction and it took the paying visitors nearly 40 minutes to gain entry such were the numbers of visitors.

Great effort was expended by NKLG members with banners, flags and each car displayed an identical styled sheet describing something of interest for each of the cars (Thanks to Jon and Michelle).

Unfortunately, the NKLG stand did not win the best display award which went to a “kit car club”.

In the March issue newsletter, I stated that I hoped replacement front Elise disks and “softer” pads would improve the initial brake bite and suspected the previous pads of being too hard. Following careful bedding in, I can report the brakes are much improved and fitting pads suitable for very high-speed driving may not be the best option for normal road use.

Sorry, but I rather got carried away with this month’s contribution, so it is in two parts and rather more technical than normal. Part two should be published in a later issue.

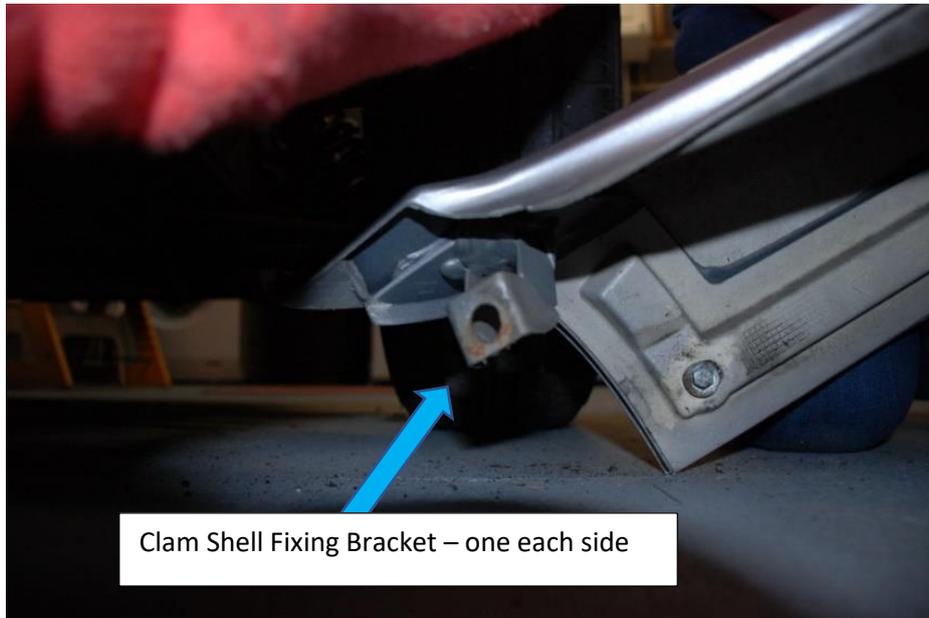
Better Late than Never – Part 1

SECTION 1

I am rather ashamed to admit that my Elise S2 heater blower fan speed control has not been functioning for nearly four years. This loss of control is very common and is caused by water ingress and subsequent corrosion leading to a smell of burning wires and total failure. Various internet reports suggest Lotus dealer repairs, including labour, can cost around £800 so there is a strong incentive to D.I.Y.

A number of internet articles state it is impossible to remove the S2 heater unit without first removing the front clam shell due to the clam’s central spine getting in the way. By following various helpful articles, I managed to remove the front clam shell on my own but my experience suggests this is not to be recommended – seek help when removing or re-installing the clam shell.

I had also been told that the two most difficult front clam shell fixing bolts to remove were located just inside the door openings. It is common for them to be seized and the mounting brackets may need to be cut off and later re-bonded (see photo 1). Fortunately, by using a very strong Allen key with lots of leverage, I managed to remove both bolts and intended to treat the threads with copper slip grease upon eventual reassembly.



Clam Shell Fixing Bracket – one each side

Removal of the clam shell revealed years of debris in the corners of the scuttle channel which is hidden by the clam shell corners, potentially blocking the drain channels (see photo 3).



(2) – A naked Elise



(3) – Blocked hidden scuttle drain channel

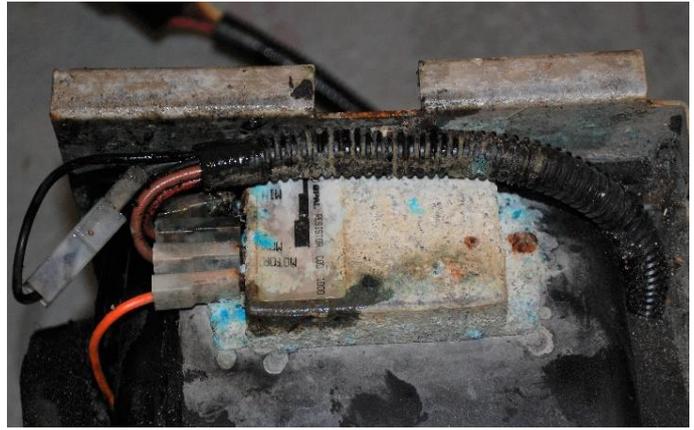
Having struggled to remove the heater box and blower motor from the very tight chassis aperture, it was obvious that the chassis compartment had over the years held copious amounts of dirt and water (photo 4). This led to severe corrosion of my aluminium blower motor speed control box and associated electrical wiring connections which are underneath the blower motor (photo 5).

It is interesting to note that the Elise S1 blower motor control system uses a large wire wound resistor mounted on the top of the heater box to provide fan speed control and does not suffer from the same corrosion problems.

But, Lotus in its infinite wisdom decided to mount the aluminium control module underneath the S2 fan motor and that seems to be a major design fault as there are NO drain holes in the bottom of the chassis. Hence if/when the chassis compartment fills up with water this leads to the well-known module/wiring connection corrosion problem and eventual failure, as in my case



(4) - Chassis compartment full of water & dirt



(5) - Corroded resistance module

Having struggled to remove the heater and fan assembly (sounds a simple job but it isn't) and in accordance with a Lotus Service note issued in December 2016, I drilled four 6mm holes in the corners of the chassis compartment floor (double skinned) to minimise future water retention (photo 6).



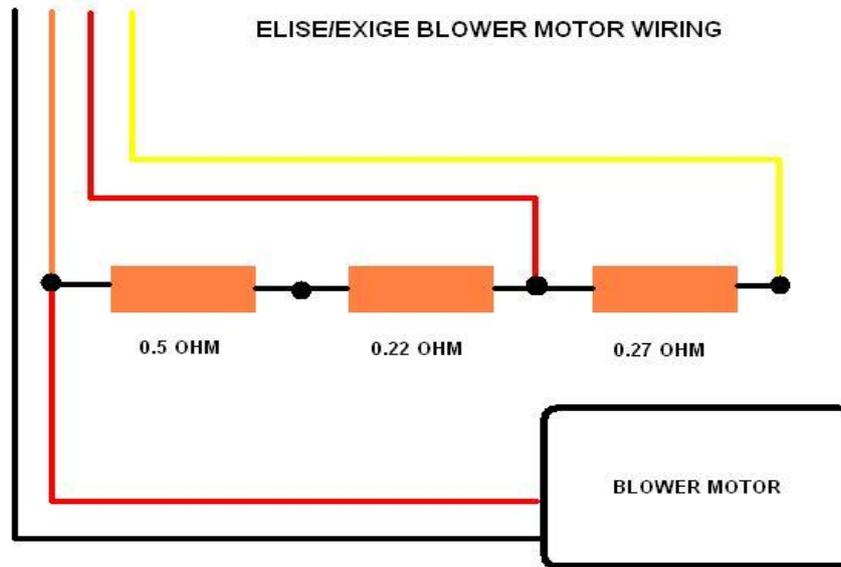
(6)- Two of the four new drain holes

Accordingly, the edges of these holes need to be treated to prevent corrosion using an AFC 50 solution. By searching the internet, I discovered that AFC 50 is commonly used to protect motorbikes from adverse weather conditions and can be obtained in various quantities and containers.

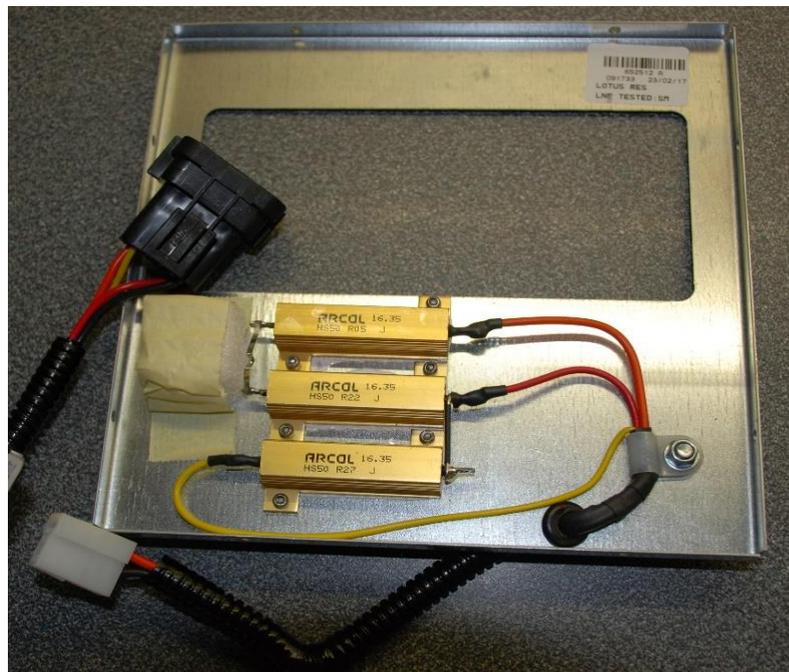
A spray can of AFC 50 costs around £12, a 0.95 L container with separate spray pump cost approx. £27 and tubes/cans of grease are also available. I sprayed the chassis compartment floor prior to the heater box re-installation and ACF 50 can also be used on the underside of the Elise floor for added protection from road surface splash.

Now to the real technical part.

To overcome this fan control problem, Lotus have designed a modification kit, part number A120P0148S at a cost of £186.12 inc VAT (Elise-Shop.Com). At that price, my first thought was to build my own control system and discovered the Lotus up-dated circuit design on the internet which is shown below:-



Unfortunately, due to the poor condition of my heater box metalwork (very rusted end plates) and disintegrating air duct sealing foam, building my own control system turned out to be a non-viable option, hence I was forced to purchase the kit shown below :-



(7) - Lotus up-dated heater fan control kit A120P0148S

As an ex electronics engineer (unfortunately, rather a long time ago), prior to purchasing this kit I decided to check the Lotus design and to make sure it was technically sound. Looking very closely at the images on the internet, I was able to identify the make and type of components Lotus had used.

The three aluminium bodied resistors used in the kit are made by a UK company called Arcol and are available from several sources including Farnell, an electronic component distributor at a total cost of approx. £12.

As you can see from the wiring diagram above, the fan speed control system circuit design is very simple electrically and easily made if you understand the design parameters and have the tools etc.

For those of a nervous electrical or mathematical nature I suggest you skip to SECTION 3.

SECTION 2

The Elise S2 Blower motor fan fuse rating is 20 Amp's. Measuring the heater motor windings with an Electronic multi-meter on its lowest resistance range gave me a value of between 0.8 and 0.7 Ohms.

Taking the mean motor winding resistance value of 0.75 ohms and using the Ohm's law formula: -

Voltage/Resistance = Current,

Hence :- $12\text{volts}/0.75\text{ ohms} = \mathbf{16\ Amps}$ current when the fan is fully on so that is well within the Elise 20 Amp fuse rating.

So far so good.

The **medium speed** setting uses both 0.5 ohm and 0.22 ohm resistors both in series with the motor winding of 0.75 ohms, (total resistance 1.47 ohms), so again using the same ohms law :-

Hence:- $12\text{volts}/1.47\text{ ohms} = \mathbf{8\ Amps}$ approx. so again the result is good.

The **slow speed** setting where all three resistors and the motor are in series, gives **6.9 Amps** so even better.

Now, each of the three resistors has a maximum power rating of 50 Watts in still air, so using the medium speed setting value of 8 Amps, being the higher current of the two slower fan speeds, the formula I used was $\text{Current}^2 \times \text{Resistance} = \text{Watts}$.

Hence :- $8\text{ Amps}^2 \times 0.5\text{ ohms} = \mathbf{32\ Watts}$ dissipated by the 0.5 ohm resistor and 14 Watts for the 0.22 ohm resistor, both values are well within the individual Arcol resistor limits.

Likewise, the calculated value for the slow speed setting was $6.9\text{ Amps}^2 \times 0.27\text{ ohms} = 12.8\text{ Watts}$ dissipation.

So, all the values are well within the individual Arcol resistors 50 Watt maximum capability and as Lotus install the resistors inside the heater's "cold air box area", the fan's air flow additionally aids heat dissipation.

The fact that Lotus used two resistors in the medium speed circuit (0.5 ohms + 0.22 ohms) rather than the nearest value available (0.68 ohms), is because the resultant wattage (45 Watts approx) would be much too close to the 50 Watt maximum for the resistor leading to the possible failure in the longer term.

So, you can see, Lotus have got it right this time but the kit costs a small fortune!

SECTION 3

Although the Lotus modification kit included wiring/connectors, I had to replace the original leads attached to the fan motor as the original wire corrosion was just too bad. Kit assembly/installation instructions were not supplied by Elise Shop.Com and only after telephoning to complain did they send me an electronic photo copy.

Their excuse is Lotus do not supply kits with instructions – although if this is true it is very un-helpful but they could have included a photostat copy of theirs. I now suspect the kits are intended to be fitted only by Lotus approved dealers.

The kit had a small block of polystyrene taped to the back plate adjacent to the resistors (photo 7) but Lotus instructions did not detail if it should be removed prior to installation. Suspecting it was just packing protection, I again telephoned the Elise-Shop to check but they had never fitted a kit and the person I spoke to was not very technical or possibly just unhelpful.

Common sense prevailed and I removed the block.

Prior to the expected struggle to re-insert the heater system into the chassis, I decided to externally connect up the kit and test it, and thankfully “it all worked”.

Re-installing the heater/fan assembly commenced with a vengeance BUT the problems I encountered is a story all on its own and will be reported in Part 2.

Regards

Vaughn

Contacts

**Meetings: 2nd Wednesday, The Moody Mare. Seven Mile Lane. ME18 5QY
www.northkentlotusgroup.org**

2019 NKLG Events		
	Date	Event
	<i>Sat/Sun 25/26th</i>	<i>Brands Hatch Masters</i>
June	Sat/Sun 15/16 th	Le Mans
July	Sun 14 th	British GP
	<i>Thurs – Sun 4th to 7th</i>	<i>Goodwood Festival of Speed</i>
	Fri – Sun 26-28 th	Silverstone Classic
	TBA	NKLG BBQ
August	Sun 11 th	Herne Bay Classic Motor Show
	Sat 17 th – Sun 18 th	Biggin Hill Festival of Flight
	Mon 26 th	Bexhill Car Show
September	Sat 7 th TBC	Brands Hatch
	<i>7th TBC</i>	<i>25th Anniversary Meal</i>
	Sun 8 th	Kent Classic Car Show, Aylesbury
	Sun 8 th	Edenbridge Car Show
	<i>13th-15th</i>	<i>Goodwood Revival</i>
November	TBA	Quiz Night
	Sat 30 th	Christmas meal Hadlow Manor Hotel. Room Rate £87. Quote 31268 when booking.
<p>TBA:</p> <p>25th Anniversary celebrations. Ypres weekend away. Fish & Chip Run – Short notice, nice weather. Recharge Run, Dungeness Power Station and Pilot Inn Dover Castle Run Howard & Jenny's with BBQ</p>		