Fuses & Breakers

by Michael Link

One of the many charms of owning a Triumph or any LBC is the Lucas electrical system—always fodder for a few jokes. Something to consider with our electrical system is the type and rating of the fuses and circuit breakers we choose.

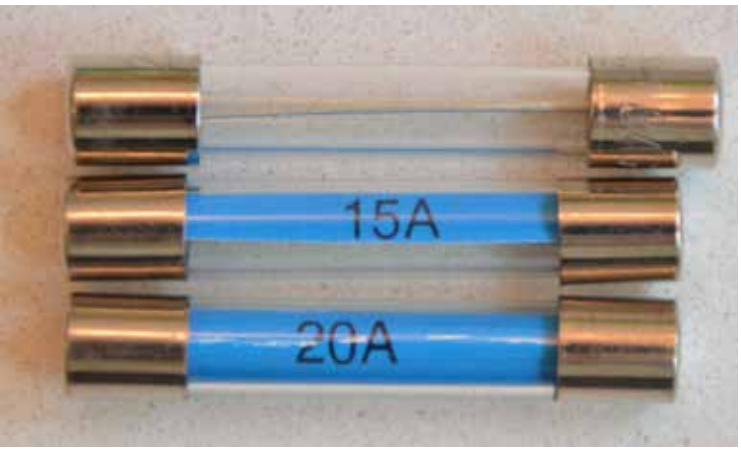
The fuses are primarily used to protect our wiring harnesses. Yes, they also protect the connected electrical components, but mostly if something is going to become ruined in the electrical system it will be the wiring. Current flowing through wires produces heat. The Stag is wired with PVC covered wire which begins to soften at 185^{0}F; the fuses need to prevent enough electrical current from flowing that would cause a wire to get hot enough to soften the insulation.

Fuses (and circuit breakers) are thermal devices which, as such, have tolerances for their performance. The glass fuses in the Stag have a filament in them, which gain heat from the electrical current flowing through. Fuses are rated relative to their current carrying capacity, and as long as the current doesn't generate more heat than the fuse is designed to handle, the fuse will conduct electricity. If the heat generated by the electrical current exceeds the fuse's capacity, the filament will melt and the fuse will blow. Minus, of course, the fuse's ability to dissipate some of the generated heat through the ambient air around it or the clips and wires attached to it. Think about the implication: in cold weather the fuses will not blow as readily as they would on a hot day; fuses that receive thermal radiation are under additional load and will blow sooner.

The fuses used in the Stag fuse box are the glass type fuses with metal caps having flat ends. These are "AG" prefix type fuses, the AG stands for "all glass" and are usually rated at 32 volts, which works because the voltage rating needs to be at least the same or higher than the voltage in the system.

Fuses are rated in several different ways. The fuse rating listed in the manual (86.70.00) is the system rating whereby fuses were catalogued by the value at which they would break the circuit. The rated value for a fuse was the current required for the fuse to blow in one second.

However, there is also another fuse rating system where the fuse amperage listed is the current that the fuse can reliably carry without blowing. This is the system you will find mostly in modern blade fuses and circuit breakers. There is about a 2:1 ratio between the values of the first system and the second system. In the first system, a 30 amp fuse with 30 amps drawn through it would blow in one second. In the second system, a 15 amp fuse with 30 amps drawn through it will blow in about one second. Confusion can easily happen here, if you mistakenly install a fuse with its value rated at its current carrying capacity and not its "blow" capacity, you could effectively have an unfused electrical system if you used the wrong rating system for your calculations.



Upper fuse is a longer AGC-type with incorrect rating . Lower fuses are OEM Lucas type

There are a couple of different ways fuses and circuit breakers are designed to act (blow or "fuse" or open). One is fast acting, which is where the fuse opens on overload very quickly. This type is not designed to withstand temporary overload currents associated with some electrical loads. These typically will open within five seconds. The other type of interest to us is the time-delay. These have a built-in delay that allows temporary and harmless inrush currents in the overload range to pass through the fuse or circuit breaker without blowing; but they are designed to open on sustained overloads and short circuits.

The Lucas glass fuses used in the Stag (AG prefix) are usually rated at the current where they will blow, and are fast acting fuses. Where you want to be careful is when adding either a fuse or circuit breaker to your vehicle; choose circuit protection so that the mistake is not made of having twice the blow rating you intend.

When selecting fuses or circuit breakers, be sure the rated voltage is at least equal to or higher than the operating voltage, which for autos is 12 volts. If you're adding a circuit breaker or a modern blade fuse to protect a circuit, the rated current (amperage) should approximately correspond to the operating current; bear in mind that a higher ambient temperature means an additional load on the fuse or circuit breaker.

Generally, the recommended continuous current of a fuse or circuit breaker is a maximum of 80% of its rated current. Use 75% if there is an initial surge from an inductive device (motors, transformers, or solenoids) or if the circuit is for large current drawing lamps such as headlights. For such current loads you might consider using time delay protection instead of fast acting.

Bear in mind too: fuses fatigue over time, their performance isn't what it was when they were rated as new. As fuses age, they tend to blow sooner than they would when first manufactured.

This discussion is intended to give some pertinent information and guidance to those adding fans, headlamp relay systems, and other added electrical circuits to their LBC's. It would be devastating to install a new circuit and put in the wrong protection resulting in the car sustaining an electrical incident - or have the new circuit keep blowing its fuse and not know why. I hope this technical note has been helpful. **SN**

*[Michael Link shares a 1973 Sienna Stag with his wife Lynn in Santa Maria, CA. He is active in the Paradise British Car Club, the Triumph Stag Club USA, Vintage Triumph Register, and the Stag Owner's Club (UK). Michael is a regular contributor to Stag News and the TSC Forum - **Ed.**]*