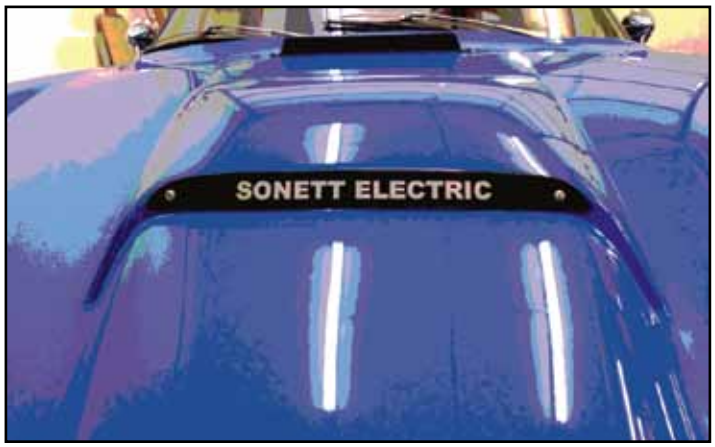
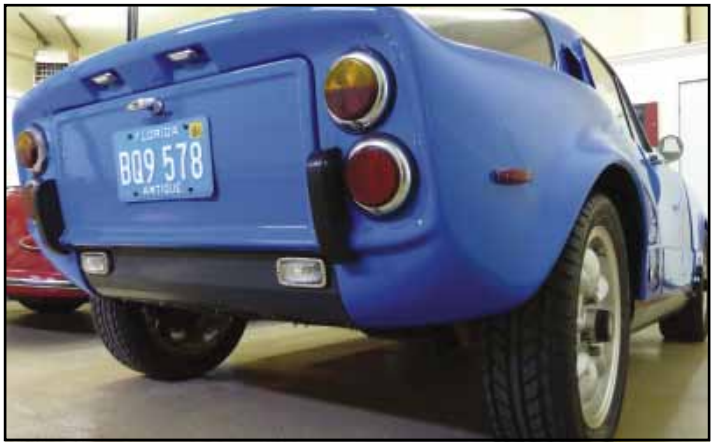
The Lithium Electric Sonett





Look ma, no exhaust pipe! Top picture shows the recharge plug port. All photographs by the author.

Eric Kriss, KrissMotors.com

I first fell in love with the quirky Saab Sonett in the summer of 1968, and now, forty-five years later, my 1969 Sonett is reborn as a lithium electric, keeping the feel and look of the original, but significantly modifying the innards beyond recognition. The "V4" has been transformed into an "EV."

Why convert my beautiful Sonett in the first place? I had completely restored the chassis, interior, and body to concours condition in 2007. But I was always fighting a mechanical battle of attrition: a bad oil pan gasket; a broken master brake cylinder; a frozen speedometer; a smelly fuel pump; a rusty water pump; an unreliable cooling fan; deteriorating wires; the list was endless. Parts became harder to find, so ad hoc fabrication was substituted out of necessity. Cannibalized parts cars kept my Sonett alive, but I could see the handwriting on the wall.

I wanted my Sonett to be carefree and new again, as it was back in 1969. Since I was already involved with emerging electric technology, this experience gave me a viable pathway. The Sonett is my second electric conversion, following a period-correct 1957 Porsche 356 Speedster. Both use a new battery chemistry – LiFePO4 or lithium iron phosphate – and a new type of alternating current electric motor optimized for lightweight vehicles. A series of incremental advances fortunately places us at a tipping point where electric conversions of classic 1950-70 sports cars becomes a practical do-it-yourself alternative.

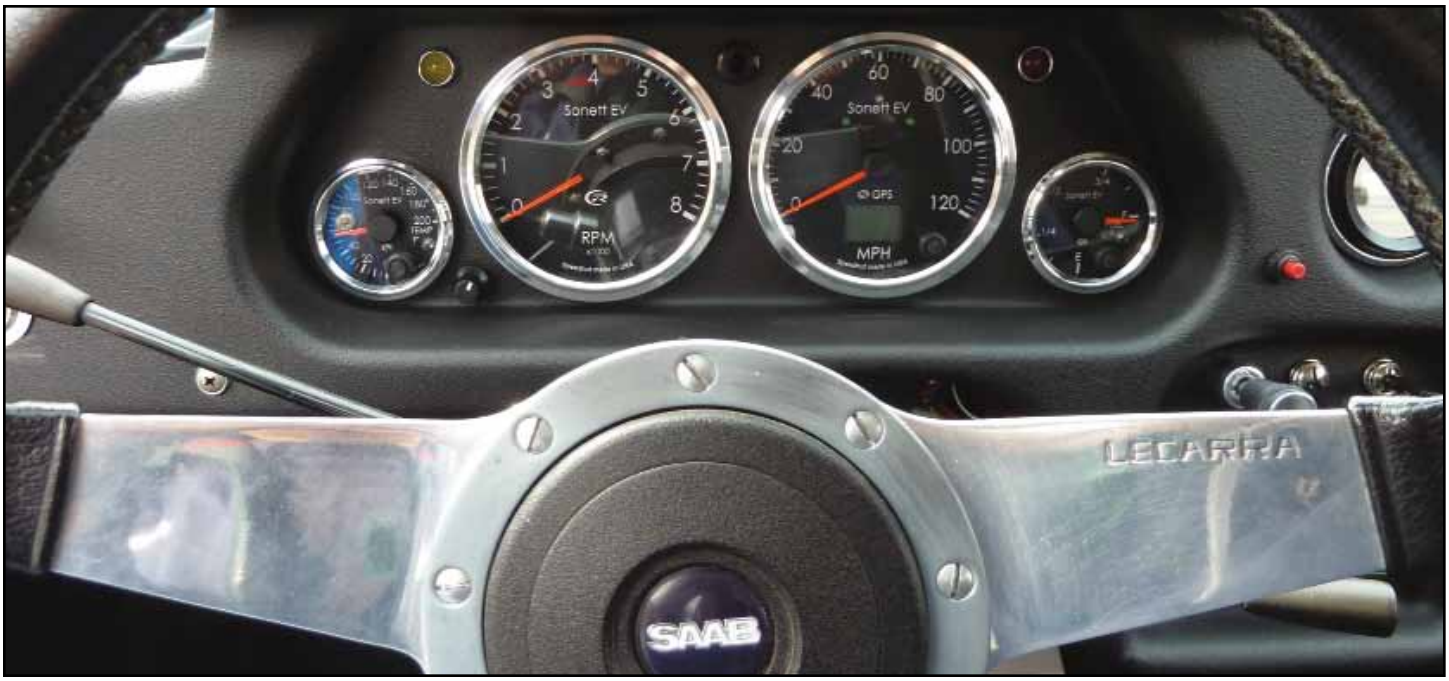
The Sonett platform, it turns out, is perfect for an electric car. It's curb weight is under 2,000 pounds, the fiberglass body does not conduct electricity (a safety feature), and the front transaxle mounts comfortably to an electric motor. I elected to replace every mechanical and electrical element with all new parts (except the transaxle), and re-purpose several aspects of the vehicle as well.

For example, an array of lithium battery cells replaces the fuel tank behind the seats, and an all-weather three-prong plug mounts where the gas cap/filler tube used to be. The black crinkle fiberglass dash has new digital instrumentation, some specifically relevant to EV operation. The rear spare tire/battery hold now contains an on-board AC-to-DC charger, a DC-to-DC converter to power the 12-volt circuit, master fuse, and battery cells. The access hole for the original fuel level sensor is re-purposed for the master cutoff switch.

Looking at the exterior, there are only three giveaways that the car is electric: 1) no exhaust pipe in the rear, 2) the recharge plug instead of the gas cap, and 3) a new front hood emblem that reads Sonett Electric. And, of course, it's quiet! But not completely silent. A gear-meshing-like sound from the transaxle and tire noise alerts pedestrians.

The original Sonett came equipped with a free-wheeling clutch, first developed for the Sonett II (c\

Continued on page 36.



Continued from page 8.)

3-cycle engines, and later retained on the Sonett V4 to satisfy emerging U.S. clear air regulations. A switch on the transmission case toggled in and out of free-wheeling, allowing the car to coast when your foot was off both the accelerator and brake pedals. I remember coming down out of the Rocky Mountains several times and saving a lot of gas that way.

An electric motor can, if you wish, completely recreate the free-wheeling profile, although the transaxle must have the original free-wheeling mechanism disabled. In fact, the degree of free-wheeling is programmable, so you have even more custom options. I've set my Sonett to exactly mimic my original free-wheeling, but I also now get regenerative braking that feels like power brakes. This, too, is completely programmable.

When triggered by a pressure transducer (a device that translates hydraulic fluid into a specific voltage), the motor controller induces resistance in the alternating current motor that slows the vehicle without the brakes. At the same time, the mechanical brakes also slow the vehicle, and the two systems are additive. You can set any level of "power" brake you wish, depending on terrain or driving style.

Another difference in electric driving technique involves the clutch. Without current from the battery pack – that is, when your foot is off the accelerator – the electric motor does not turn at all. So you can shift without use of the clutch, much like with the original free- wheeling design. But the electric car pushes this even further. When the Sonett is completely stopped, you simply let out the clutch while in gear. The motor is not rotating so the car doesn't move. When you accelerate, the clutch – already engaged – moves you forward. This is more like an automatic transmission, but you still shift at the same RPM points, so the Sonett retains its sports car feel with a power brakes bonus.

I did give up one creature comfort however: heat. The original heater core was, of course, removed since there is no longer a radiator or any coolant. An electric heater can be installed, but I'm a warm weather driver in the Sonett anyway. All the other systems work like a gas-powered vehicle: lights, wipers, cabin fan, horn, flasher, and so on.

There are two prior Sonett III electric conversions that I'm aware of, but these early pioneering efforts date back to the days of heavy lead-acid batteries, and performance suffers accordingly. My Sonett Electric is a different animal. Acceleration is very brisk, much faster than the original, and handling is better too, since the center-of-gravity is lower with excellent weight balance. Curb weight is about the same as the original.

The trade-off is range. I'm still doing test drives, but I expect my range to be about 65 miles. So, no more trips across the Rocky Mountains, but I will be able to zoom around town with a brand new vintage car, and – forgot to mention – no maintenance. The electric motor has one moving part, and it should last at least 500,000 miles. The battery pack has a very robust recharge cycle, and it should last at least 300,000 miles. And my electric recharging cost works out to

Engine bay detail.

around $0.015 per mile, economically the same as 275 MPG!

I've tried to anticipate some common questions:

How much does a concours quality conversion cost?

Between $12,000 and $20,000 assuming the Sonett chassis, body, interior, and transaxle is already in excellent condition.

Can I convert my Sonett to electric drive myself?

Yes. Only a few special tools are needed, and fabrication/assembly is no more complicated than typical engine work. A lift is helpful, but not required.

Is an electric vehicle safe?

Yes, if you follow a few simple safety rules and precautions, an EV is no more dangerous than a gas-powered vehicle, either to drive or work on. Battery terminals can be safely touched with your fingers.

What parts are removed from the gas-powered Sonett?

The engine, exhaust, radiator and hoses, heater core, gas tank, fuel pump, alternator, coil, 12-volt battery, wiring harness, accelerator pedal, instrumentation, and a few other parts related to gas-powered operation.

What mechanical parts are retained and/or refurbished?

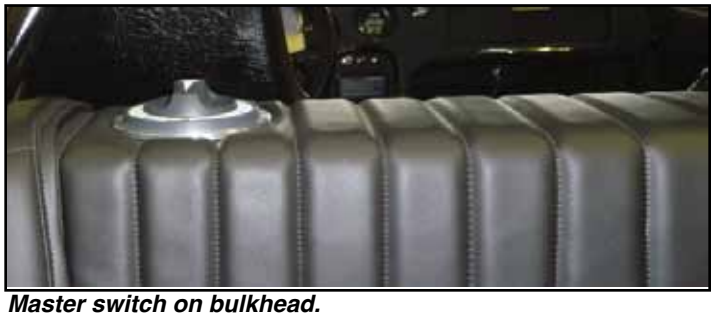
The brakes and brake lines (although a modification is required for the pressure transducer), clutch and master/slave cylinders, brake master cylinder, flywheel (it can have the ring gear removed to lighten it), and transaxle.

How heavy are the batteries?

There are 38 individual cells, and they each weigh about 7.5 lbs., or about 285 for the entire pack which is distributed in the front and rear of the vehicle.

How long does it take to recharge the batteries?

Using standard 120-volt household AC current, an 80% discharged battery pack will be fully recharged in about six hours.



Master switch on bulkhead.

Can the electric Sonett be licensed like a gas-powered car?

Yes, but regulations vary by state. My Sonett, for example, is registered in Florida (with an antique license plate) without any restrictions or limitations.

Do I need a special home charger installed?

No, the Sonett can be recharged from any three-prong socket with an extension cord. If you have a convenient outlet at work, for example, you can comfortably commute 40-50 miles one way, recharge during the working day, and drive home fully recharged in the evening.

Where can I see the lithium-powered Sonett?

Since there is only one in the world so far, you may have to travel. I plan to show the Sonett Electric at the Larz Anderson Auto Museum's Swedish Car Day on August 25, 2013 in Brookline, MA (http://larzanderson.org/events/lawn-events/2013-lawn- events/swedish-car-day).

If I'm seriously interested, what's the next step?

I suggest you get the Sonett Electric Owners Manual (available from http://www.lulu.com/shop/kriss-motors/sonett-electric-owners- manual/paperback/product-20517674.html). This 63-page book covers all major aspects of the installed technology, including complete wiring diagrams and components. My web site, krissmotors.com, has additional information as your planning progresses.