

TechniCorner: Here comes the Battery Blaster

By Ken Koch, KTA Services Inc.

It's good to be back at the typewriter once again after taking a couple of months off between TechniCorner article. Having suffered a "digital subtraction lesson" at the hands of a folding chair, typing has been on the slow side. Full healing may take months, but good progress is being made. Thanks for all the get-well wishes and all the "9 and 2/3" teasing.

In the last TechniCorner article, we discussed upgrading an EV to 144 volts for more performance using the new Curtis-PMC Model 1231C-8801 motor controller. In that article, we concluded that the growing trend with EVs was toward better "performance" — which generally meant improved acceleration. Acceleration, of course, is affected by the weight of the vehicle and the torque developed by the motor. It can be improved by lightening a vehicle and/or developing more motor torque by employing a higher-current controller or controllers. Along those same lines, we'd like to discuss a unique new way to link up 2 motor controllers to 1 motor for improved acceleration.

Early efforts

EV hobbyists first got wind of Curtis-PMC's intent to manufacture a higher-performance controller around mid-1993. For the following 18 months, while Curtis's 1231C development work ensued, some hobbyists tired of waiting for the promised new controller. During this 18-month period, 6 or 7 individuals or companies began developing high-powered experimental controllers to satisfy the perceived demand. A few hobbyists even experimented by trying to hook up 2 Curtis 1221B units in parallel, attempting to deliver 800 amps to a motor from a pair of 400-amp controllers. Most of these experiments didn't pan out, as master-slave synchronized switching must take place for parallel Curtis units to multiply current.

Synchronizing the electronics requires opening up and modifying the controllers — a complicated process that voids the

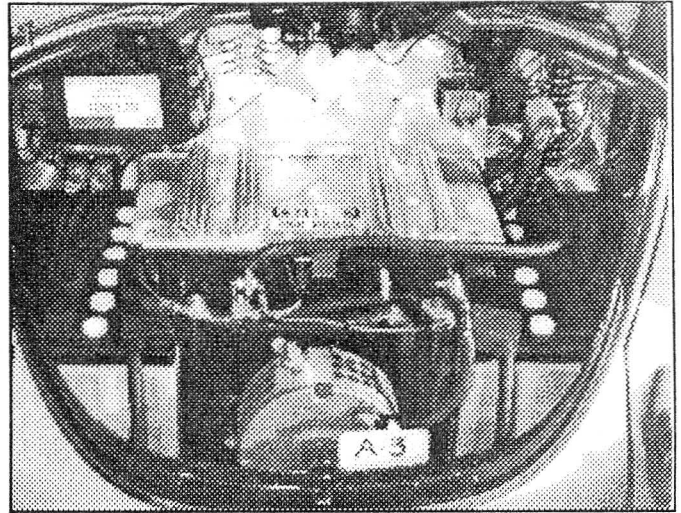
factory warranty and puts the controllers at risk. Well, then, what's the best way to get more torque to the road? Two medium-sized motors driven by 2 medium-sized controllers? One big motor with 1 powerful and very expensive experimental controller?

Capt. Glenn Roach and others affiliated with Replica Roadsters took a close look at the challenge and came up with a novel approach: using 2 traditional unmodified Curtis-PMC controllers and one slightly modified Advanced DC motor.

Enter the Battery Blaster

Capt. Glenn has built several electric vehicles, all of them with a masterful touch of quality and attention to detail. His motto is "No electric slugs — kick-butt performance only!" His latest performance creation has been dubbed the Battery Blaster (TM). To some degree, the technical details are proprietary, so this article will present only as much detail as we can without divulging all of the technology.

In a typical 4-pole, series-wound motor such as those manufactured by Advanced DC, there are 4 field windings spaced 90 degrees apart. With the larger motors, windings opposite each other are placed in series, and then the 2 series combinations are wired in parallel. The overall motor field represents 4 sets of magnetic "poles," oriented alternately as north-south-north-south. Armature windings receive their power via the brushes and commutator. The armature winding groups are excited 2 at a time. Armature windings switch pole polarity between north and south as the armature rotates through the field. Continual



Two controllers, a heat sink, and a high-voltage wire.

magnetic repulsion of like poles keeps the armature in motion, thus producing the motor's torque.

Capt. Glenn has devised a new way to modify an Advanced DC series-wound motor so the armature winding groups are split off into separate connections, each excited by a separate (but equally matched) motor controller. The technique doubles field current and armature current through the motor, and thus increases torque by as much as 2 times. Aside from producing increased torque, other advantages are greater acceleration, longer controller life at half the amps per controller, and greater capacity for heavier vehicles.

The actual implementation requires opening up the motor, changing the internal wiring, drilling through the case to add a third armature terminal, and then silver soldering a high-current wire to the added terminal. The photo shows one of Captain Glenn's Battery Blaster installations in his own Volkswagen Super Beetle. Note the 2 Curtis 1221 controllers mounted to a heat sink and the terminal identified as A-3 on the commutator end of his 8-inch Advanced DC motor. This is the terminal which is added to the motor and connects to the second controller.

If you plan to take advantage of this technology, you can ship or bring your motor to Capt. Glenn's shop, and he

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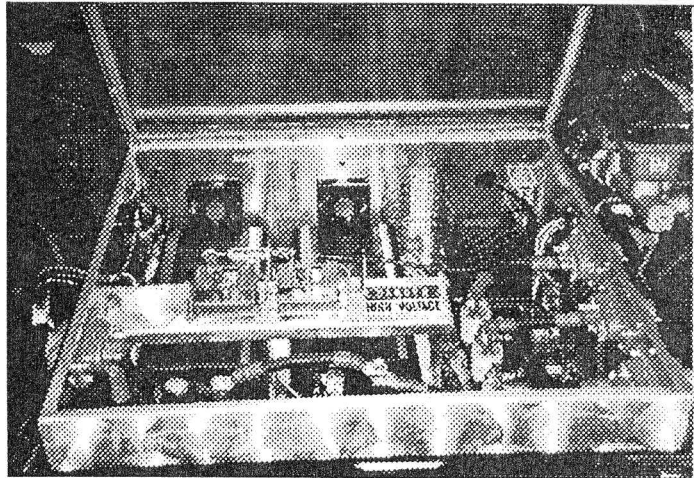
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can modify it for you for a price. Two controllers and 2 potboxes of the same rating are required. The potboxes are tied together by a mechanical linkage. Synchronizing controllers for equal current can be accomplished by readjusting the potbox shafts for equal resistance, or by simultaneous monitoring of the motor control currents while readjusting the potboxes.

Of course, you can buy the works in an electronic control module (ECM) box as shown in the adjacent photo. This particular installation features twin 1231C-8601 controllers, PB-6 potboxes, and other goodies. It runs at 144 volts and is installed in Saxe Dobrin's new Chevy S-10 truck conversion.

Additional controllers, potboxes, higher-current fuses, shunts, and meters can be purchased through KTA Services.

(For more information, contact KTA Services at 944 W. 21st St., Upland, CA 91784, phone 909-949-7914, fax 909-



The electronic control module.

949-7916, or Replica Roadsters, 17508 Delia Ave., Torrance, CA 90504, phone 310-329-5436, fax 310-329-8736.