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AUTO ELECTRIC CORNER

Hyundai Starter, VW Alternator, Starter Fuse

IT WORKED FOR ME

Rivet Jig, Long Drill Bit, Flat Screwdriver Bit, and Chain Vise

TECH TIP

Generator Regulator Conversions

A WORD FROM THE PRESIDENT

A Change In the Association's Staff



Fellow ERA Members, I regretfully would like to make you aware of correspondence that I received from ERA Exchange Magazine Assistant Editor Bob Thomas just prior to leaving for Cincinnati, Ohio for the 2020/2021 ERA Trade Show Expo. In Bob's Memo he expressed that the task of being involved with the ERA Exchange Magazine has become overwhelming for him during his retirement age of 72. Unfortunately, he has been dealing with health issues for the last year and a half. While not life threating, he feels that it limits his productivity and the quality of his writing suffers. For these reasons Bob expressed that he felt it would be best for himself and the ERA that he step aside from the ERA Exchange magazine position.

You, as have I, would have never known, as the quality and content of his recent technical articles were of the highest standards of technical information journalism. I called a special Executive Board meeting along with Bob Thomas on June 2nd to hear what his intentions are concerning the ERA Association moving forward. Bob expressed that he was willing to stay involved with the ERA Association, which would include remaining as a liaison between the ERA and the ERA website contracted maintainer/ programmer, Whatcom Electric. He will continue to proof read the ERA Exchange magazine before being sent to the contracted printer firm. Bob also expressed that he would like to continue to help fellow members who call him with technical problems and other related industry questions, along with helping the ERA office with membership website issues.

The Executive Board expressed to Bob that the association was very grateful and appreciative for all his time and work since the inception of the ERA Association in 2001 and that we respectfully honored his request. Bob Thomas is a Founding, Charter, and Honorary Member of the ERA Association. Bob also served many years with the Executive Board, Board of Directors, and Advisory Board.

The Executive Board along with Bob renegotiated and agreed to revised terms with B&H Tech Services for contracted services. Bob, I can't thank you enough, The ERA Association website would not exist if it weren't for yourself & Wes Grueninger. Both of you should be very proud of your accomplishment of the best industry wide global technical data base for our industry.

Now for the members, I along with the Executive Board have been interviewing with 4 other industry technical journalist to maintain the technical articles that you have become accustom to within the monthly issues of the ERA Exchange magazine. The Executive Board has negotiated and contracted with our own Technical Advisor Mohammad Samii and rebuilder member Nathan Unger to produce and provide one technical article each per month to be published in the ERA Exchange magazine. Also, North Central Regional Vice-President Bob Hopko, along with the approval from his superiors at Mahle, have agreed to provide complimentary industry trade related articles to the ERA Exchange magazine. Thank You Mahle & Bob Hopko for your generous support to the ERA Association. My hope is that you will continue to look forward to receiving the next issue of the ERA Exchange monthly magazine.

Ken Plourde

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ABOUT THE COVER

Close up of a regulator mounted on a generator

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BY MOHAMMAD SAMII

Occasional Customers

We all have clienteles, either individual or business customers that only show up when they cannot find the part or the unit they need after looking in all the possible places. There are also garage customers who are stuck in a certain electrical/electronic repair, and after unnecessarily changing a lot of parts and still not fixing the car, they need our help to bail them out. Regardless of the type or headaches, these customers can occasionally present us with challenges or odd units that can turn into a good learning experience. Here are a couple of such examples:

A failed 19090 Hyundai Starter

A local shop who is one of those occasional customers for diagnostic and troubleshooting called some weeks ago about a no-start condition on a 2013 Hyundai Sonata. This shop does not buy our units, so most of the work they send will usually have an alternator, starter, or battery installed that they have purchased from the lowest bidder. Of course, we charge them for our time accordingly. This vehicle also had a new starter installed lately.

The above Sonata has a push-button start switch. The condition of battery, power and grounds were satisfactory. Once we saw the "S" terminal signal was present when the start button was pushed, it became obvious that the starter was the culprit. Lifting the vehicle up and taking the splash shield off, the burnt odor of the solenoid or armature's winding became strong enough to suggest that the starter or its solenoid was indeed the problem.

Since the starter was under their warranty, I agreed that if they would supply another starter, we would install it, which is contrary to our policy of installing customer supplied parts. A new 19090 starter was sent in (*Figure-1*), installed, and the vehicle cranked, started, and ran fine. We also replaced the starter relay as a safety measure because I could not assess what kind of damage it had suffered from repeated application of power to the starter solenoid. More about this later in this column.



Figure 1 – A New 19090 Starter (Aftermarket)

About two weeks later they called and said the same problem persists, and the car would not start. They agreed to tow the car in for further inspection. This time after the starter button was pushed, it seemed the starter engaged and made that light groan, as if it was trying to turn the motor but could not! This prompted us to check the engine mechanically for any issues. A big wrench over the crankshaft pulley nut would not budge the motor. The engine was solidly locked up…!

A search of the service bulletins and recalls showed there indeed exited an issue with this particular vehicle. The National Highway Transportation Safety Administration (NHTSA) has issued a recall, possibly affecting 527,000 Santa Fe and Sonata vehicles with 2.4L engines made in 2013-2014. The same engine that our troubled car had.

The NATSA campaign # 12V226000 states: *"Hyundai Motor America (Hyundai) is recalling certain 2013-2014 Sonata and Santa Fe Sport vehicles. Machining error during the engine manufacturing process may cause premature bearing wear within the engine."* The campaign adds *"Bearing wear may result in the engine seizing, increasing the risk of a crash."*

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The remedy for the affected vehicles is the replacement of a short block engine by the dealer at no cost. One can only guess the cumulative cost of this repair to the car maker which is estimated to affect 572,000 vehicles…!

The field reports from the people who have experienced this problem shows the affected engines would run normally with no indication of any problem, but at times the starter fails to crank it over. Sometimes after sitting a short while it clears up, and starts and runs with no problem again until the next time.

We reported the VIN to the shop that had send us this vehicle, and after following up with the dealer, they confirmed that this vehicle was one of the affected ones, which was then towed to the Hyundai dealer to comply with the campaign.

Incidentally the19090 starter used on this vehicle was the subject of a TSB and Recall a few years back. The shift lever would break and prevent the starter from cranking the engine. It would just spin like a defective starter drive. A repair kit provided by Hyundai included a new stronger fork (*Figure-2*) and detailed instructions for its replacement. The process of changing broken shift-lever was rarely done at the dealerships, they just changed the starter either under warranty or charged the unsuspecting owners. The OE Valeo shift levers are available at minimal prices (J&N, Wagner). We always keep a few in stock.



Figure 2 – Shift Lever Fork

VW Beatle Alternator

Another repair shop who we unsuccessfully have tried hard to convince to do more business with us brought in this VW alternator to be tested (*Figure-3*). This shop, despite praising us for quality work and rebuilding units for them that they could not find anywhere else, is still not a regular customer. We of course charge them accordingly for any kind of bench testing.



Figure 3 – VW Alternator (9 120 080 122)

This VW Beatle alternator, a Brazilian made Bosch (9 120 080 122, Lester #13080) has an internal regulator and looks and mounts like the older 13048 alternators that had a 3-pin plugs and were externally regulated. But this alternator has a one pin plug, which is its +D (L/Trio), and the output stud. (*Figure-4*)

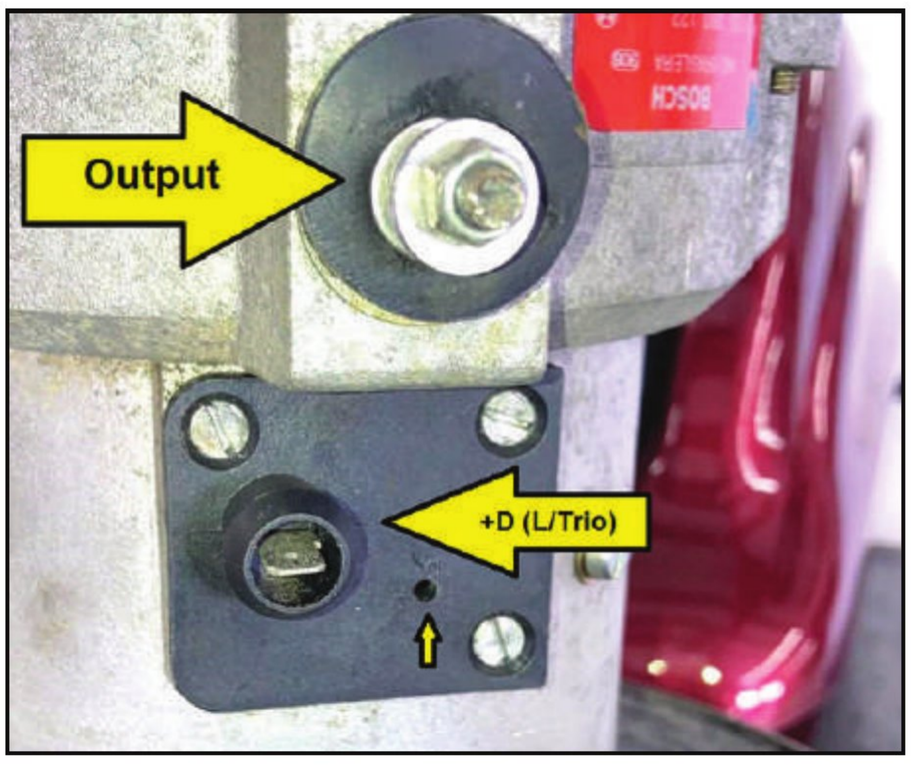

Figure 4 – VW Beatle Alternator Terminals

Removal of the fan and mounting plate is of course necessary for testing this unit. It was run on the test bench and found to be defective. The light would stay on and there was no output. Next step was to find a way to bypass the regulator to get an idea what could be wrong with it.

The internal regulator (a WAI IB-359) is an "A-circuit" regulator with leads attached to the brush holder. Since there was no other access to the regulator, I removed the brush holder, soldered a piece of wire to its field terminal, drilled a small hole in the cover to bring the lead out, and then reinstalled the brush holder. Now grounding this wire would by-pass (Full Field) the

regulator to give me an indication for the stator and rectifier condition. (*Figure-5*)

Bypassing the regulator did not produce any significant amount of output (less than 20 amps) which made me to believe something was wrong with the stator/rectifier combination. Or perhaps one or two blown diodes out of the three that constitutes its diode trio, as I could not detect any growling that indicated a phase imbalance. Surprisingly all the major parts as well as new units are available and are moderately priced.

So an estimate with options for rebuilding or exchanging was prepared and submitted, but that was the last time we heard from this shop. I cannot say our estimate was so high that they found one much cheaper on the internet. The fan and the mounting plate along with a clamp are still in my custody, and those items do not come with an internet unit. So we are still waiting to hear from them but regardless of whatever the case is, if they don't claim it soon, I will be the owner of this complete 113080 unit after I rebuild it for our stock. Maybe getting paid in advance is an incentive for this kind of customers to pick up their units...!

Starter Fuse

I try to reflect on some of the posts on the ERA forums, and by expanding it here in this column, I hope to reach more than the limited number of members who are website regulars.

One such subject is the consequences of a clicking starter that does not crank but only clicks, and then blows a fuse. We know a typical solenoid consist of two internal coils, Pull-In and Hold-In coils (*Figure-6*). Let's suffice to say that the two coils will be in parallel configuration at the moment the "S" terminal power is applied. This will draw the highest current from the circuit but last a very short time (a few milliseconds).

Once the contacts are made and armature starts to spin, the voltage across the Pull-In winding equalizes, and the only draw through the ignition switch (or

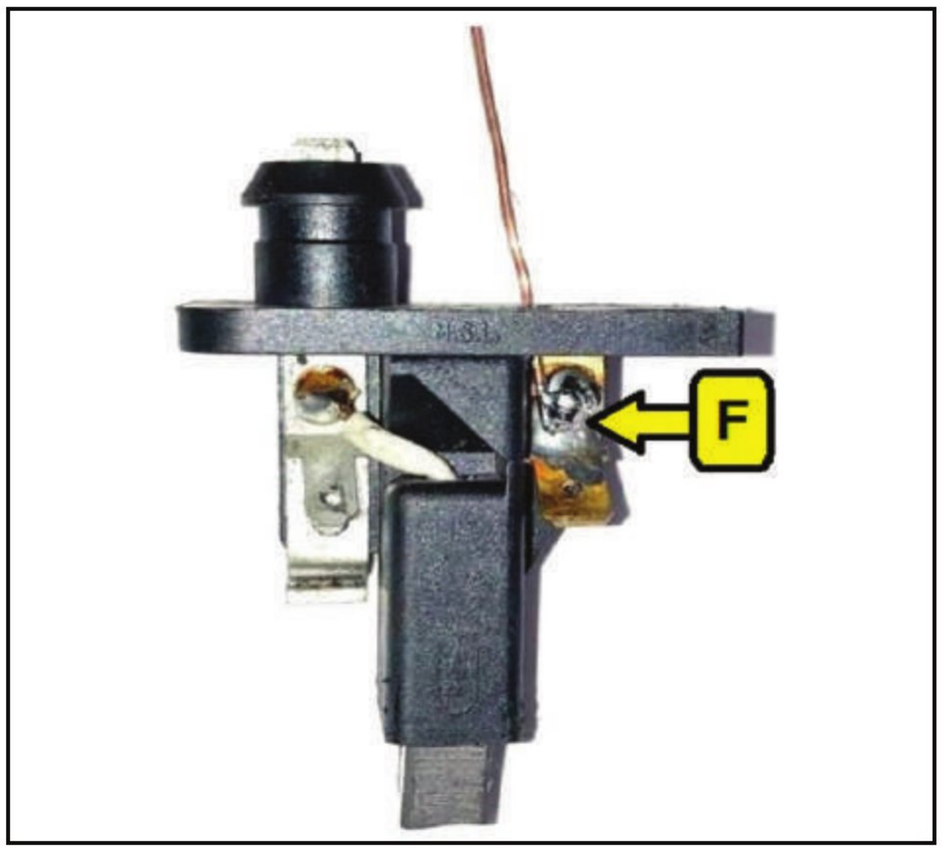

Figure 5 – VW Alternator Brush-holder

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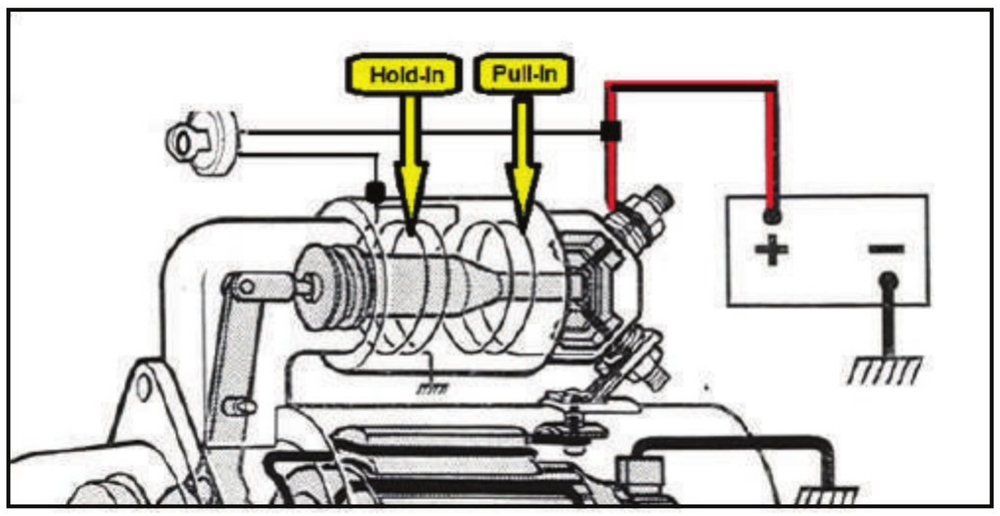

Figure 6 – Starter Solenoid Coils Arrangement

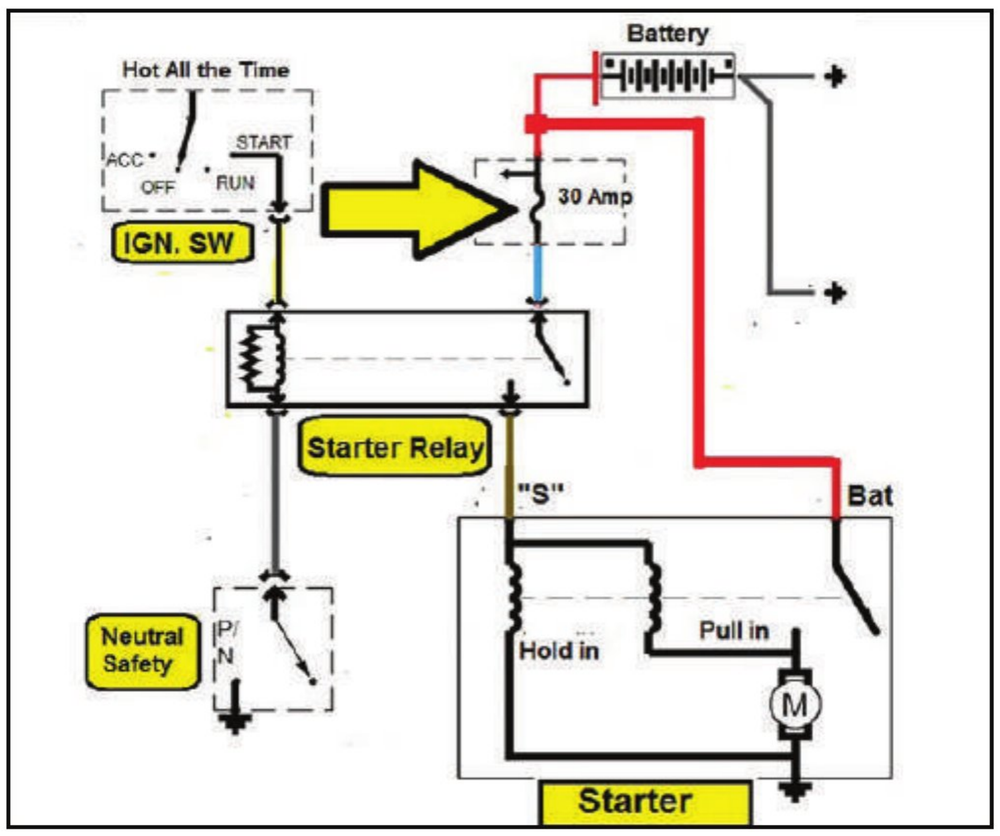

Figure 7 – 2000 Dodge Starting Schematic (Partial)

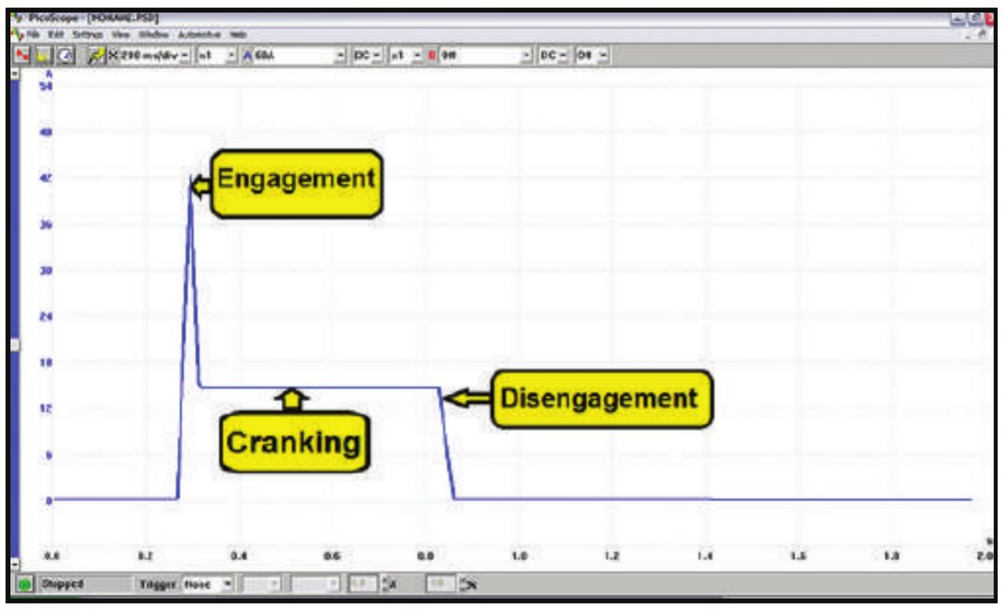

Figure 8 – Normal Starting Solenoid Current

starter relay) will be the current through the Hold-In coil, which is usually about 10-15 amps. So when the starter clicks but does not crank, the higher current is sustained much longer. This can affect the points on the ignition switch, starter relay contacts, or the fuses such as starter or starter relay fuse.

To demonstrate this, I will cite a case we had with a 2000 Dodge truck with 5.9L diesel engine. The starter fuse would blow at times which would prevent cranking (*Figure-7*). The problem happened so often that I was able to capture the wave-form with the PicoScope when it cranked and when it did not and blew the fuse. Figure-8 shows the normal graph of the solenoid



"Current" which peaks at 40-amps momentarily but drops as soon as a good contact is made. Figure-9 shows the same current which does not drop, and blows the fuse, as shown by an immediate drop of the current to zero. You can see the pitted solenoid contact in Figure-10 that was the problem with the above truck.

In such cases, consequently the new starter that will be installed will not crank (due to blown fuse) or show symptoms soon due to damage to the ignition switch points on applications that the starting circuit is not protected by a fuse. A good example of this was the ignition switch failures on older Chevy cars which had a 3510 starter replaced due to repeated clicking of the old one, but shortly afterward it would not crank reliably until the ignition switch was replaced …!

That's all for this issue. Until I see you again, keep up the good work.

You can contact Mohammad Samii by email at: sammyselectric@sbcglobal.net, or by calling the ERA Tech Help Line at 636-584-8324

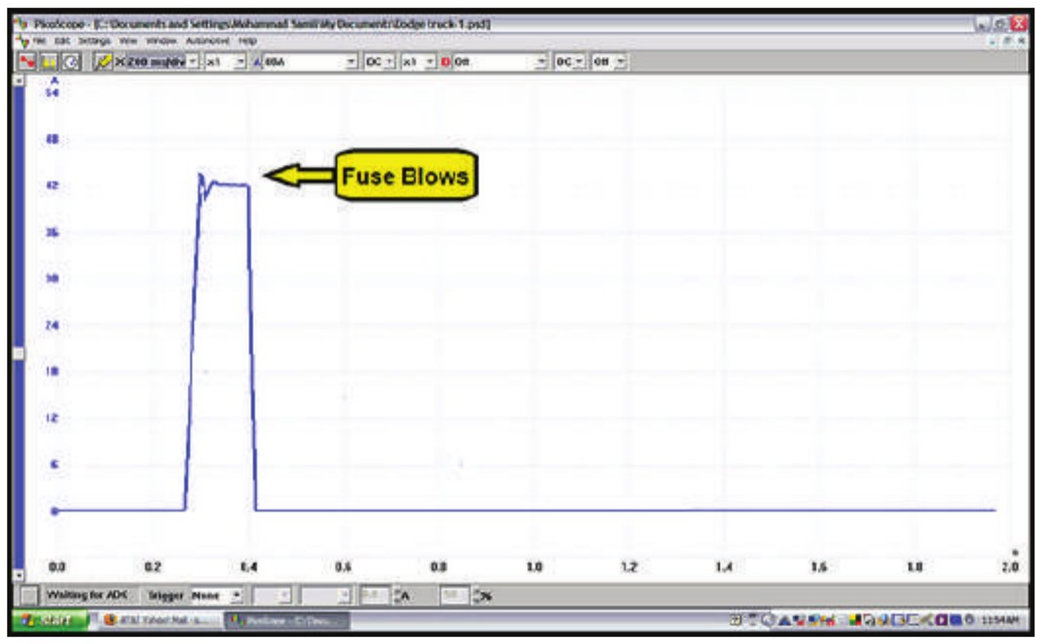

Figure 9 – Worn Contacts Results in Blown Fuse

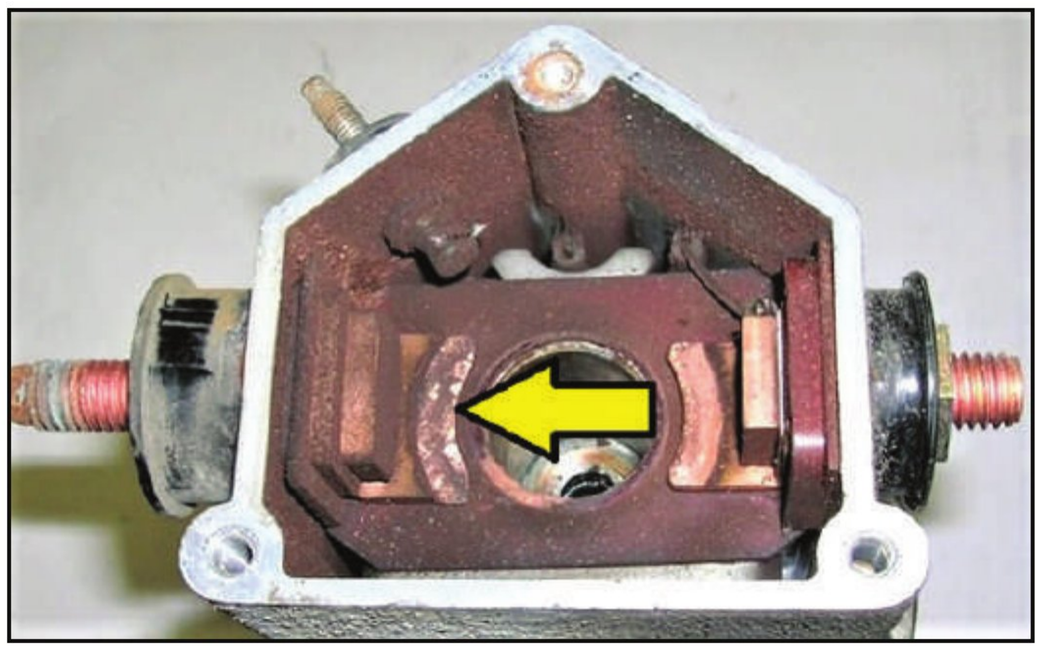

Figure 10 – The Solenoid's Worn Contact



IT WORKED FOR ME

Rivet Jig, Long Drill Bit, Flat Screwdriver Bit, and Chain Vise



BY NATHAN UNGER

I made a base with a 1/2"-3/8 “adapter tack-welded in the middle. I glued a washer onto it so the socket attachments won’t wobble. This jig comes in handy when using the arbor press or the drill press. (*Figure 1*)

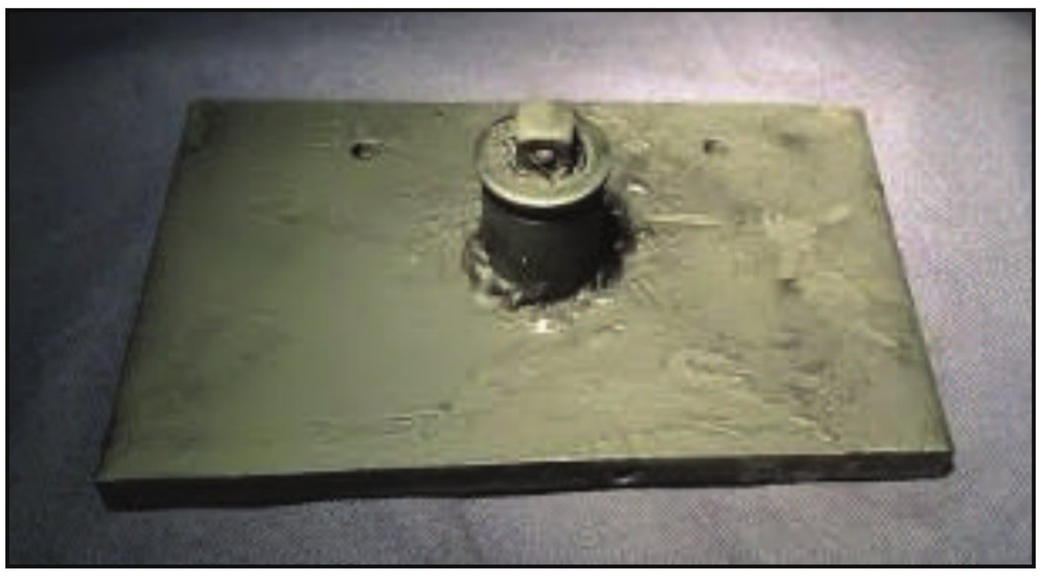

Figure 1

When drilling out squeeze rivets or pop rivets, you have to be careful because as soon as you go deep enough to weaken the rivet, it will start to spin, and then drilling becomes impossible, also destructive if holding plastic parts. Remember the really old Dodge gear reduction starters with the plastic brush box?

I took a small socket, and used a die grinder to make some counter-clockwise-pointing teeth on it like a crown. I also machined the socket down to a smaller diameter to fit in tight places. (*Figure 2*)

A carbide bit in the lathe tool-holder works great on hardened steel.



Figure 2

I put this on my base/adaptor jig as a rivet-head support. The more pressure I put on the drill press, the firmer the grip. Once the drill has gone through the rivet, the drill bit simply goes down into hollow of the socket.

If you are really fussy to not disturb the parent material, you can drill an undersized pilot hole first. But then go only halfway down, not all the way through. Then you put a punch (even smaller than the drill bit) in the hole and push or tap the rest of the rivet out. This has the advantage of stretching the rivet material, making it thinner so it comes out easier. If you attach a socket just bigger than the head of the rivet (to support the parent material) on the base/adapter, then you can use your press instead of a hammer to push the rivet out.

If working with pop rivets, I try to clip the mushroomed material off of the rivet first, then punch the nail out from the other side. Then I drill and tap the rivet body out.

****

From a local machine shop supplier, I ordered a 1/16 drill bit that was like, five or six inches long.

What for, one might ask? Sometimes I have to take a 22SI or Leece Neville alternator apart again after rebuilding it because the turn on rpm is too high, or some other issue. But I don’t want the brushes to come out of the holders and get grease all over them from contacting the rotor shaft as I pull it apart.

By carefully drilling a hole through the brushes and brush holder, (*Figure 3*) and installing a temporary brush pin before I take the alternator apart, I can avoid these issues. It won’t hurt the brushes or the brush holder to have that little hole. Then while holding the brushes in place, I can pull out the temporary pin and put the proper pin in place to retain the brushes correctly.



Figure 3

IT WORKED FOR ME

Sometimes I break a flat screwdriver bit and want to cut the shank back to make a new flat bit out of it. I have a 1/16" thick cutting wheel on one side of my bench grinder to use for that, but it's really difficult to get the two flatted sides exactly parallel. So, I attach a tiny locking plier to the shank. I let gravity align my bit to the grinder wheel. (*Figures 4 and 5*) Then I can grind on first on one side of the bit, then on the other, and the bit will have parallel sides (mostly).



Figure 4

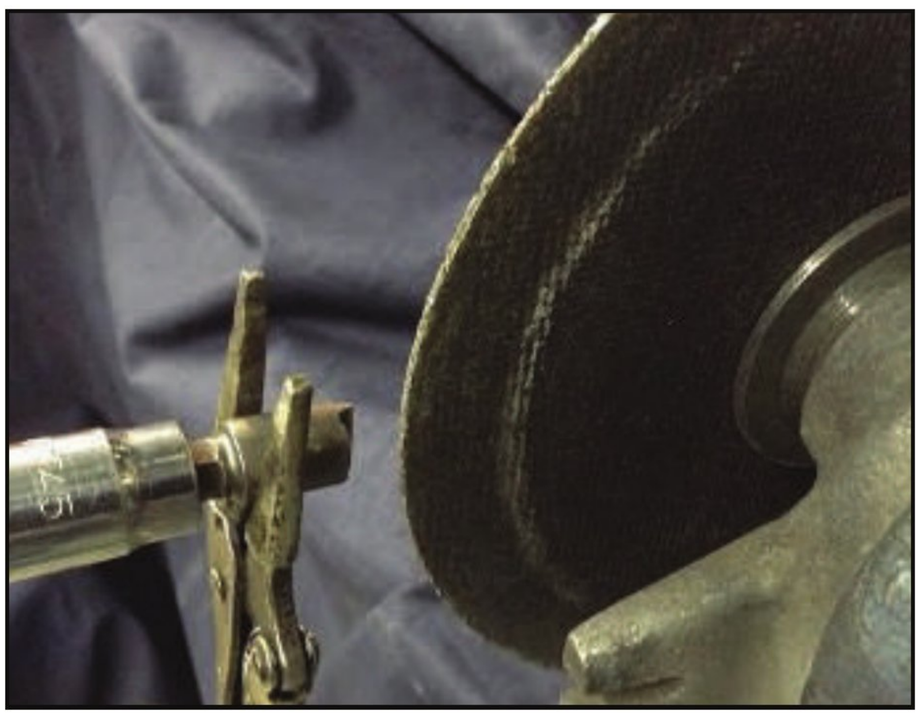

Figure 5

It's also good to make the bit not only the correct thickness, but also a little bit wider than the screw head. Most of the pressure will be at the very outer circumference of the screw head (in the slot), so that's where the bit will usually break, or else deform the screw.

****

I bought two chain vise-grips. With just a pin punch and a support socket, it's easy to make one out of two so it has a long chain. (*Figure 6*)



Figure 6

It's great for large odd shaped objects. On my Crumbliss 2495 starter load tester, it is handy to use the chain vise to secure starters. I hardly ever do two of the same starters in a row, so this is a way to mount a starter quickly. (*Figure 7*)



Figure 7

If anyone out there has more ideas, post them in the "It Worked For Me" section of the ERA forums. You never know what might get published!

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TECH TIP
Generator Regulator Conversions



BY LARRY HAGEMEISTER

The mechanical voltage regulators that we are getting today are not much better than junk. Whether they are made in China, India or the good-old USA, none of them work properly out of the box. Sometimes they can be recalibrated, but sometimes you waste 20 minutes only to learn that the one you bought for a customer cannot.

I have been converting them for a long time instead, using electronic regulators and 50DN diodes. Some are easier to convert than others. A recent challenge was a Delco 6-volt, positive ground system (*see Figures 1, 2 and 3*). I had to slightly reconfigure the generator to make it work, thanks to Mohammad Samii who provided the diagram. The voltage was a little low, 6.9 to 7.1 because of the diode but it was a 30-amp generator.

The Ford was a conventional 12-volt negative ground system (*see Figures 4 and 5*). It worked out good using a M5-130A adjustable regulator. I built the Ford regulator in about a half an hour using less than $16.00 in parts.

Larry Hagemeister is the owner of HEI in Lebanon, OR. You can contact him by phone at: (541) 259-2262 or by email at: hei@usa.com

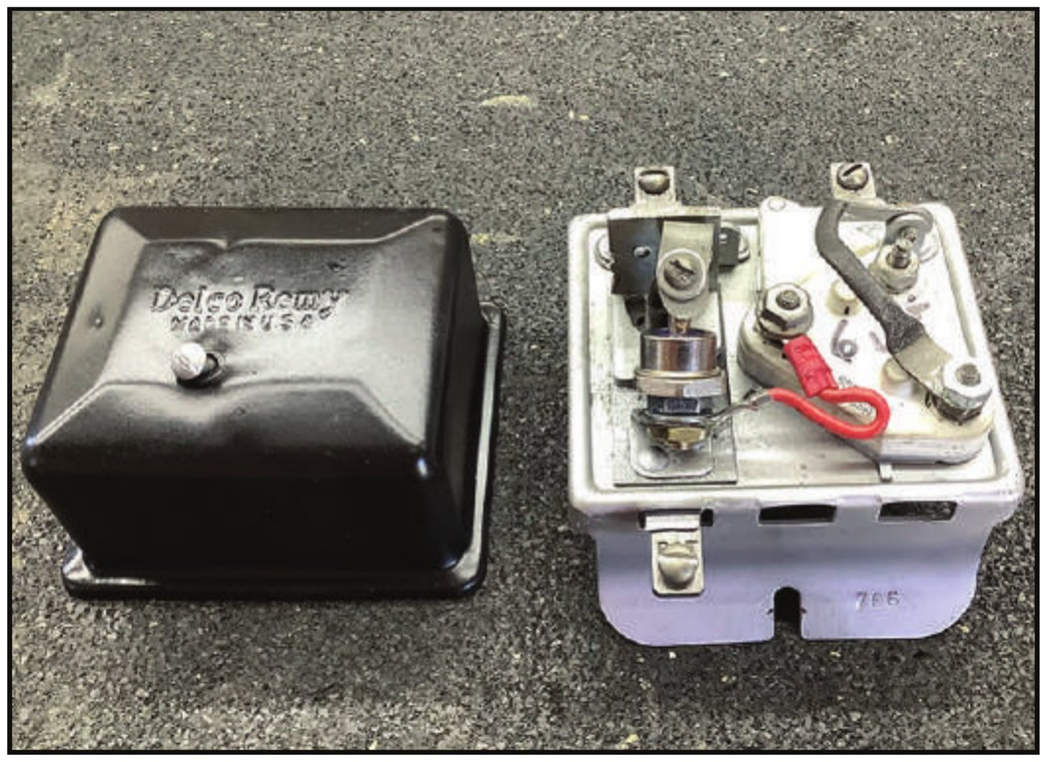


Figure 1 – Delco 6-volt, positive ground conversion

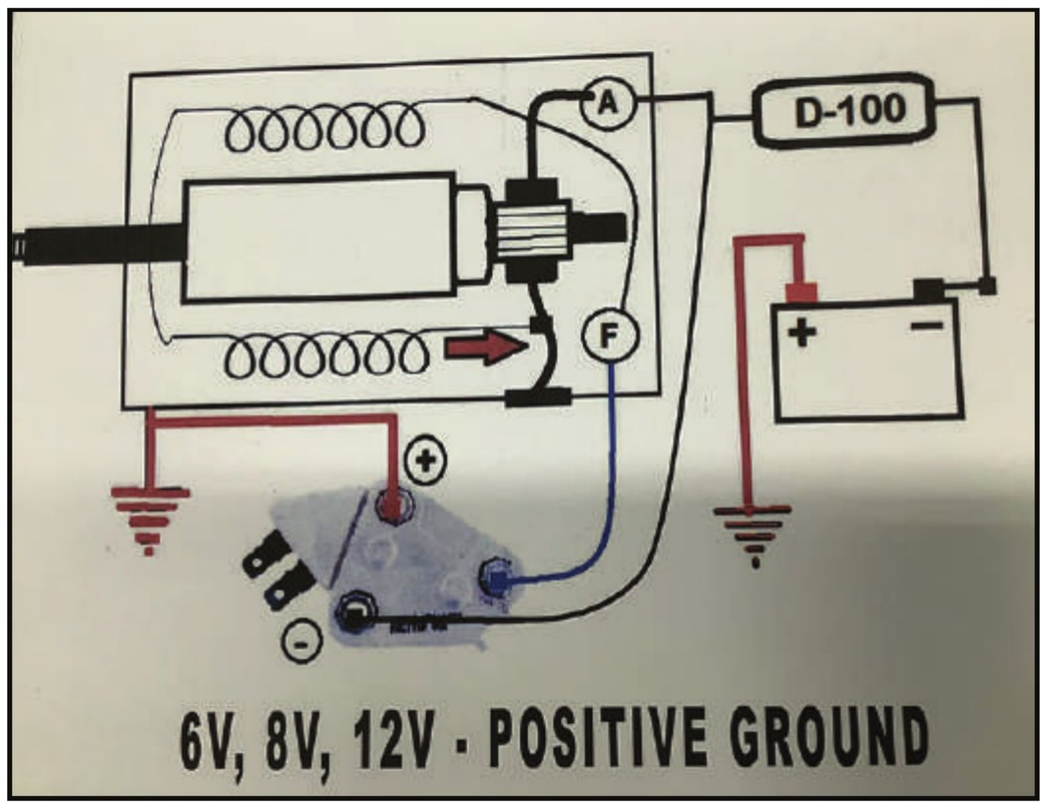


Figure 2 – Diagram courtesy of Mohammad Samii

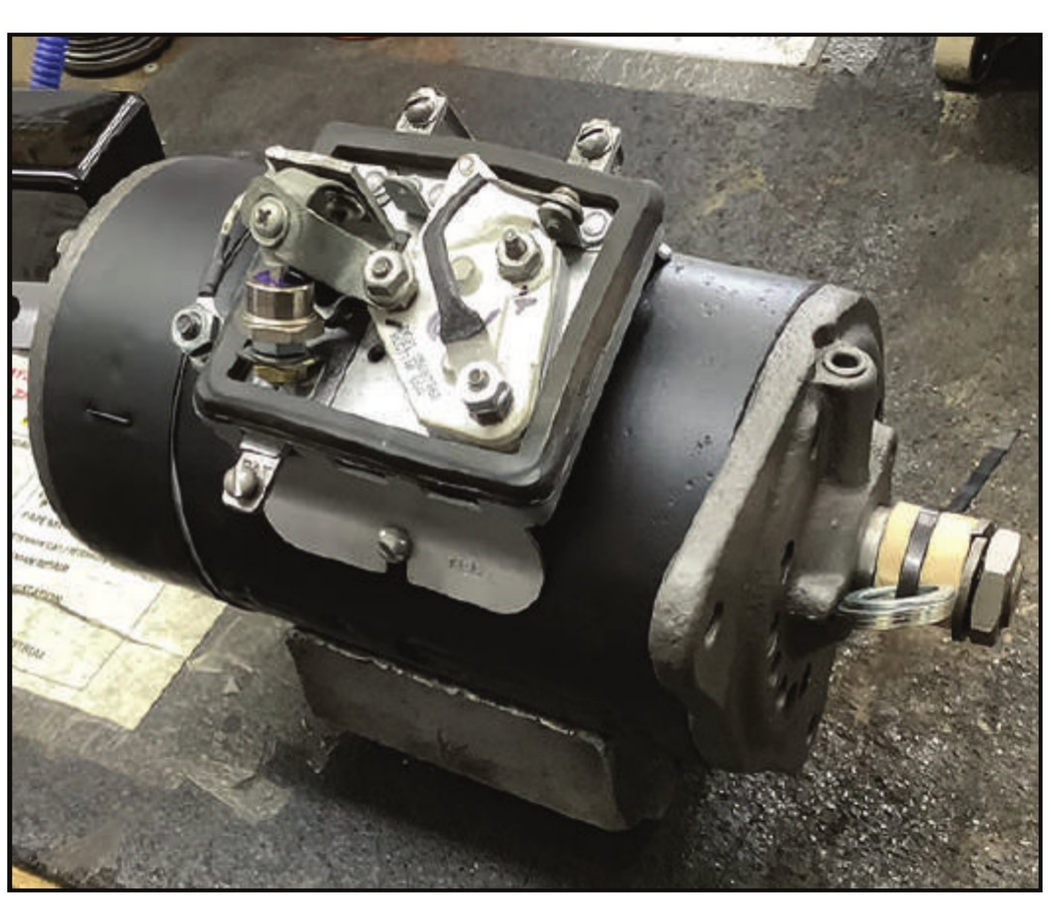
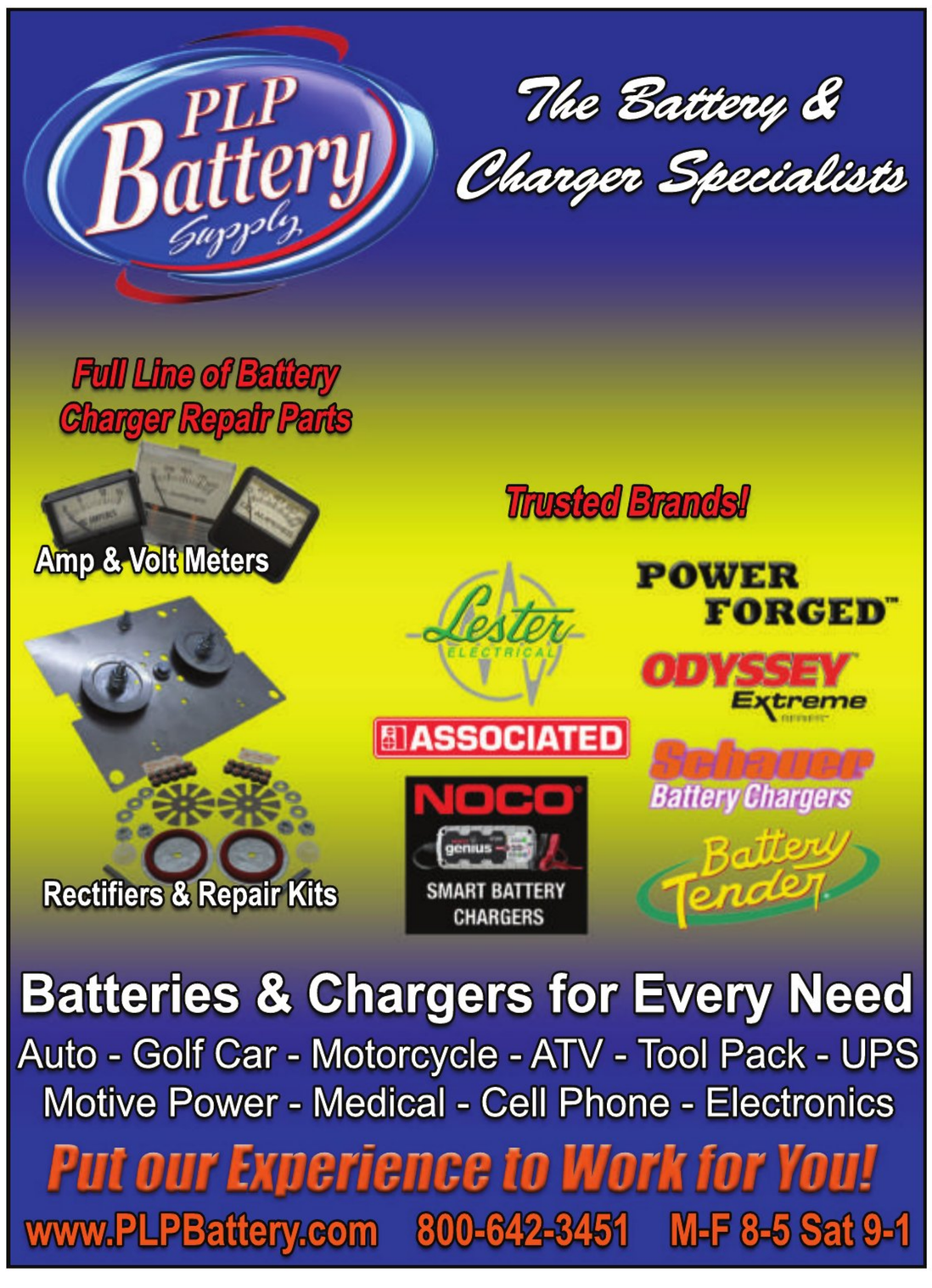


Figure 3 – Here is the regulator mounted on the generator



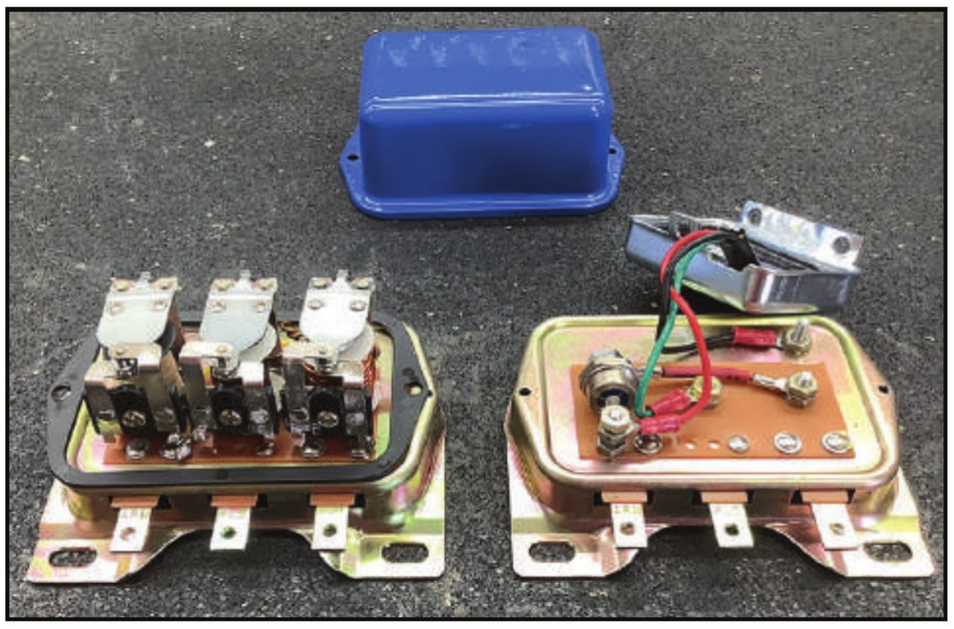


Figure 4 – Ford 12-volt conversion using a Motorola M5-130 A adjustable regulator



Figure 5 – I mounted the electronic regulator above the base

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Tech Help from Mohammad Samii



Do you need help testing an alternator or getting it to work as it should on a vehicle? Call the ERA Tech Help Line and talk to an industry veteran that has over 40 years of rebuilding and on-car experience. Mohammad Samii can help you to find the answers that you need to solve any rebuilding problem. No question is too difficult. "Sammy" has a formidable list of resources at his disposal and is backed up by a line of regular ERA Forum contributors. The ERA is there to help when you need it.

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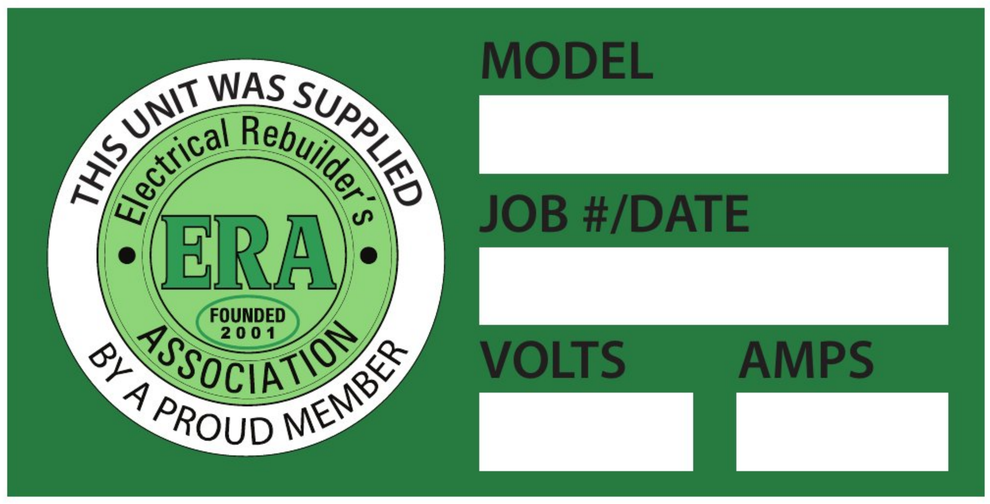



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Have you had an experience or learned something new that you'd like to share with other members? Call or text Bob Thomas at: 904-673-7301 or drop him an email.ere.bobt@gmail.com.

WANTED rebuildable Military electrical cores, any quantity, Prestolite 60 amp alts, Leece Neville 24V starters, CE Niehoff 24V alternators, Bendix 650 amp oil cooled alts, 300 amp Teledyne generators, any quantity, send your list or if not sure send pictures, and we can identify. 305-633-1524 or hy@cmearma.com

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Would you like to know what other members think about a particular issue related to your rebuilding business? Go the the ERA's website – electricalrebuilders.org and check out the ERA Forums.

PARTS, SUPPLIES, EQUIPMENT FOR SALE

3500 AND 3599 CORES. Contact Larry at Hagemeister Enterprises. 800-944-0494

For Sale; Crumbliss model 2105 Alternator, Generator Test Bench. 5 HP 230 V. single phase, electronic variable speed drive, very good condition. Call 574-862-3910

For sale: New Starter Armature Shafts. ACE Electric Parts SS Numbers Call: 952-888-0886 Email: autoelectricserv@qwestoffice.net

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Complete starter and alternator rebuilding business w/house, shop and barn on two acres in the country. Well established with loyal clientele. $210k (920-566-2723)

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SERVICES

R&R ALL STARTER DRIVES. North Atlantic Starter Drive, 741 Broadway, Pawtucket, RI 02861 800-822-2735 Email: popsy26@verizon.net

MISCELLANEOUS

United Battery Systems in Portland, Oregon is seeking an experienced Rotating Electrical Rebuilder. Qualified Applicants will have 3 to 5 years' experience rebuilding Alternators, Starter Motors and Generators. Please email a resume to susan@unitedbattery.net to apply for this position.

HIRING: Looking for a change but want to stay in the industry? Join our growing Sales team! Please email info@regitar.com for more information.

Experienced rebuilder needed for high volume auto electrical shop to rebuild starters and alternators in sunny, St. Petersburg, Florida. Have a career, not just a job. Call Tony at 727-522-7420, fax 727-528-8823 or email superstreet1964@gmail.com

ADVERTISING: If you'd like to submit a classified ad, email Stephanie at smsdesigns@hotmail.com. ERA members receive the first 25 words free. It's an ERA benefit!

WANTED

Information on members or affliates of the ERA who have passed, to add to our In Memorium section of the website.

Please contact the office with information at office@electricalrebuilders.org or 636-584-7400.





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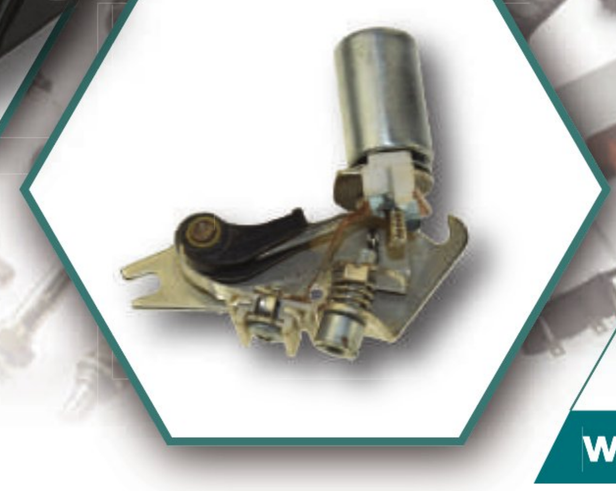

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