ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

October 2019 $12.95

AUTO ELECTRIC CORNER

Horn Electronics, Toyota Truck Alternator and Audi Decoupler Pulley

WHAT IS THE BEST CHARGING VOLTAGE?

It All Depends

COMMON SENSE | Admitting When You're Wrong; Not as Easy as You Think

A WORD FROM THE PRESIDENT
We Need Your Input



With the date and location of our next trade show already announced (see Industry News on page 3), our next job at hand is putting together a schedule for the event. To accomplish that we need to hear your suggestions and ideas for seminar topics or presenters.

The ERA's Technical Advisor, Mohammad Samii is already hard at work on this front. If you have a topic or a particular presenter that you would like to see in the schedule, please share those with Mohammad or any other member of the technical committee. At the association's August Board Of Directors meeting, Mohammad informed all in attendance that he was already exploring several ideas. He had started right after the show in Springfield!

As I have said in the past, the ERA Expo is not for our Trade Show Committee or the Technical Training Committee. This show is for YOU, each and every member of the ERA. Please let Mohammad Samii know what topics you would like to see presented.

Seminar topics can be anything related to but not limited to our industry or future industry ventures that may be on the horizon. Such examples from the past include: Business Management, On-Vehicle Diagnostics, Shop Layout, Test Equipment Training, Updating Equipment to Improve Productivity, Navigating the ERA Website or Building Your Own Company Website. These examples have all been presented at past ERA shows, but they can still be revisited if the requests are there.

Please do not hesitate to call Mohammad Samii with your ideas and/or suggestions. You can also use the suggestion box on the upper right corner of the homepage of the ERA's website. Those suggestions are all read aloud at the following ERA board meeting. Mohammad Samii can be reached through the ERA Technical Help Line at 636-584-8324 or by way of his email address: sammyselectric@sbcglobal.net

A complete list of the technical committee members is available on the ERA Website's home page. Use the left side menu under Association, select "Contacts" on the drop down bar and then select Committees at the top of Contacts page.

This is your Trade Show!!! We want to hear from you!

Ken Plourde

NEW ERA MEMBERS

Fox's Repair
Dayton, Virginia

ABOUT THE COVER

Battery Extender maintaining a battery at 12.65 volts.

ERA EXCHANGE

Volume 36 Number 11

October 2019

Published monthly by the
Electrical Rebuilder's Association
PO Box 906
Union, MO 63084
Phone 636-584-7400
office@electricalrebuilders.org

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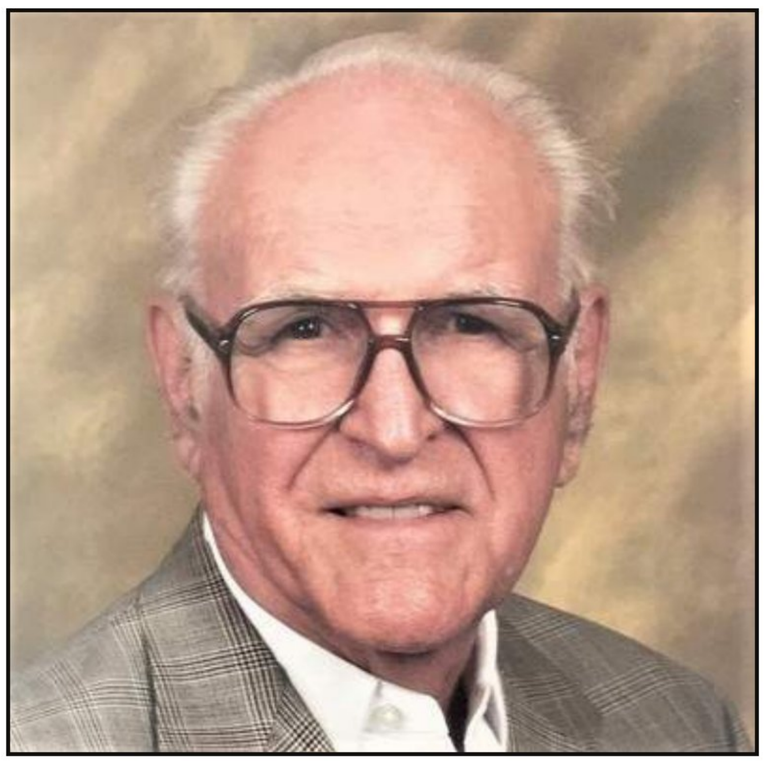
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Rebuilding is Recycling!

INDUSTRY NEWS
& ANNOUNCEMENTS

On a Sad Note

Kenneth Grady Turner, Sr, father of ERA South-Central Vice President Kenny Turner, passed away on September 8, 2019. He will be greatly missed by his family, his friends and all customers of C.C. Battery.



After serving in the United States Marine Corps Reserves from 1948-1949 and the United States Army from 1953-1955, he joined C.C. Battery Co., Inc in Corpus Christi, TX, a business that was started by his father in 1923. Under Ken's leadership, C.C. Battery was one of the oldest family owned businesses to become a member of the Corpus Christi Chamber of Commerce. He was active in his community serving on the Gregory Portland Independent School District Board for nine years and elected President of the School Board for one term.

As owner and CEO, Ken took C.C. Battery to new heights. He designed and manufactured special equipment for industrial and agricultural engines that were shipped all over the world. In 2012 he was recognized by his peers in the industry as a distinguished member of the Automotive Parts Remanufacturers Association. Many rebuilders have talked to Ken over the years as he often answered the phone at C.C. Battery. He was always willing to share his vast knowledge of hard to find parts with his customers and go out of his way to fill their needs.

2020 ERA Expo – Cincinnati, Ohio

You will not want to miss ERA Expo 2020 in Cincinnati, Ohio, March 27-29, 2020. Mark that date on your calendar now.

The Expo and all seminars will be held at the Holiday Inn Cincinnati Airport located in Erlanger, Kentucky, which is minutes from Cincinnati/Northern Kentucky International Airport (CVG). The hotel provides free shuttle service to and from the airport and is less than 30 minutes from downtown, Cincinnati. The Holiday Inn will provide a free breakfast for all registered ERA Expo attendees.

Further details will be provided in the upcoming months. If you happen to have any suggestions for seminar topics or speakers that you would like to see or hear, please share them with the ERA's Technical Advisor, Mohammad Samii by phone or email. His contact information can be found at the bottom line of his column, Auto Electric Corner, on page 8 of this issue.

AUTO ELECTRIC CORNER — Horn Electronics, Toyota Truck Alternator and Audi Decoupler Pulley



BY MOHAMMAD SAMII

It is complicated…!

The complexity of the electronics in new and newer automobiles creates challenges as well as opportunities that at times make every day work challenging as well as a learning experience. I wrote about this particular case a few years back in another publication but here is a shorter version of it to share with my ERA readers.

We had this clean 2001 Lincoln LS that had a couple of warning lights on. The customer whose mechanic had recommended us, was not inclined to fixing it completely. All that she wanted from us was for the horn to work! She was going to renew her driver's license and one requirement is the test vehicle MUST have a working horn as well as proper lighting, wipers,…etc…!

You would think that a simple horn circuit, possibly consisting of a switch, a relay and a horn would not be that complicated to figure out…but this was not to be the case. The horn on this vehicle works in this manner:

- The instrument cluster sends a low voltage signal that goes through the clock-spring contacts of the steering wheel to the horn button on the steering wheel pad.
- When the horn button is depressed, the signal, now coming back from the horn pad goes through another set of contacts on the clock spring, and is fed to the PCM.
- The PCM, detecting a horn request signal, communicates via data-bus with other electronic modules. (There are 11 or 12 of them!)
- The Front Electronic Module or FEM (there is also a Rear Electronic Module or REM) detects the horn activation request, and grounds the control coil of the horn relay.
- The horn relay, located in the Auxiliary Junction Box (AJB) in the engine compartment gets activated, and feeds the horn power to honk. I am not kidding…!

No wonder her mechanic—whom she claimed "knew everything"—did not bother to tackle the problem and thankfully sent it to us.

Upon a detailed inspection, following the low voltage circuit through the contacts and commanding the activation of the FEM (via our PC-based scan tool) to sound the horn (which it did), we came to the conclusion that the clock-spring assembly (*see Figure 1*) inside the steering column was defective. The list price of the switch and the labor involved was well over $450, which the customer approved, and the job was done. Incidentally, this also took care of the airbag light that had been coming on, to the delight of the customer who had not expected it to be fixed without changing an expensive airbag module costing many hundreds more - as she was told by her mechanic.

New technologies can be confusing, but when figured out and repaired properly, they can be a good source of revenue as well as being very satisfying work.

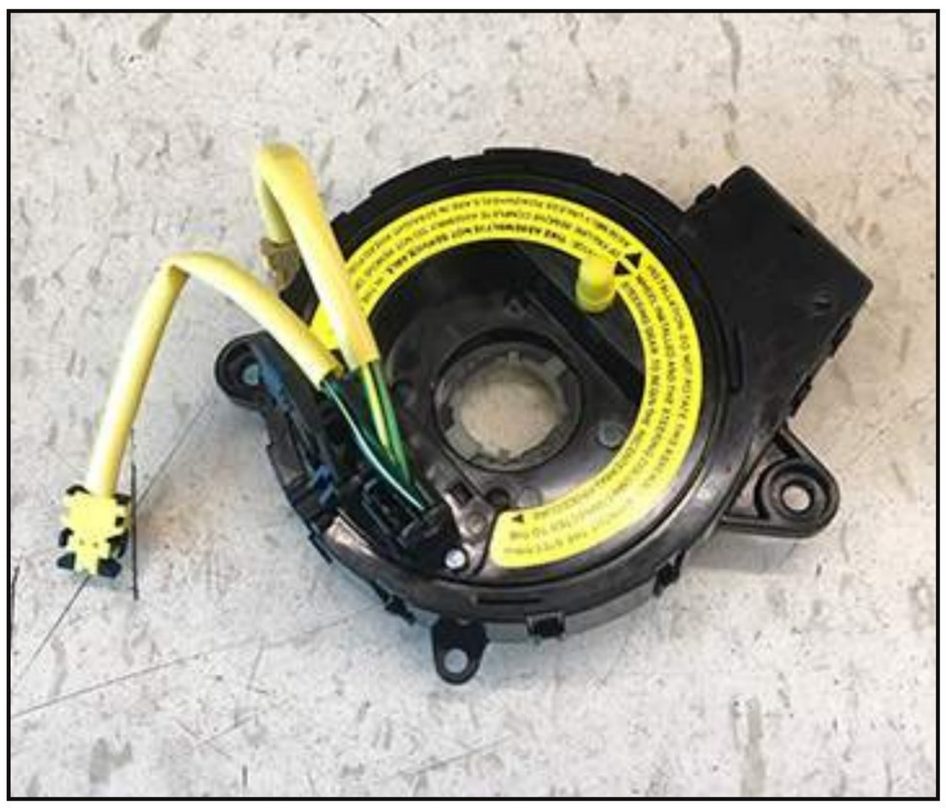


Figure 1 – A typical clock spring located under the steering wheel



Figure 2 – 14552 A-Circuit alternator for some early 80's Toyota trucks

14552 Alternators…Remember Them?!

It did not take long after a serious house cleaning and disposing (literally) of some good old rebuilt alternators to thin our stock to make room for the newer ones, that a garage customer from a nearby town would call for this alternator. The only practical choice was to bring it in to be rebuilt as our rebuilt ones were now all in alternator heaven someplace…!

To refresh your memory; this unique 14552 Denso external fan and externally regulated (EF/ER) unit (*see Figure 2*) was used for only a few short years (1981-84) on Toyota pick-up trucks and 4Runners with 2.4L engines, and not necessarily on all of them!

What was unique about this simple alternator was that it operated on A-circuit with an external, firewall mounted 5-pin electronic regulator. The very same model of these vehicles could also have come out of the factory with a 14273 alternator that is B-circuit, run with an external electro-mechanical 6-pin regulator. The regulator plugs were the same shape and and size, except for the extra wire on the B-circuit regulator. So you can imagine the chaos that could arise when a mix-up would take place.

It usually took a lot of time and money to figure out the right alternator-regulator combination and repair the damages caused by uninformed techs, DIY's, and assorted hackers who tried to replace one with the other, and with some pushing and shoving, either fit the connector plug into wrong alternator (albeit they were different), or supposedly re-wiring the connector by discarding the OE plug and using individual female connectors.

Testing this alternator was of course a little different than its contemporaries in that they were mostly B-circuit. The plug had 3 pins, namely "L", "E", and "F" terminals (*see Figure 3*). If you did not have a Jimco TB-46 test lead, you could ground the "F" (Field), and with a test light or jumper wire connected to +B, momentarily touch the "L" (Lamp), and if the alternator was OK, it would start charging in a full-field mode. You could then use the field rheostat to control the field to change the output. For a detailed internal schematic, you can use "Jimco Manuals On-line" on the ERA website. Go to "Look Up Diagrams", and put 14552 in the box, and click on NIPPON06. All a courtesy and a valuable gift from Jimco, Inc. to our members.



Figure 3 – L-E-F terminal pins for 14552 alternator



Some of these vehicles were modified into a small camper or mini RV which were kept longer by the owners than a working truck. Our garage customer had encountered one such vehicle which needed that alternator, some 35 years after it was built and still being driven. To expedite the work, we managed to find a favorably priced reman unit at WAI, marked it up accordingly and sent it to the customer. The old unit was well beyond what I consider to be a reliable overhaul, and will perhaps join its comrades in the rust bins of the old and discarded alternators!

2009 Audi A-4 and IDP…!

The flat-bed showed up with the above vehicle belonging to a young couple who were experiencing a discharged/dead battery. After partially recharging the battery to be able to get the key fob out of ignition and release the brake to roll the vehicle off the flat-bed, we managed to get it into the shop. The battery was so low that it took some time to build it up enough to get the car started for a charging system test.

Obviously it was not charging. Since the battery voltage existed between the output post and the case, it was a very good bet that this11466 Bosch COM-type alternator was bad and needed to be rebuilt. A run on the test bench confirmed it was not charging with the set voltage was turned up to 14.1, but the alternator voltage was 12.6 which is test bench battery voltage (*see Figure 4*). Our WAI 1000 also indicated that this regulator was running on LIN 1.3 protocol. The DFM wire connected to "DFM" showed a 15% duty cycle, meaning that this B-circuit regulator was turned up high with an 85% duty cycle, yet nothing was coming out of the alternator.

Since the regulator can be easily removed, I temporarily installed an IB-261 regulator which is light activated to see if the alternator was good. Still no output and a glowing warning light, but a close inspection of the unit while running on the bench revealed that we had a slower than normal spinning rotor while the test bench was operating at 3000 RPM…! You guessed it…the clutch pulley was worn out and was slipping freely, not transferring the pulley's RPM to the rotor…which was not a surprise given the 180K miles on the odometer.



Figure 4 – WAI-1000 screen, reading our Bosch 11466 alternator parameters

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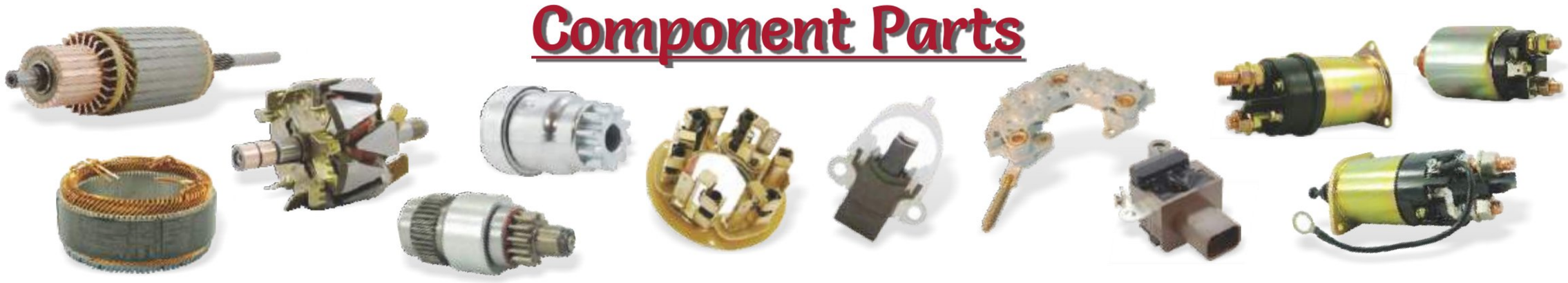
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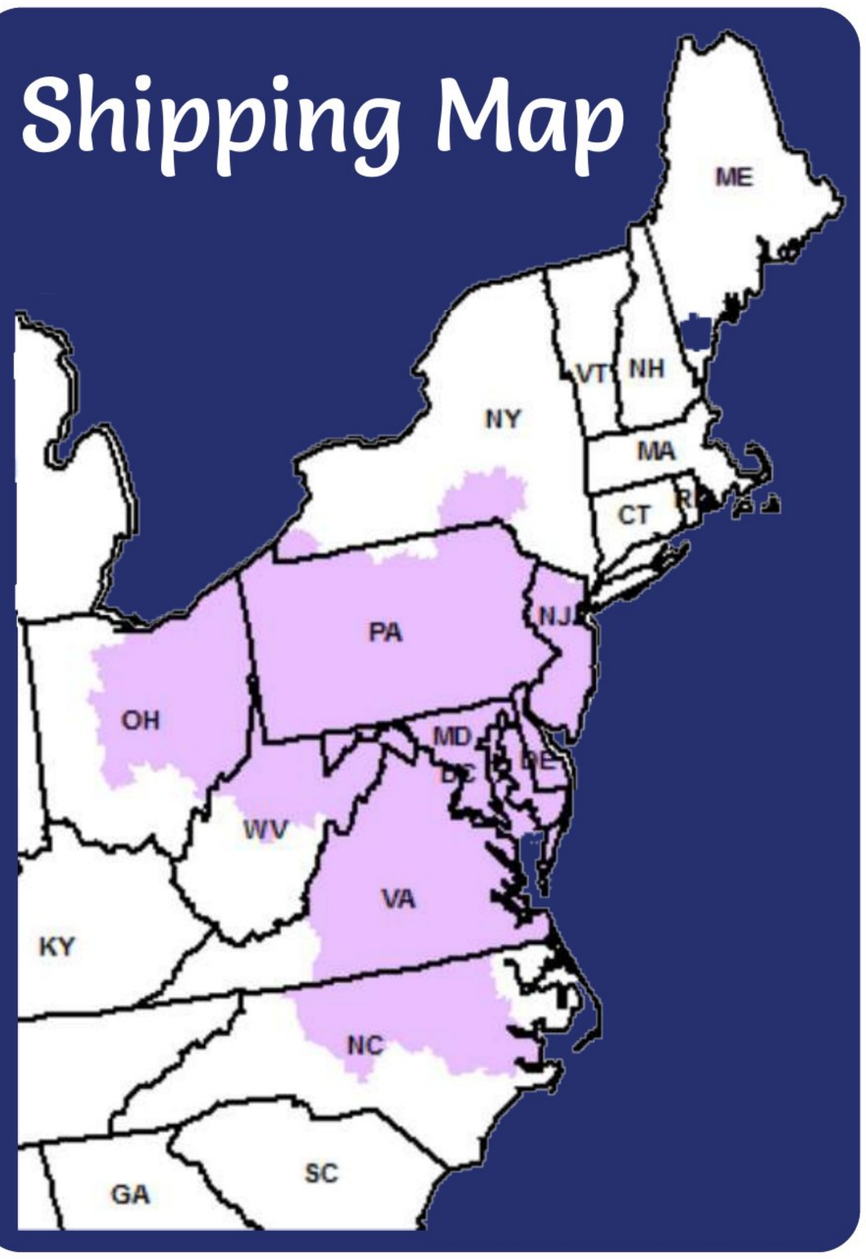


Complete Units



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Shipping Map



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Figure 5 – New Litens decoupler pulley for our alternator



Figure 6 – Tightly packaged Bosch F00M199197 regulator



Figure 7 – Our rebuilt alternator being installed on the Audi

A new clutch pulley (*see Figure 5*) along with a new regulator (F00M199197) were ordered and the alternator was torn down for rebuilding, bearings changed and slip-rings serviced. The reason for the regulator change was the worn brushes that measured 6 or 7 mm, where as the new regulator's brush length was 14 mm, and I did not want any compromise in quality for this expensive job. The new OE regulator is shrink wrapped and comes in a nearly crush-proof box (*see Figure 6*).

The alternator was assembled and the same LIN 1.3 Protocol was observed while being tested. It was installed and the vehicle was returned to a happy customer who was very pleased with our prices (*see Figure 7*). The dealer had given him an estimate of $1100 to $1200, where as we did it for about one half of that price and still kept a very good profit margin.

A word about certain Audi and Volkswagen engines. Not all of the, say 2.0L engines of a certain model year use the same alternator. The correct application, and a lot of other related technical information depends on the engine code. The code is not embedded in the VIN but is stamped on the side of the cylinder head or could be found on a sticker in the trunk, near spare tire well - an important point to remember if you need to send an alternator away to the customer.

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

You can reach Mohammad Samii by email at: sammyselectric@sbcglobal.net or you can call him on the ERA Tech Help Line at 636-584-8324.

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COMMON SENSE — Admitting When You're Wrong; Not as Easy as You Think



BY BOB THOMAS

Something that has annoyed me for much of my life has been people, both friends and acquaintances, who have trouble admitting that they are wrong or mistaken, even when you offer them proof that they are. One such incident that has stuck in my mind happened forty years ago.

I had left a job in retail management to work for the owner of a small auto electric shop, even though I knew next to nothing about rebuilding alternators or starters. I was told that he needed some help and the business sounded like it might be interesting. I had taken a shop class in electricity in high school and always enjoyed working on cars. While I had never taken an alternator apart in my life, I did understand how they worked and was confident that I could learn.

The shop was located in an old two-bay service station. One of the bays was used for tear-down, parts cleaning and preparation - the other for assembly, testing and on-car work. There were two other employees, Bill and Steve. Bill worked on the tear-down side and Steve was *"the rebuilder."* He took great pride in his work - so much so that he never made any mistakes. Steve also did all of the on-vehicle work and to his credit he was relatively good at that. For the first few weeks I got along just fine with both of them.

Once I had learned enough to handle the front counter alone, the owner began taking time away. By that point I had earned Bill's respect. But Steve on the other hand had never quite accepted me as a manager. Some of that, no doubt was caused by my lack of experience in a field in which Steve considered himself the expert. But Steve's ego was also part of our problem. He believed that he, not I, should be running the business when the boss was away.

Keep in mind, that in 1979, most of the alternators that we sold were externally regulated. Steve was very good at putting units back together and swapping parts around when one failed a bench test, but he did not have a clue how any of them actually worked.

We put up with one another for weeks, then months, while he tested my patience whenever the owner was not around. The owner, on the other hand, was partial to Steve because he worked for free on nights and weekends on the owner's drag strip car. After six months I found myself wondering why I ever left the department store.

Then, when the owner was out of town for three days, the incident took place. Steve had rebuilt a Lucas alternator for a nearby import specialty garage. Less than an hour after it was delivered, the garage owner showed up with the alternator. It was not charging on the car. I handed it to Steve, who tested it on the Crumbliss test bench and it worked. The customer could plainly see that. I suggested that they check the car's wiring.

An hour later he called me. All of the wiring was fine. They could not find anything wrong on the car. Keen to help the customer, I suggested that he bring us the MG. He dropped it off five minutes later.

When I asked Steve to check it, he flatly refused, using an expletive to describe the British sports car. We went around and around for about 15 minutes until I realized that I was getting nowhere with him and would be on my own with this car.

I removed the alternator myself and asked Steve to test it one more time. I knew that he would be eager to show me once again, that it worked. Only this time I paid attention to how he connected it to the test bench.

There were no wiring diagram books for me to use. So I had to figure out how the alternator was connected on the car. Then I took the alternator back in to the shop's front counter to remove the back cover.

I wish I could say it was easy, but it must have taken me at least 30 minutes to figure it out. I noted that Steve was putting battery power on all three terminals. But on the car the small terminal was only getting power through the charge indicator bulb on the dash. I could also see that the small terminal was on the rectifier's outboard plate which was not connected to anything else, even though it seemed to have a male spade terminal made into it. Assuming that the three diodes must be there to power something, could it be the field circuit?

What took me so long to realize was that Steve might have lost or forgotten a jumper wire from the diode plate to the brush. When I looked out the door toward his bench, I spotted a small yellow wire on the floor. I causally walked over and picked it up right in front of him. Then I found that it fit perfectly where I thought it might go.

Once re-assembled, I installed the alternator on the MG rather than include Steve and his test bench. He was pretending to look the other way when I started the MG, but once I saw that it was charging, I turned the VAT40's display turned toward his bench without saying a word.

I called the garage owner, who asked what we found, expecting it to be something on the car that they had missed. I told him the whole truth and apologized for the trouble that we had caused him.

When the shop's owner returned the next day, I explained everything that had happened and gave him a choice. Either Steve had to go or I would. He tried to explain why he needed to keep Steve, but in the end, that was Steve's last day.

All that Steve had to do to keep his job that day was to admit what really happened. He probably knew his mistake the moment that he saw me pick up the jumper wire. His own ego prevented him from admitting it. He departed that day, still insisting that there was absolutely nothing wrong with his alternator.

A year later, I left to open my own business and the owner re-hired Steve the week after I was gone. Incidentally, that import garage was one of my very first customers.

You can reach Bob Thomas by email at: ere.bobt@gmail.com, or by phone at: 904-673-7301.

WHAT IS THE BEST CHARGING VOLTAGE?
It All Depends



BY BOB THOMAS

A question that I have been asked often over the years is: "What is the best charge voltage?" At times the question is in relation to a charging system on a vehicle, or less often it involves charging a battery off the vehicle with a charger. My response is usually a series of questions pertaining to the specific application, the battery type, its current state of charge and the electrical loads that may or may not be on the system. So it all depends.

Vehicle manufacturers have come a long way in their ability to control alternator output voltage over the last 30 years. We have gone from simple temperature compensated voltage regulators with a single voltage set point, to the computer controlled regulators of today that manage the charging voltage down to one-tenth of a volt based upon dozens of parameters, some of which were never considered thirty years ago.

Two personal incidents earlier this year caught my attention as to just how far we have come in respect to maintaining that perfect charge voltage under continuously variable circumstances. The first one involved our 2016 Nissan Versa Note. The interior lights had been left on by accident for more than a day and we only drive this car about once a week. The error was not discovered until after the battery was pretty well drained. I recharged it and decided to do a precautionary check of the charging system to insure that the alternator was in fact working properly.

I put a voltmeter on the battery, started the engine and observed the voltage as it quickly came up to 14.2 volts. I turned on multiple loads that included the AC with fan on high and the headlights. The voltage never wavered a bit, even though the engine was only running at idle. I turned the loads off and was about to switch off the engine when Peaceful Easy Feeling came on the radio, one of my favorite Eagles songs. So I sat there with the engine still running as I listened all the way through. It was a beautiful day and the standard radio in this little car puts out fantastic sound.

As the song was ending, I glanced up at the voltmeter which was still connected. It was now reading 13.16 volts (*see Figure 1*). The first thought that entered my mind was that the alternator had a problem. I switched the headlights back on, expecting to see it drop even more, but the voltage jump right back up to the 14.2 volt level within a few seconds. I turned them off again and watched it slowly drop again to 13.15 volts. I repeated the process several more times, just to confirm what was taking place.

This did not really surprise me, given that the 2016 Nissan was behaving an awful lot like the RVC charging system on a GM vehicle that I wrote about over 10 years ago. The point is, when you don't see 14.2 volts, do not assume that there is a problem.

The second incident involved our sailboat which is tied up in a slip at the end of our dock, or what is left of it. All



WHAT IS THE BEST CHARGING VOLTAGE?



Figure 1 – 2016 Nissan Versa Note charging at 13.16 volts under no loads.

boats take on some water; a weeping shaft seal, deck fittings that need to be re-bedded or just a good hard Florida thunderstorm blowing some water past the cabin door. For that reason, we keep a deep-cycle marine battery on board to power a bilge pump through a float switch. When enough water accumulates in the bilge, the float switch turns the pump on. Once it is pumped out, the float switch turns the pump off.

We have a second pump on a manual switch in the lazarette, a storage compartment between the cockpit and the transom. This compartment is isolated from the rest of the boat and can be used for fuel canisters (to keep any fumes out of the bilge), or for equipment that might be needed quickly on deck. Our lazerette is empty, except for rain water that gets in around the seal. It's not a big concern, but the pump is easier to use than bailing it out with a bucket when it accumulates.

With a few sections of our dock still missing from Hurricane Irma in 2017, I have been using a canoe to check on the sailboat periodically. Even though the stringers and decking were washed away by the hurricane, the pilings and the 120v AC power line to the end of the dock remain intact. We have been using a small six amp charger to recharge the battery whenever it gets low. Each recharge requires two trips in the canoe. One to turn it on and another to turn it off when the battery is recharged.

Several months ago I found that the charger on the boat, close to 20 years old now, was no longer working and the battery was consequentially totally discharged. Paddling a canoe in choppy water with a lead acid battery as a passenger was not fun. While the battery was being recharged in the garage, I started looking for a new charger, one capable of not only charging but also maintaining the battery full time, so as to limit the number of canoe trips until I find time to finish the dock project.

What I found initially were marine chargers that I would have been comfortable with except for their price, or cheap chargers that I had little faith in. I kept looking until I found exactly what I needed. It is a 6 amp charger and a maintainer, electronically controlled to do both. It was also smack dab in the middle of my price range, less than $50 with shipping.

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WHAT IS THE BEST CHARGING VOLTAGE?

I tested it on an extra battery that I knew to be at least slightly discharged. That battery had never been installed but had been sitting unused for about five months.

This charger only has one button switch on it, used to select between a lead acid or lithium ion battery. It can charge and maintain a 12 volt lithium ion battery too - not of much use to me now perhaps, but who knows what we will see in a few years. Once you select the battery type, it reads the state of charge and gives it to you as a percentage on an LED display – 76% on the test battery. When I check back on it later that day, the display was showing 100% and maintaining the battery at 12.6 volts (*see Figure 2*).

Once installed on the boat, it immediately told me that the battery was at 80% and began the recharging cycle (*see Figure 3*). By now, it is maintaining the battery day and night and only recharging as needed whenever the bilge pump is called upon.

The point of all of this is that you should no longer be looking for that once magic number of 14.2 volts when testing any charging system, unless that is, you know that 14.2 is the specified voltage set point for the regulator that you are working with.

You can contact Bob Thomas by email at: ere.bobt@gmail.com or by phone at: 904-673-7301.



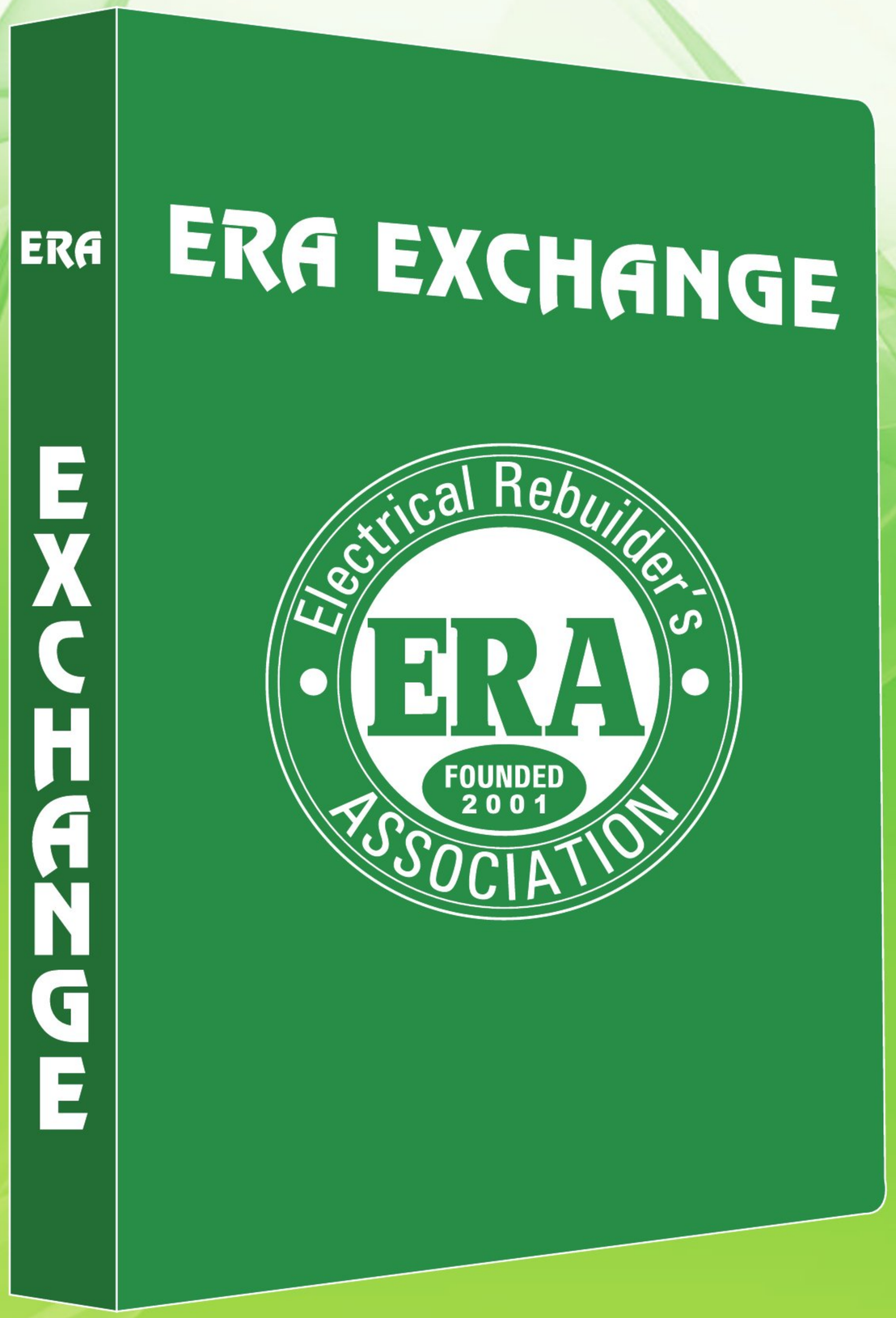
Figure 2 – Battery Extender maintaining a battery at 12.65 volts.



Figure 3 – Battery Extender showing 80% charge on the boat battery while recharging it at 14.46 volts.



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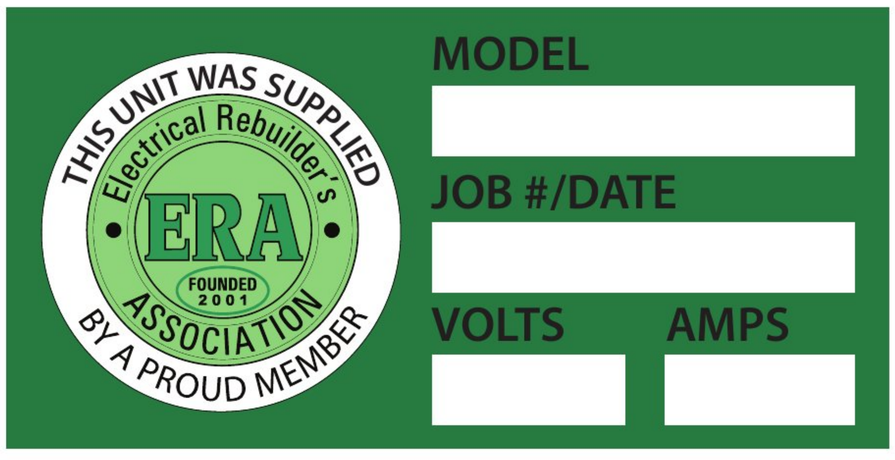
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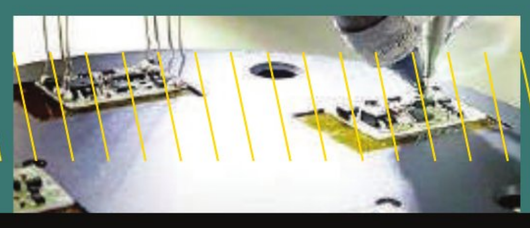


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