ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

April 2018 $12.95

AUTO ELECTRIC CORNER
New Generation Alternators & Mismatched Starters

24 VOLT BRUSHLESS CAT DENSO
Heavy Duty Alternator

COMMON SENSE | What You Think You Know

Electrical Rebuilder's ERA FOUNDED 2001 ASSOCIATION

A WORD FROM THE PRESIDENT
I Don't Have Time



The most common reasons that I hear from members who do not attend ERA trade shows are: "I don't have the time to be away from my business" or "I can't afford it – it just costs too much."

But most of the members that I meet and see each year at the shows are the same people. They are what you might compare to your repeat customers. They continue to come back every year - year after year. Obviously, those members do not feel the same way. Those members, many owners of one or two-person small shops, would not be traveling to the event every year unless there was a good reason.

When I ask any of them why they always show up, no matter where that show is being held or how far they had to travel to get there, I get the same answers almost every time. What they tell me is that they cannot afford to stay at home. They point out that our industry and its technologies are changing at an ever-increasing rate and the seminars help them immensely in keeping up.

They tell me that missing just one opportunity to attend a show would cost them more money than they are spending to attend. They often offer examples of the things that they learned at past shows that saved them hundreds or sometimes thousands of dollars over the years since.

They tell me that their customers really do understand the benefits of the training they receive at shows. They tell me that their absence for a few days does not harm their business at all, but actually increases it in the long term because their customers know that they will benefit from it into the future.

They also tell me that many new products or revenue streams that they have discovered at past shows have increased their sales and will continue to do that well into the future.

In short, the regular show attendees are looking at the long term benefits, not the immediate costs. They see attendance as an investment in business – one that has proven to pay off for them.

If by chance, you find yourself reading this at work or home over the second weekend in April, you missed the Montgomery show. It is too late to change your mind now. But you can change it now for next year. By the May issue, we will know where the 2019 show will be held, and you can begin planning to attend that event – wherever it may be. Our next issue will also give you a glimpse of what you missed this year in Montgomery.

Mike Dietrich

NEW ERA MEMBERS

Affinity International
Northville, Michigan

Alfa Auto Electrique
St. Laurent, Quebec, Canada

Moran's Alternator & Starter
Saraland, Alabama

ABOUT THE COVER

A behind the cover view of CAT Denso alternator.

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CONTENTS

2 A WORD FROM THE PRESIDENT
2 NEW ERA MEMBERS
3 INDUSTRY NEWS
4 AUTO ELECTRIC CORNER — New Gen. Alternators & Mismatched Starters
6 COMMON SENSE — What You Think You Know
8 24 VOLT BRUSHLESS CAT DENSO Heavy Duty Alternator
15 CLASSIFIED ADS

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Rebuilding is Recycling!

INDUSTRY NEWS
& ANNOUNCEMENTS

A New ERA Label Is Now Available!

In response to requests for a label to help members identify their alternators and starters, this new ERA Unit ID label is now available. The 1.5" x 3" tough waterproof vinyl label provides space to write or stamp a unit number, your invoice number or date, the units voltage and the unit's amperage. This 2-part label comes with a self-adhesive cover sheet to preserve your unit info. It has been designed to work with both rebuilt and new units and is manufactured to last many years in the field.

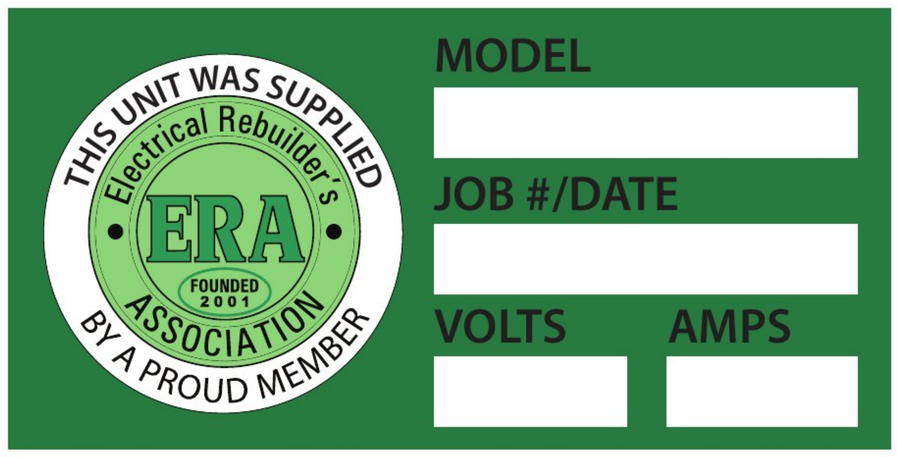
These attractive labels are affordably priced and can be ordered today by calling the ERA office at **(636) 584-7400.** They will also be available for sale at the show in Montgomery. Stop by the ERA booth to check them out.

NEW!

18 labels per sheet

1 sheet: $11.00 each
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ACTUAL SIZE

Gordon Hacken Retires From BPS!

Gorden Hacken retired from BPS in East Point, GA on December 1, 2017, after serving as their manager of automove cores. Members who have bought cores from BPS over the years very likely got to know him well.

He was hired by BPS in January of 1981, moving from Minnesota where he workied for Armature Exchange. "Gordy's 36 years of service helped BPS grow to become one of the top core suppliers in the world," explained BPS President Jerry Bowles. "Gordy's product knowledge and work ethics where the best and he was well respected by his employees and customers alike. BPS will miss Gordy and wishes him all the best in his retirement."

ERA members who toured BPS at the Atlanta ERA Show may remember Gordy who was introduced as their the alternator and starter core expert. He is now looking forward to traveling and doing wood work from his shop at home.

AUTO ELECTRIC CORNER — New Generation Alternators and Mismatched Starters



BY MOHAMMAD SAMII

Testing Newer Alternators…!

A significant number of questions asked via the ERA Tech Help Line concern alternator testing, especially the new generation of alternators that require some sort of adaptor or test box. The days when we could put an alternator on the test bench and make it run by connecting a regulator plug, a test light, or a couple of jumper wires are long gone. Simply said; if you work on automotive alternators of anything made within the past 15 years or even more, you have to invest in the appropriate test boxes capable of activating, monitoring and running the unit being tested.

One of my goals during the 2018 ERA Trade Show is to shed some lights over a variety of such test boxes and demonstate them in their working environment. For those who will not attend the show, here I will point out a couple of examples.

The newest generation of alternators that are coming in for rebuilding are the ones that are equipped with a COM terminal that is not always labeled as such. Sometimes they may say "L" or LIN.

Local Interconnect Network (LIN) is a slow speed communication bus that mostly runs the commands to the accessories. As an example in a LIN equipped car, when you push a window down button, you are not applying power or ground to anything. You are putting in a request on the LIN bus, asking for the window to go down. The Body Control Module (BCM), after receiving the request. commands the Driver's Door Module (DDM) via the same network (LIN) to lower the window. DDM decodes the information that it received via the LIN and commands the window down relay to activate, which powers up the window motor in the down direction.

The same LIN is used to carry information to identify (handshake) with the regulator, command the alternator to energize, set its voltage (Vset), receive malfunction information and keep a two-way communication between the alternator and PCM/BCM, or any other module that requires such information for their role in the charging system (*see Figure 1*).

So obviously a test box of sort that can generate a LIN-type signal is needed for such alternators. One of my first such test box was and still is the AutoDiagger AD-100 that I have talked about before. Figure 2 shows this test box running a Bosch LIN alternator and automatically extracted and identified the communication protocol (LIN2) that it detected.

In the February issue I showed my first-time experience with WAI-1000 tester. This is a versatile device that can simulate signals to test a variety of the available units in the market, including the latest models of the LIN controlled alternators. Figure 3 shows the test box running a Bosch LIN alternator. It has detected the protocol as LIN 1.3, and is also showing the feedback (DFM) through the LIN wire due to two-way communication capabilities of LIN.

Another LIN test box that has been around a few years is the Regitar COM-01 tester, made exclusively to simulate different types of LIN signals to test applicable alternators. One of the abilities of the COM-01 is it has a fault detection feature that can show fault codes of the unit under test. These codes that are indicated by a series of LED's, can indicate issues such a communication failure, lack of stator signal and other internal issues within the alternator being tested (*see Figure 4*).

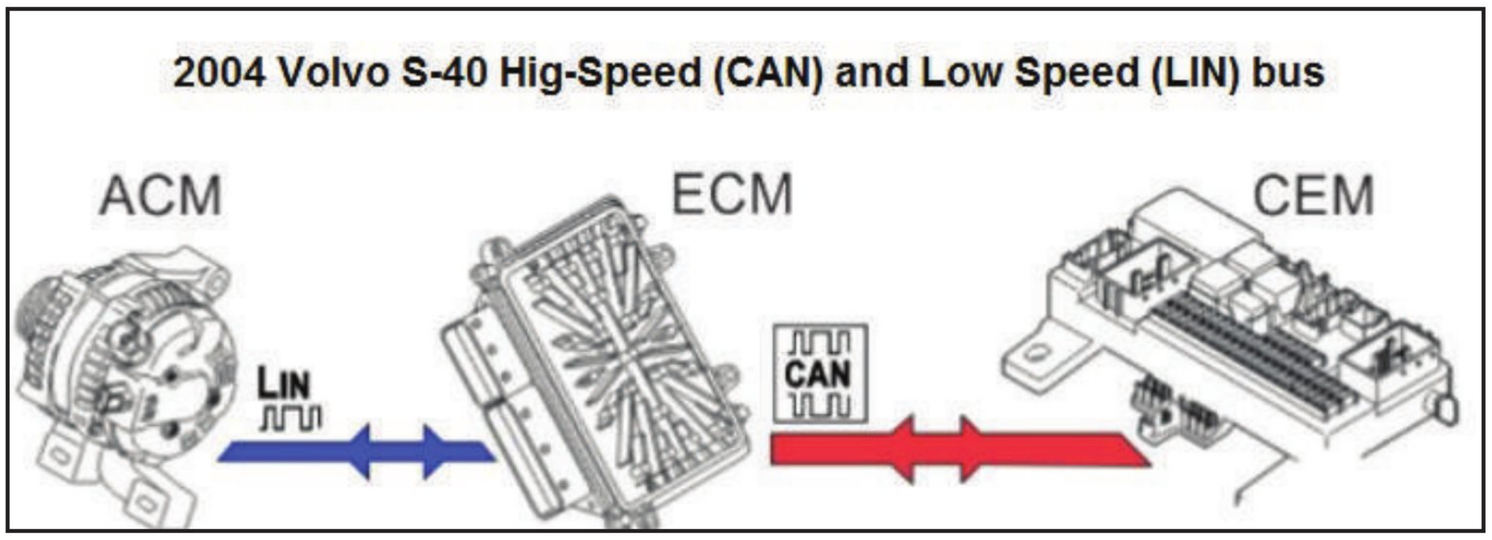


Figure 1 – LIN bus connecting to Alternator Control Module (ACM), meaning the regulator!

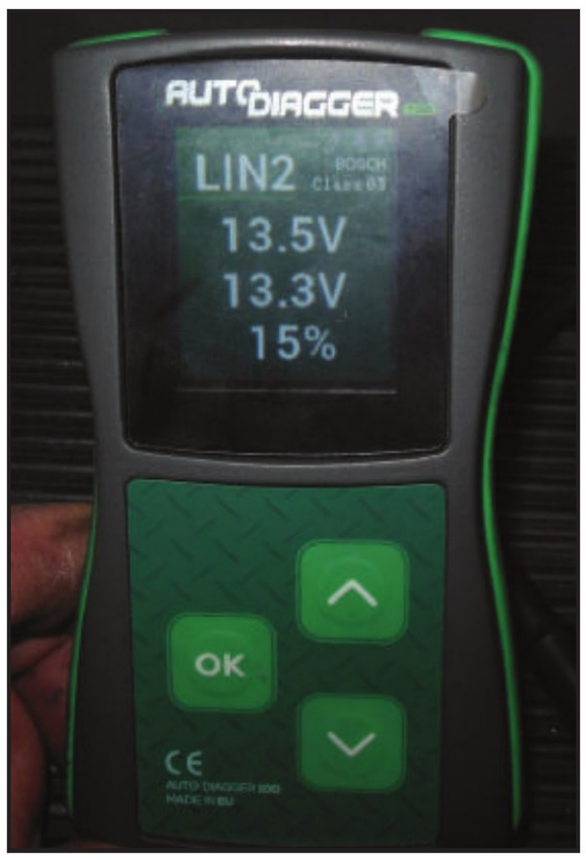


Figure 2 – Our AutoDiagger AD-100 running a LIN-controlled alternator



Figure 3 – WAI-1000 running a LIN alternator and showing feedback (DFM)

AUTO ELECTRIC CORNER

One of the advantages of our annual ERA Show is that you can see and touch these testers as well as a variety of other equipment and supply sources all under one roof, allowing the rebuilder to actually see them first hand, and talk to the people who are supplying them. This is an opportunity that should not be missed.

The Wrong Starter…!

Fighting a misapplication is always troubling and without exception, it can turn into a lot of wasted time, money, and efforts that result in a good amount of frustration. When the problem is solved successfully, you cannot help to feel a little elation of a job well done!

The technician who works for a customer of ours, a big construction rental company, laid an 18230 Bosch starter (0001223002) on the counter with a drive gear that was torn up. He said they are in the process of changing the flywheel's ring gear. So a reman starter was handed out to him and billed out.

A few days later he returned and claimed the starter is making the same engagement noise. Suspecting perhaps something wrong with the particular unit, another starter was handed out to him but the results were the same, poor engagement, and a lot of noise!

Since his original core was now dismantled and its drive in the bottom of the scrap barrel, it dawned on me that maybe I had given him the wrong starter to begin with. 18951 starter (0001223016) looks very much like an 18230 where it has a 9 Tooth drive with 34mm gear diameter. The 18230 has an 11 tooth drive with 36mm diameter (*Figure 5*), so they are close and I could have made a mistake. An 18951 starter was sent over but the results were the same. It barely engaged the new flywheel and when it did, it made an unruly noise.

The business customer in question, a large construction rental company, is located right behind our building and getting there requires only walking out of our back door, going across our backyard and walking into their large building. They have called me for help repeated times to check a machine's charging/starting system on their varied line of equipment and do diagnostics for relays, DC motors for scissor lifts and their controllers. We have a good working relationship with them.

So when the 18951 starter did not work satisfactorily, I decided to look into our application catalogs and see if I could find the proper starter, even if it required to hesitantly call JLG directly for help. Then I was told that they had bought this machine, a JLG Articulating Boom Lift model 600A with a 4-cylinder Deutz engine, at an auction with the stipulation of a bad flywheel. They had never heard it run before!

The only application source I could find for an JLG Articulating Boom Lift was in our own PartRef online catalog that ERA members have free access to, compliments of YouTech Group and Dennis Jacinto. The catalog called for an 18525 starter which is a Letrika/Mahle 3.0KW unit that physically is larger than either the 18230 or 18951 starters. A replacement (J&N's 410-24069) was obtained and installed with no noise issues at all (*see Figure 6*).

Our customer has more than 6 of these machines, and our mechanic friend told us that this particular machine is unique as it does not have a cold-start injector, while all of the others have and use the smaller (18230) starter - so the reason for the difference in the starters. He accepted perhaps the machine came to them with the wrong starter to begin with, thus the reason for the mismatch and the torn flywheel. We will know better the next time!

Until I see you again, keep up the good work.



Figure 4 – Regitar's COM-01 Test box running a LIN-controlled alternator

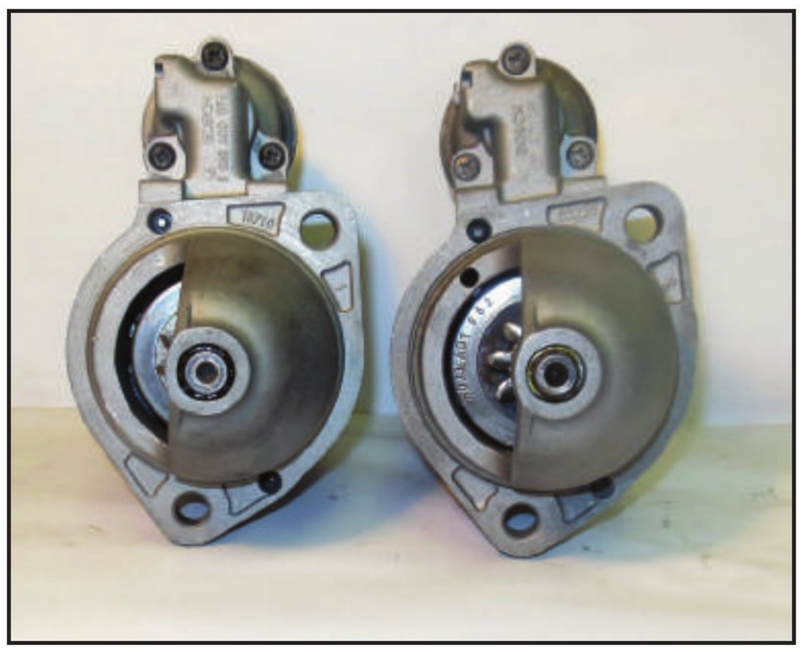


Figure 5 – 18230 and 18951 starters, very similar but have different drives

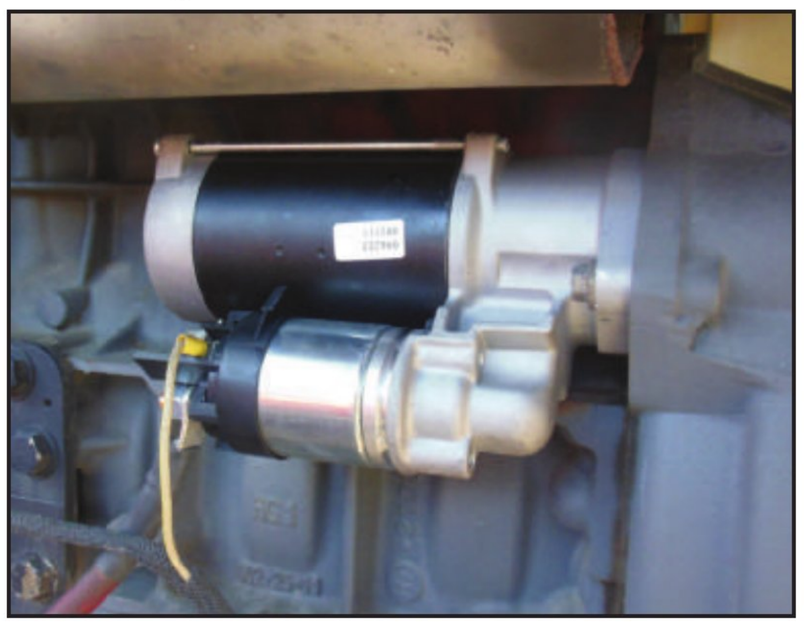


Figure 6 – Installed 18525 unit on the JLG 600A machine

COMMON SENSE — What You Think You Know



BY BOB THOMAS

I am a avid proponent of asking questions when speaking with customers, even though I still feel uncomfortable talking to strangers at the age of 68. There is something about a front counter in a business – any business – that seems to carry with it a set of rules – or at least expectations. I figured this out while working behind the camera counter of a Woolco department in Orange, CT in the mid 70's. The experience was an awaking akin to learning to ride a bike for the first time by overcoming gravity using inertia.

With any counter in any business, you are on one side as the seller, owner or employee (as was my case) while the buyer or customer is facing you from the opposite side. We sellers expect the customers to ask us questions and they expect us to provide them with answers. Selling cameras, film and photo supplies in a retail setting gave me plenty of experience serving a wide array of customers. Since the camera department was smack dab in the middle of a huge store, many were just asking for directions to another department. I usually spent most of my lunch break walking up and down the aisles of other departments, so that I could answer questions like, "Where are the pots and pans?" or "Where is the house paint?"

After a few weeks I was able to answer any of those types of questions too. I was comfortable answering questions about cameras and film from the get go, because photography had been a passion since high school. I took a required photojournalism class in college. After that, it was a major part of my job in the Army for 3 years. To this day, I still enjoy taking the photos for this publication as much as the wildlife in our yard or the sun rising over the river through a bank of morning fog.

Working 48-hour weeks at Woolco's, I got to talk to hundreds if not thousands of customers before moving to Jacksonville, FL a few years later to become the assistant store manager of a downtown Woolworth store. Suddenly, the protective barrier of a counter was gone and the customers were spread out all around the store. If there was a counter, I usually found myself on the customer's side, after another employee rang for my help using a bell or the PA system. Hearing "99 to the front counter" meant a serious problem – as if 100 was the end of the world.

The number of questions decreased as the easy one's were being handled by other employees. And the customers were not really asking too many questions once I became involved. The encounters were now more about solving problems for the few unsatisfied customers that we had. These people could be unhappy about literally anything. Many were trivial and hence easy to deal with, but on occasion I might find myself



being blindsided by an unruly customer. We had plain-clothes off- duty police officers in the store during the afternoon, who were at my disposal if I needed them. But normally they were only called in if a crime was involved – which was an almost daily occurrence.

The camera department experience helped some, but it was the guidance and advice of the store's seasoned manager that enabled me to develop the skills necessary to handle complaints. To be successful at that required asking the right questions and then listening carefully to their answers. Total understanding is essential.

One of the reasons that I ventured into the business of rebuilding alternators and starters was the lack of knowledge that I found in the industry. I saw that as great opportunity in the late 1970's, when alternators were new and few in the auto repair business understood them. I had been an avid science reader since I learned to read. I took every science class offered in high school, including a shop class in electricity. I enjoyed fixing anything electrical – or at least trying to. While not all attempts were successful, I learned something from each experience, even if it was never cut an extension cord that is still plugged in.

My first job at an auto electric shop was in management. The owner had been running his three-person business for several years, and he wanted time away. But I quickly figured out that I understood automotive electrical systems better than the employees doing the work, including the owner – who often used the words current and voltage interchangeably. If something didn't work, they changed parts until it did. When all parts had been changed and it still did not work, they started from scratch and began changing all the parts again. I tried to teach them a better way, but they had no interest in learning. After two years, I set off on my own.

Because I worked on vehicles of all types with any kind of electrical problem, I quickly learned the importance of good communication. Not only was I answering customer's questions, I had to ask them too, listening carefully to their answers. I discovered that taking an extra five minutes to insure that I understood each vehicles problem, saved me hours of work by the end of the day. If your are not careful, a customer can easily convey a false assumption that will lead you down the wrong path, away from customer satisfaction.

When it comes to business transactions, for any type of enterprise, nothing is more important than knowing what each customer really wants and expects. To be successful with your customers, you cannot rely entirely on the words that they use. If they do manage to verbalize their needs, you have to remember that it is what they "believe" the problem is or what they "think" they need. Where you go from there is up to you.

A quote attributed to Mark Twain reads: *"It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so."*



24 VOLT BRUSHLESS CAT DENSO
Heavy Duty Alternator



BY BOB THOMAS

I was recently introduced to a Denso alternator that I had not seen or heard about before, even though it was used by Caterpillar on a wide array of equipment models spanning 21 years – from 1980 to 2001. The original Denso number for this unit is 100211-0890, 101211-6100 or Lester 12060 (*see Figures 1 and 2*). It is a brushless, 24 volt, 50 amp, J mount alternator (or very close to a J mount). More about the mounting later. It is self-exciting and isolated ground. You can easily identify it by the cooling holes on the back cover, which is attached with five hex-head machine screws with Phillips-head slots – a Denso trademark of sorts.

This alternator was used on over 100 different Caterpillar equipment model numbers using over a dozen different CAT engines. Anyone who has ever priced an original Caterpillar alternator already knows that this one is going to be expensive from the dealer.

In today's world, many rebuilders are inclined to replace first and rebuild only when a replacement is not available. But this alternator is probably the easiest and simplest I've ever worked on. It was designed to be repaired. There are no soldered or welded connections. Replacement component parts are readily available and inexpensive by today's standards. In many ways it is similar to a 25SI, but smaller and easier to work on.



Figure 1 – Front view of the 24 volt CAT Denso Alternator.

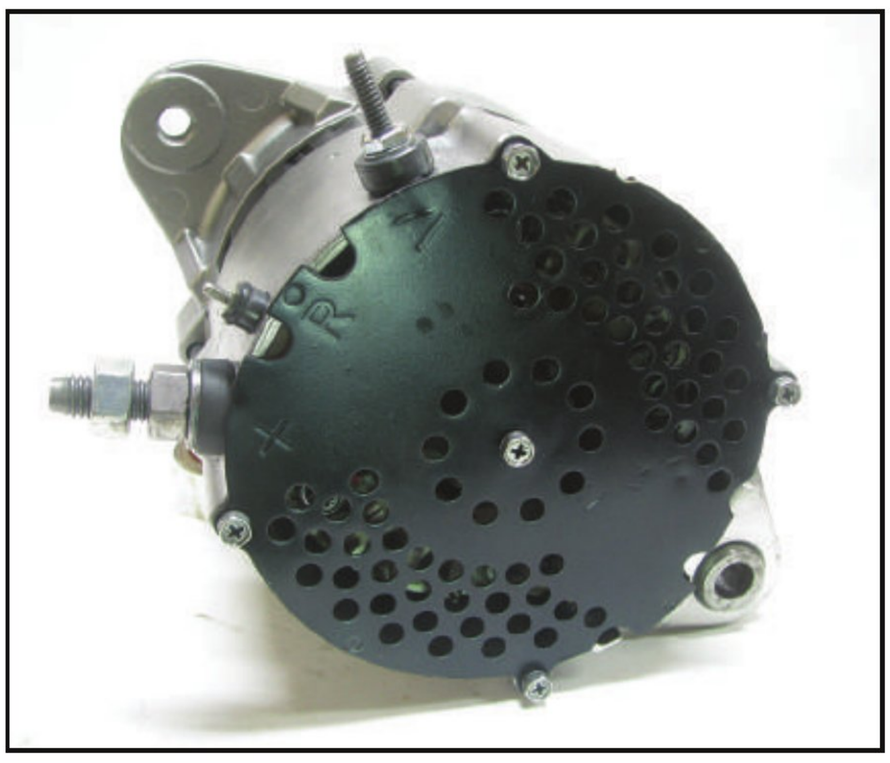


Figure 2 – It is easily identified by its back cover.

Once the back cover is removed (*see Figure 3*), you can easily trouble-shoot an inoperative alternator on your test bench before disassembly. I find that taking a little time to do that can save you time later, especially when when all components seem to be good. The regulator has four connections. It is mounted just below the R terminal (*see Figure 4*) and attached directly to the positive and negative heat sinks which provide the B+ and B- connections. The other two connections go to the stationary field coil, whose leads are colored-coded (red and black) for positive and negative. Since a trio provides field current in this alternator, this regulator is A-circuit, controlling the negative side of the field. You can by-pass this regulator with a jumper wire between field negative and the negative battery terminal.

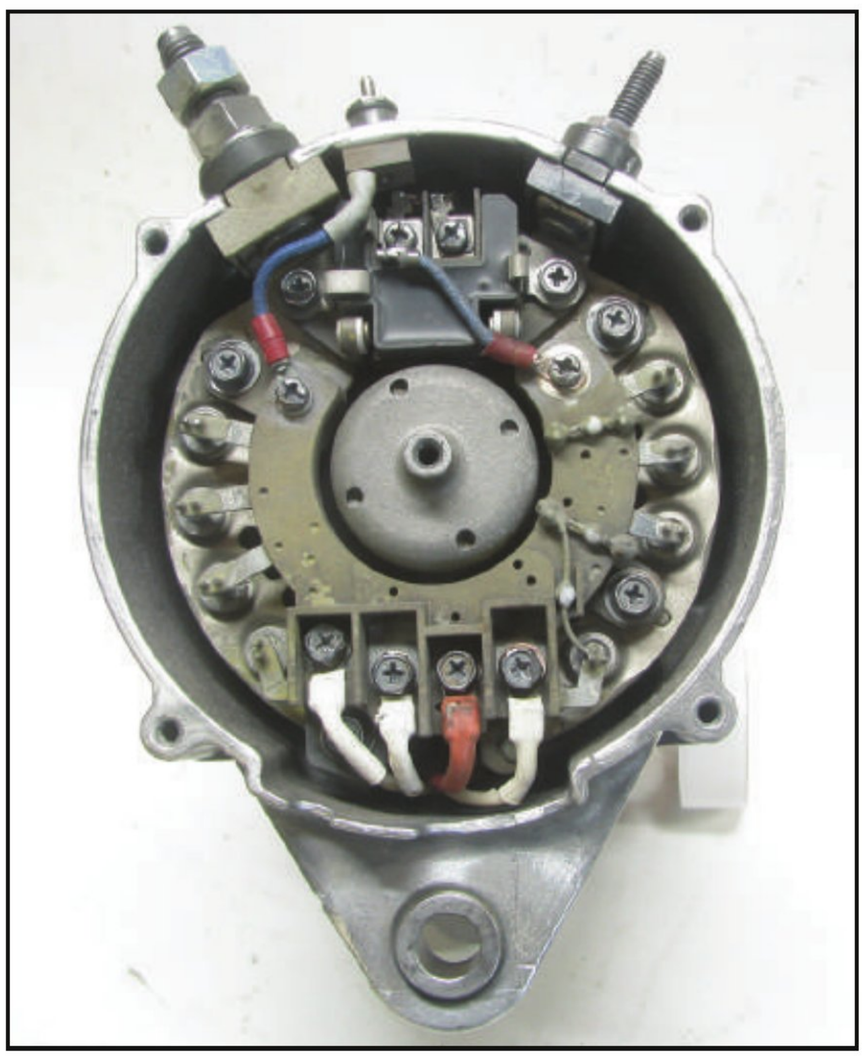


Figure 3 – With the cover removed, you can troubleshoot this alternator on your test bench.

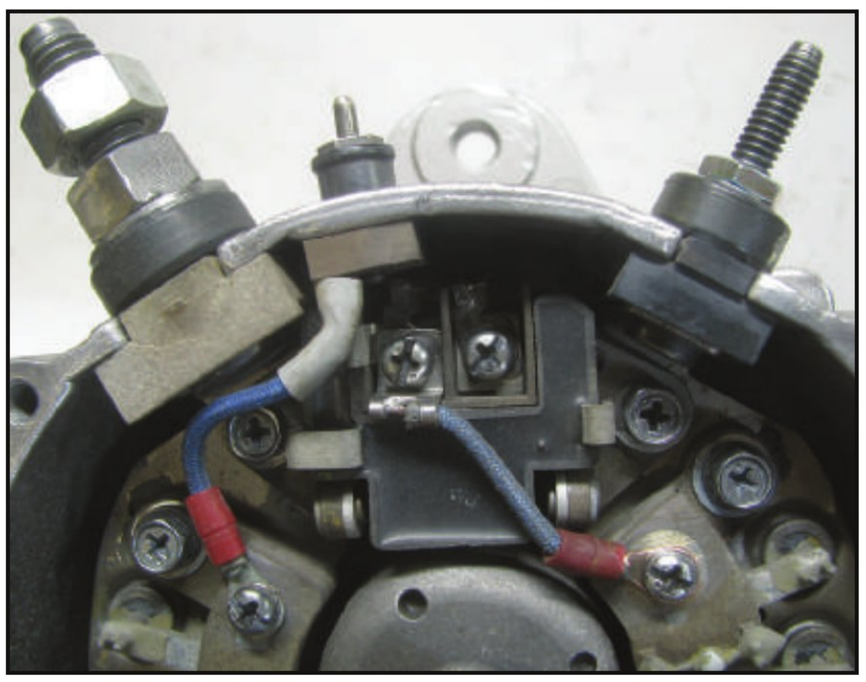


Figure 4 – A close up view of regulator which sits behind the capacitor/excitation resistor.

24 VOLT BRUSHLESS CAT DENSO

A three-terminal capacitor and excitation resistor (*see Figure 5*) mounts on top of and obscures the regulator. It has an internal 1,000 ohm resistor between B+ and the third terminal, which is field positive. Its purpose is to allow a small amount of current to flow through the field when the equipment is not in use. On a set of fully charged batteries, that current amounts to about 25 milliamps – not much if the equipment is being operated regularly. However, it will draw the batteries down given enough time, to the tune of a little over four amp-hours per week or 125 amp-hours over a month. What the owner or operator may not know is that the purpose of the R terminal is to force excitation by flashing it with B+, which is conveniently located right next to it.

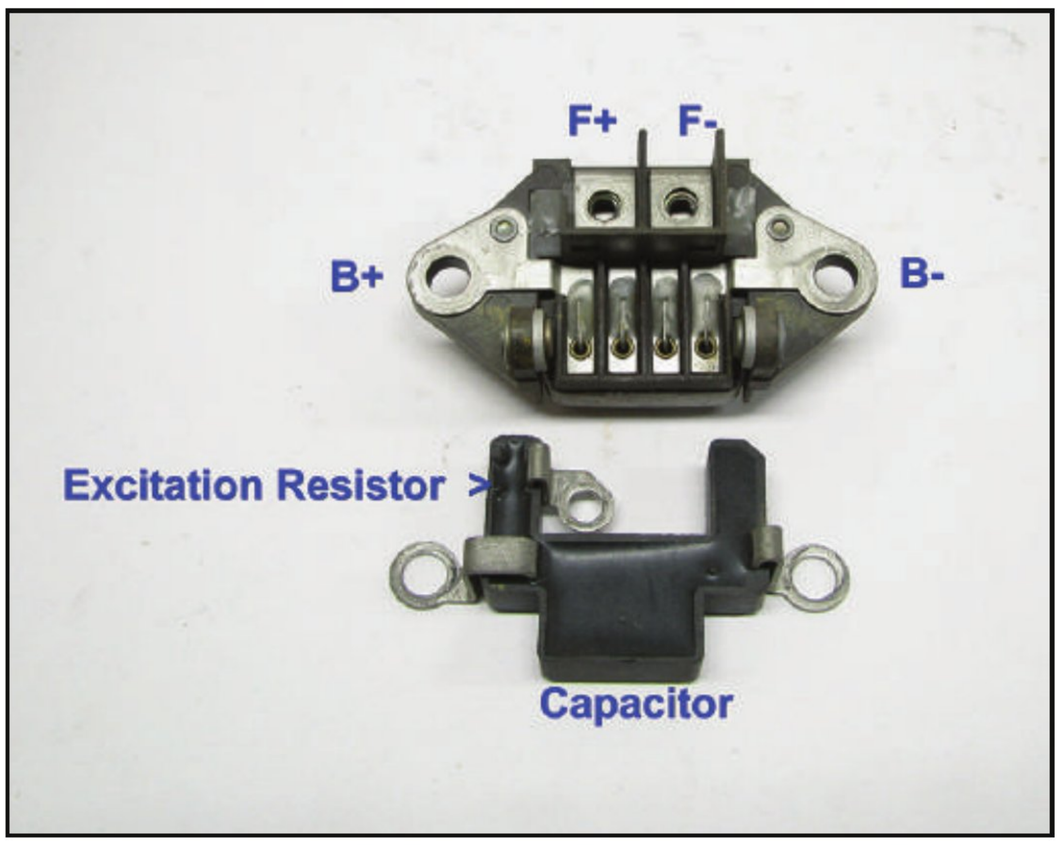


Figure 5 – Here you can see the voltage regulator's terminals along with the capacitor/resistor.

The R terminal wire (blue) connects to a threaded contact on the lead frame of the positive rectifier, which is connected internally to the P1 stator terminal. When briefly given battery voltage, some current will find its way through the P1 trio diode to excite the field. The trio diodes are located on the negative side lead frame and another blue jumper wire connects the trio to the regulator's positive field terminal.

If a customer drops off an alternator that will not self excite, but begins working normally after flashing the R terminal, it is highly likely that the machine has been sitting a long time and the batteries are at least discharged if not totally bad – information the customer needs to know.

The stator is wye wound, with the neutral wye terminal rectified. The four stator terminals are color coded with heat shrink. The neutral wye terminal is red, while P1, P2 and P3 are white (*see Figure 6*). The alternator's large 7/16" positive and smaller 1/4" negative terminals connect directly to their respective heat sinks.

Once the rectifiers are removed, you will have access to the three bolts that secure the stationary field coil in place (*see Figure 7*). The coil's leads are also more visible (*see Figure 8*). The drive end bearing is the same ID and OD as a common 6305 bearing, but it is 2 mm wider than a 6305. It is available in aftermarket and OE Denso. The back side of the rotor is supported by two 6003 bearings, which is a somewhat common size that many rebuilders stock.

As mentioned earlier, this alternator is J mount, or very close. The mounting holes are SAE as are the terminal posts. However, when comparing the Denso DE housing to a 22SI DE housing, I found that the center-to-center distance between the the mounting holes differ by two millimeters. That is not much distance and if the adjusting bracket will pivot it would not be a problem. But if the adjuster bracket is fixed, then it could cause the person trying to install it the loss of some hair.

The first inclination might be to replace this unique CAT-Denso with a much cheaper 22SI, and if you offer that to a customer, 99% of them will take it without asking a single

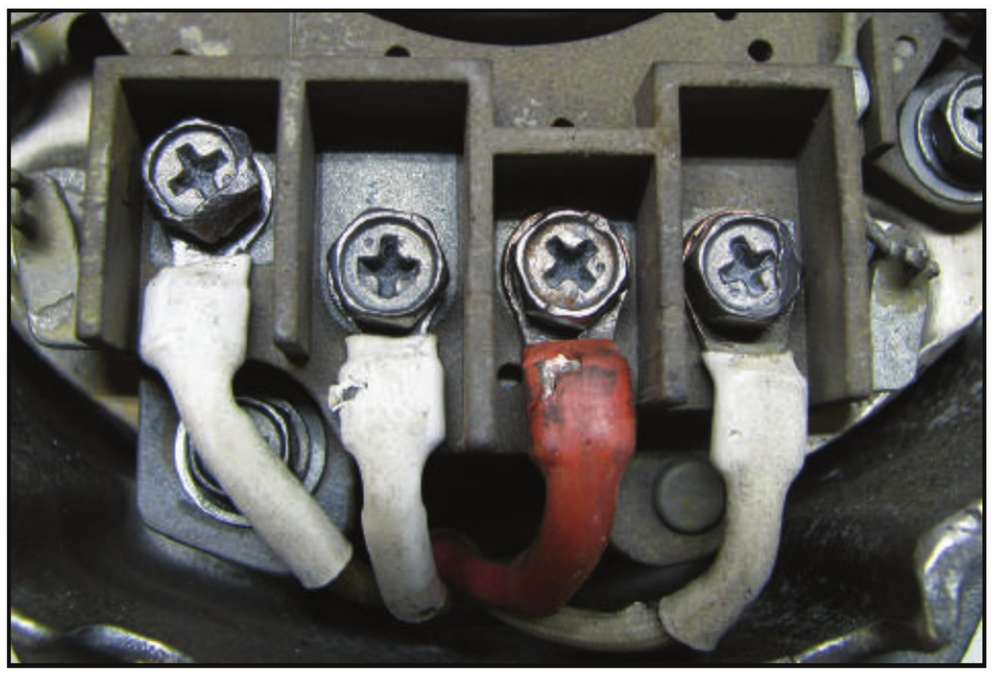


Figure 6 – The stator leads are color coded – red is the wye connection, which is rectified.



question. However, there are several things that you should keep in mind. One of them is the size and location of the positive and negative cables. Most J mount alternatives have their terminals on the back, while the Denso terminals are on the side. Will the cables reach? Also consider that the B+ post on the Denso is 7/16-14, larger that any Delco alternative that would be 3/8" at most. If the cable's terminal end has to be changed, is the cable long enough? How much time would it take to re-route a whole new cable? Is it worth the hassle of an upset customer?

If you happen to run into one of these alternators with no negative diodes, it means that you have a low amp version. JIMCO says they exist, so I know they are out there, even though I was unable to find a part number. Everything else is the same except amperage output is cut roughly in half.

Many of the applications that use these alternators are very specialized equipment. The reason that I had not seen any of these before is probably because they rarely fail. I hope this helps you make an extra dollar or two if you find one of these on your front counter one day.

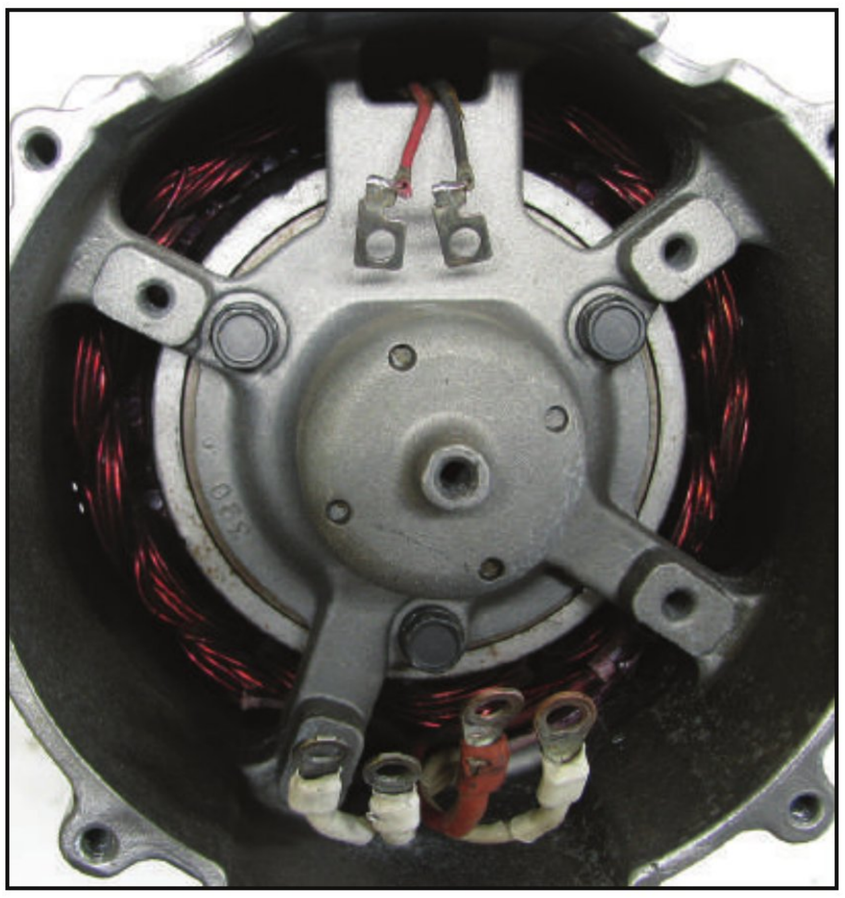


Figure 7 – With the rectifiers removed, you can access the stationary field coils mounting bolts.

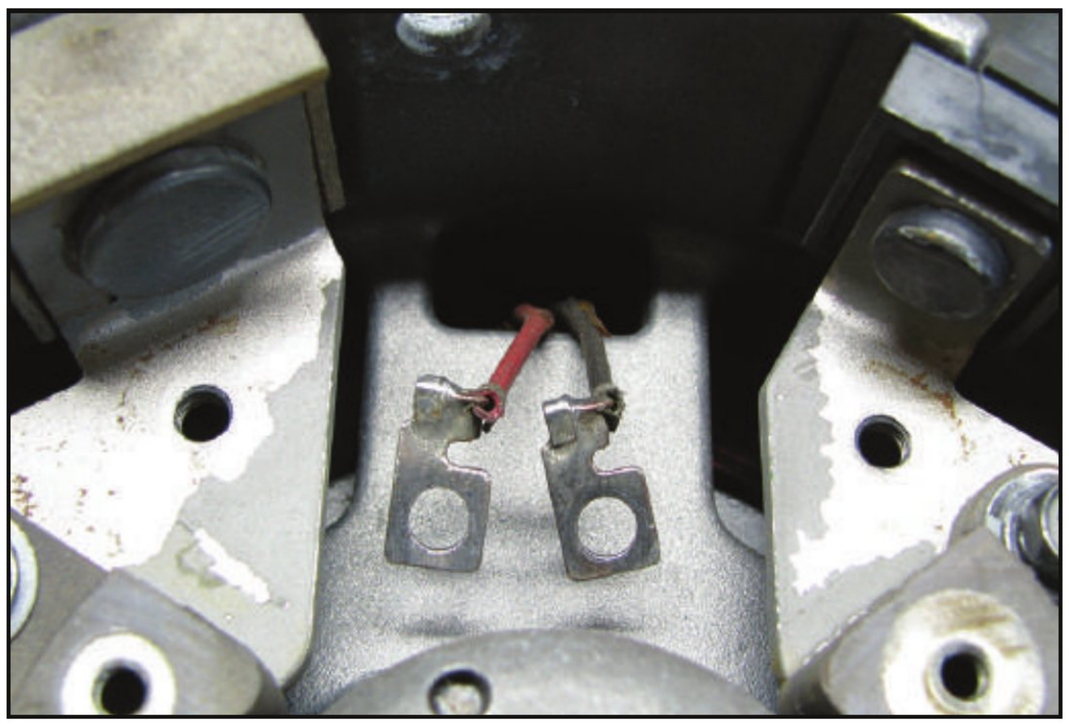


Figure 8 – Here you can see the color coded coil leads.



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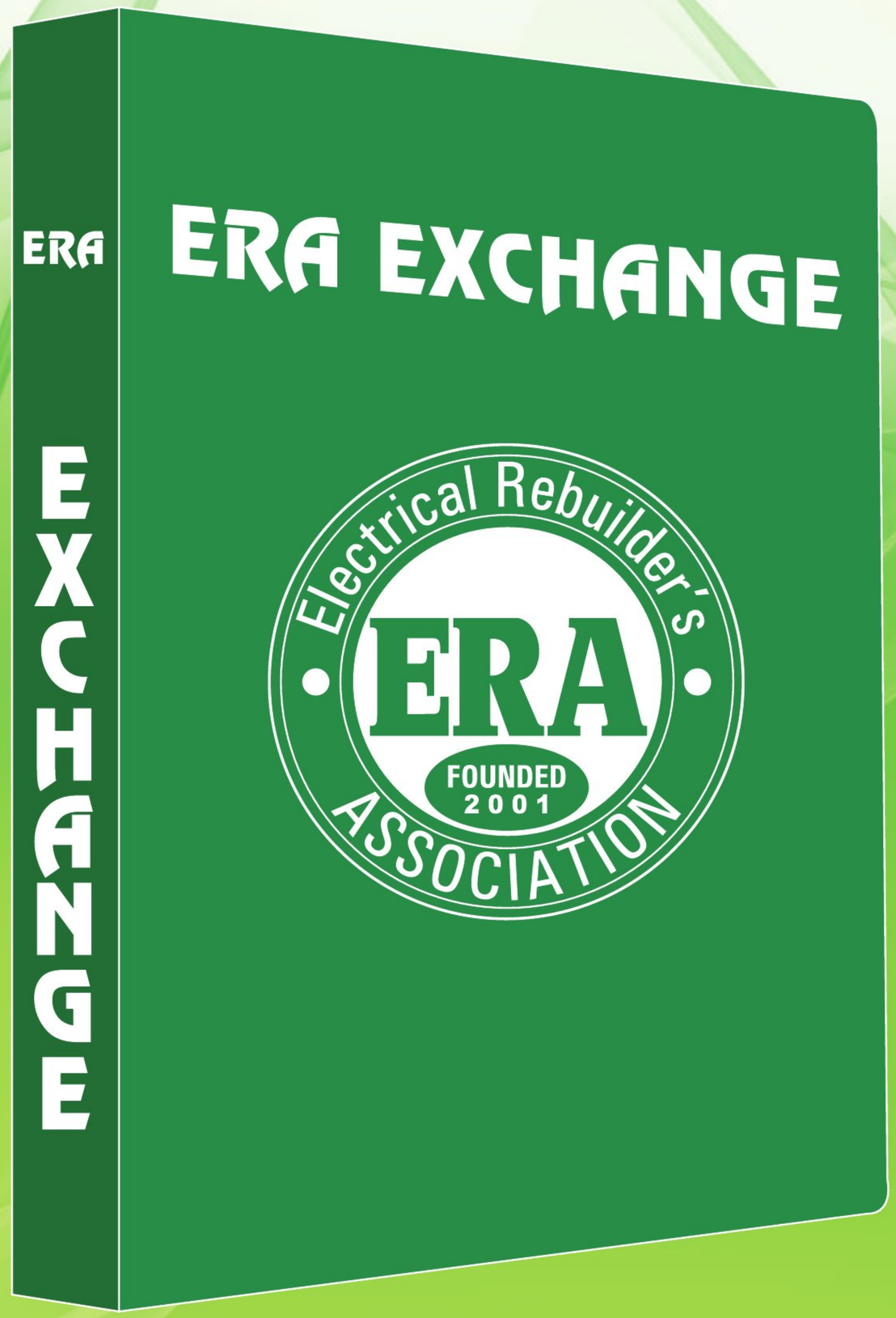


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for the era website

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THE RULES:

1 – Any video submitted between May 1, 2017 and January 31, 2018 that is used on the website will be rewarded $50.
2 – The three best videos will receive an additional $200. The winners will be announced at the 2018 Trade Show in Montgomery, AL.
3 – Only current Rebuilder and Honorary ERA members are eligible.
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- To submit ideas for videos that you would like to see done, contact the Technical Committee at: techideas@electricalrebuilders.org
- To submit videos for approval, contact the Technical Committee at: techvideos@electricalrebuilders.org
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MISCELLANEOUS

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