THE EXCHANGE

AN ELECTRICAL REBUILDER'S ASSOCIATION PUBLICATION

SHOW ISSUE

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The ERA Expo in Atlanta is only weeks away, and the lineup of seminars and speakers is one of the best ever assembled. Here is the full list of speakers and topics with a brief description of each in the order in which they will be presented

How to Treat or Not Treat Your Customers—Ronnie Charnes, Mike Dietrich and Lynn Gross will share their experience, over 100 years combined, in customer relations. Those who attend may share their own observations or just listen to others.

What I've Learned Since I Retired, About Rebuilding, Business and Life—Joe Davis began rebuilding generators and starters working for an Oldsmobile dealership when 1950's models were still considered new. He operated his own rebuilding business for many years and later presented countless day-long technical seminars for WAI, APRA and ERA. He is back for this show to share some of his wisdom and knowledge.

Flash Reprogramming—Your New Profit Center—Marshall Townsend is the Bosch technical specialist for the southeastern US. If you would like to learn more about using scanning and reprogramming tools, he will answer your questions and explain how modern automotive electronics operate.

How to Price Yourself Into or Out of a Market—Shawn Bray of Romaine Electric will explain how to go about finding that delicate balance in pricing your products for your market. Your bottom line depends heavily on your understanding of this topic. Nobody ever explained it better.

Understanding Battery Technologies and Their Effects on the Charging System—Dan Bell of Whatcom Electric in Bellingham, WA will explain the evolution of battery technology and its relationship to charging systems. All batteries do not charge the same, and rebuilders need to understand the differences, whether they sell them or not.

(See SHOW, pg. 7)

Shop Profile
A & S Starter Company
Omer, MI

BY ERE STAFF

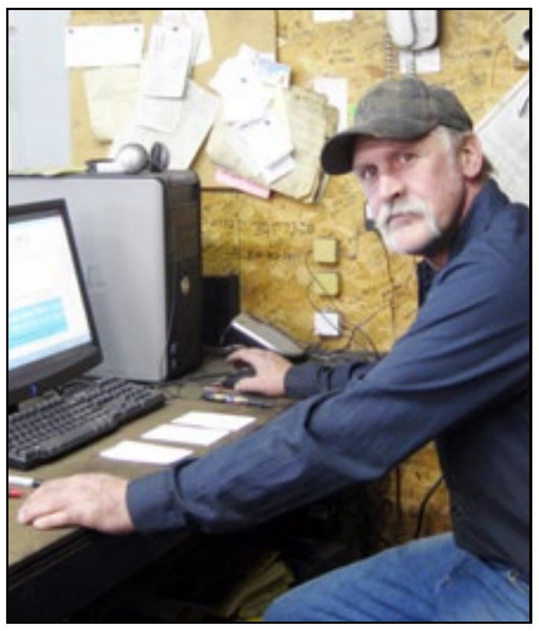
Sonny Migut, owner of A & S Starter Company, learned to rebuild alternators the hard way. He figured it out himself.

"I got married in 1962 and worked several odd jobs before an automotive parts rebuilding company opened nearby," Migut recalled. "That was in 1964. They were rebuilding all kinds of auto parts—water pumps, brake shoes, starters and generators. When I applied, they hired me at $1.25 an hour and assigned me to handling cores, where I checked them in and sorted them. And that's how I learned how to identify all of the cores they rebuilt. Then one day, they took me to a pile of odd looking cores in the corner and said, 'These are alternators. Nobody here knows anything about them.' That's how I got started in rebuilding." He was promoted to alternator rebuilder on the spot.



Sonny and Mary Migut

When the starter man quit, Migut found himself moved into rebuilding starters. "A few times I got discouraged and quit," he said, "but I always came back. They had three tractor trailers delivering rebuilt parts and picking up cores. At the peak, we were rebuilding 300 to 400 generators a day. Then, in 1979, they just suddenly closed!"



Danny Raushi

Out of work, Migut decided to open his own rebuilding business, specializing in electrical only. He chose Omer, MI for the location, a small town on the Rifle River, a few miles from Saginaw Bay on Lake Huron and about 175 miles north of Detroit. "I thought it would be a good location, because there were no other rebuilders nearby." After 35 years in the same location, that is still the case. With a population of 308, Omer calls itself "The Smallest City in Michigan."

A & S Starter Company is a three-person rebuilding business today, with Sonny, his wife Mary and Danny Raushi. "Danny has been with me for 33 years," Migut said. "He was 15 years old when he started to work for us.

"All of our business is walk-in. We do a little bit of everything. If it runs on a battery we will rebuild it." Mary rebuilds most of the alternators, whether they are heavy duty, industrial or automotive. "Our biggest challenge today is trying to keep up with all of the Chinese stuff

(See A & S, pg. 15)

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Serving the automotive electrical aftermarket

SINCE • 1983

EDITOR
Bob Thomas

ASSOCIATE EDITOR
Betsy Grueninger

DESIGN/PRODUCTION
Wes Grueninger Sr.

CONTRIBUTING WRITERS
Rob Buksar, Wes Grueninger Sr., Richard Vensel, Larry Hagemeister, Ken Plourde, Bob Thomas

ADVISERS
Hank Henke, Ken Plourde, Mike Schroeder, Daren Roggentien, Chris Thompson, Ronnie Charnes

• • •

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Phone 904-269-7052 • FAX 262-679-7028
E-mail: ere.bobt@gmail.com • ere.wesg@gmail.com

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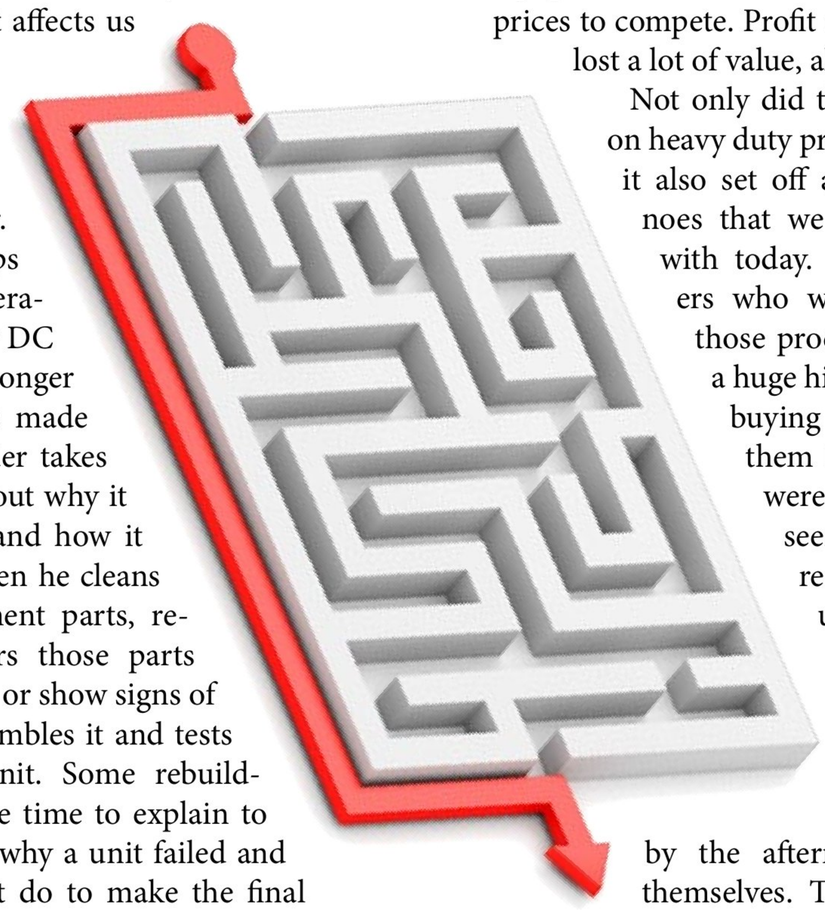
The Path Of Least Resistance

BY BOB THOMAS

Human beings, like electric current, follow the path of least resistance. Science tells us that it is part of our DNA blueprint, an attribute that helps us conserve energy—a survival instinct of sorts. Some people will say that we do it to save time, increase production and generate higher profits. Others may just call it plain old laziness. But no matter which idea you believe, it is a human trait that affects us all.



The best rebuilder is a natural born problem solver. A customer drops off a starter, generator, alternator or DC motor that no longer does was it was made to do. A rebuilder takes it apart, figures out why it does not work and how it got that way. Then he cleans it, tests component parts, replaces or repairs those parts that fail the tests or show signs of wear. He re-assembles it and tests the complete unit. Some rebuilders even take the time to explain to their customers why a unit failed and what they might do to make the final product last beyond their expectations. All of that takes time, tools, knowledge and physical labor. Of course rebuilders accomplish all of this as efficiently as they can, hopefully without sacrificing the quality of the original unit.

On occasion, the alternator, starter or DC motor that gets dropped off is destroyed beyond economical rebuilding, or it is very new or very old and requires parts that are not available. Sometimes a customer just requests a spare unit for a backup. He may want it for a critical piece of construction equipment. If he is a sailor, he may be preparing for a long voyage. If good cores are not available to rebuild or salvage for unavailable parts, your choices to make a sale are limited. What do you do?

New units from the original equipment manufacturers have always been available, at least from most of them. They were never cheap, but that was good for our industry. The price of a new unit set a benchmark that allowed for a considerable profit margin in the rebuilt price. Without mentioning any names, at some point, one original equipment manufacturer decided to compete with rebuilders by selling new units at drastically lower prices—directly to those who were the rebuilders' customers. That is probably when "the gloves came off." Other original equipment manufacturers lowered their new unit prices to compete. Profit margins on rebuilt units lost a lot of value, almost overnight.

Not only did this have a drastic effect on heavy duty production rebuilders, but it also set off a chain of falling dominoes that we find ourselves dealing with today. The aftermarket suppliers who were supplying parts to those production rebuilders, took a huge hit as their customers quit buying their parts. Many left them holding receivables that were never received. In what seemed like a reasonable reaction, new aftermarket units began to appear. Many of them were assembled by a few of the surviving production rebuilders. Others were produced by the aftermarket parts suppliers themselves. Those new units helped many rebuilders make sales that they would have missed, including those for late model applications. Few rebuilders saw them as a threat.

This is where the path of least resistance began to kick in, that human trait I mentioned earlier. Rebuilders quickly realized that they could

(See PATH, pg. 17)

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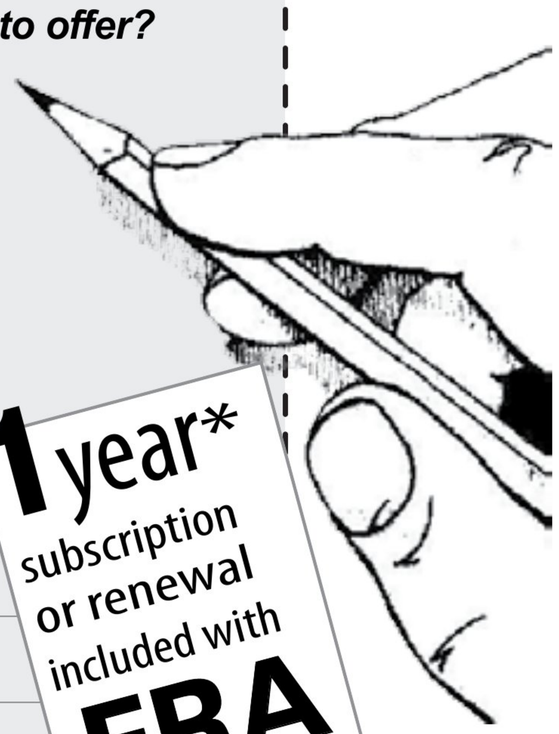

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Clark Gordon
Alpine Auto Electric
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History Repeats Itself ...
Or Some Things Never Change

ERA STAFF

When the ERA website was created, nearly ten years ago, an important part of the site was the Quality Control Forum. It is a place where members can post quality control issues that they have encountered. The purpose of the QC Forum is to warn other rebuilders in advance, of possible troubles with parts failing, so that they might avoid the resulting rebuilding problems. The QC Forum is also used to notify suppliers about problems with parts that they may be selling—parts that may not perform properly—so that those problems can be corrected. The most important purpose of the QC Forum is to improve the overall quality of what we rebuilders sell.

From time to time, we will be publishing some of the posts that have been made on the QC Forum, not to lay blame or point fingers, but to make a contribution towards improving the quality and the reputation of the rebuilding industry.

This post, we are sorry to say, was a case of history repeating itself. *Figure 1* is a photo that was recently posted to the QC Forum. It shows a brush holder in a Lester# 5771 starter which was made in China. After a short period of time on the vehicle, the starter was returned with a melted plastic brush holder. One excuse might be that the the operator cranked on the engine too long, which may have caused this failure. But we have all seen original starters of this type with brush leads that have been discolored from intense overheating—without ever melting the brush holder. Note that the brush leads of the starter in this photo show no signs of overheating.

Back in 2008, nearly six years ago, this same problem was pointed out by a different ERA member, as shown in the photos below. In this case, the member tested two brush holders with a hot soldering iron. *Figure 2* shows the failed brush holder, bottom-side up, with a soldering iron pressed lightly against it for four seconds. Note that the soldering iron tip went all the way through the plastic in just four seconds. *Figure 3* shows an original brush holder reclaimed from an original starter—turned the same way and with the same soldering iron. That photo was taken after three minutes of applying pressure from the same hot soldering iron—at the same temperature—with the same amount of pressure. A slight discolored dimple is all that resulted. The plastic did not melt!

Whether you are a rebuilder or a supplier, if you are selling this type of starter, we urge you to test the brush holder with a soldering iron. Oviously, if it fails this simple test, then it will fail in the field. These failures will reflect negatively on all of us

E R A



Figure 1—Melted brush holder from a UT-style starter.

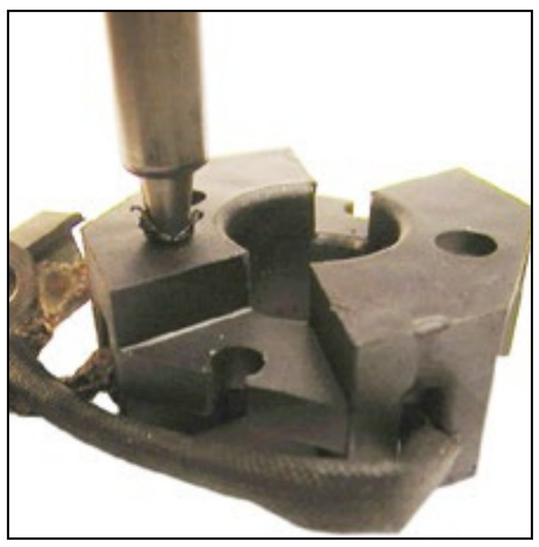

Figure 2—Aftermarket brush holder after four seconds of heat



Figure 3—OE brush holder after three minutes of heat.

Plain Talk
To strengthen and preserve

BY ROB BUKSAR



I was recently sent a message from The Exchange newspaper which really had an effect on me. I don't think that I'd be out of line sharing it with you, so here it is: "Without the dedication of our contributing authors, The Exchange would not be the exceptional publication that it is. We hope that the articles published in 2014 will be found to strengthen and to preserve our industry." From my perspective, The Exchange has been and continues to be an exceptional publication. Presently, it's being run by a couple of special guys who clearly have their hearts in it. Yet, even though I understand the intent of their statement, what fun would it be if I couldn't just throw my two cents in? I suppose a little history would be appropriate here, so let me give it a shot.

Many of us who remain in this business are old-timers. That's right, we qualify for the senior-citizen discount at Dunkin Donuts. That being the case, most of you remember the days before the global economic system, when GM, Ford and Chrysler were pretty much the only games in town. Furthermore, we were more of a patriotic country. We had a sense of nationalism, community and togetherness that I haven't seen much of lately. I think that our parents winning WWII might have had something to do with this, but that's another story. Nevertheless, when we worked together, we did great things, and we all prospered. Also, the bigger guy, in many cases, found that he could further his own interests by helping a smaller guy either to get started or to get bigger.

Back in the day, in the Calumet Region/Chicagoland, we just didn't have many different franchise fast-food shops. I remember White Castle, a few McDonald's and maybe a Steak 'n Shake. Aside from those, there was a whole bunch of independently-owned restaurants and diners, both small and large. In my area, a whole host of these were owned by first and second-generation Greeks. We even had independent coffee and donut shops.

These folks legally immigrated to this country and usually worked for the person who sponsored them, which is where they learned their craft. Maybe after 5 years or so, with a grasp of the language, our economic system and their craft, they then wanted their own piece of the pie—the American dream, "their own business."

Yet, what was one to do with a ton of desire, a hard-work ethic and know-how but no money? Dreams and desires provide the vision, but money

(See STRENGTHEN, pg. 6)

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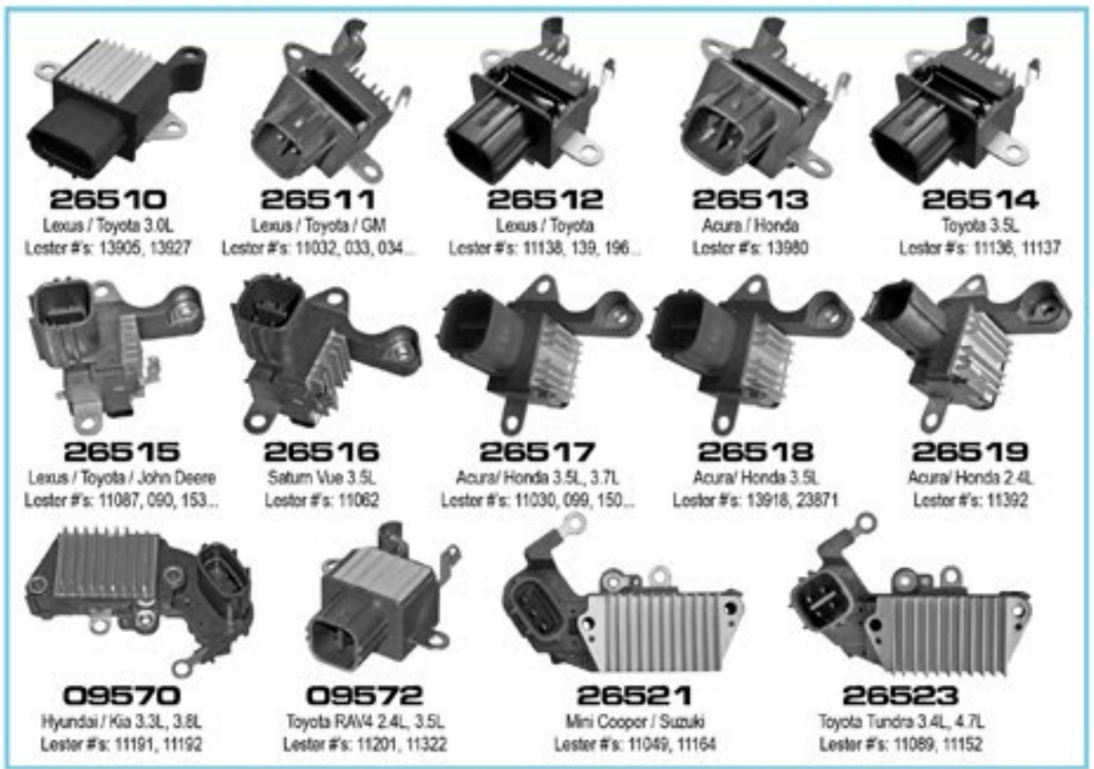

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BY BOB THOMAS

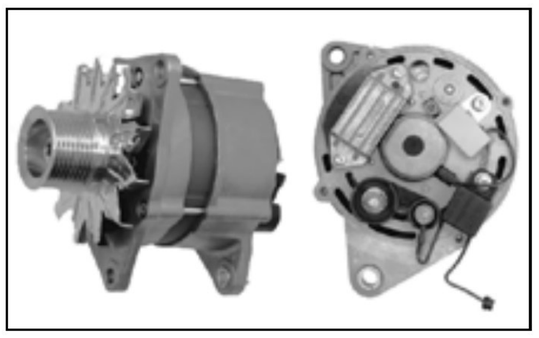

Figure 1—Iskra/Letrika 11.203.302

A strange capacitor-looking component that is being mounted on the back of some Iskra/Letrika alternators is not a capacitor at all, in spite of the fact that it is being called that in printed literature. The alternator on which you will find it is Iskra/Letrika 11.203.302 (see *Figure 1*). This part (see *Figure 2*) is actually an inductor. We have spoken to a number of rebuilders who have already seen this inductor fail, and when it does, it prevents the alternator from charging. The part number for this inductor alone is 16.911.387. If you order one, the packaging will probably refer to it as a capacitor, because it looks strikingly similar and obviously assumptions were made. The affected applications we are aware of at this time include a variety of Case, New Holland, Ford and International tractors with Perkins engines.

If you look closely, the rating on the inductor in the photo is 20 mH (millihenries), where as capacitance and capacitors are measured in farads. Note the amperage, too. We will get to the importance of that later.

If the electrical component's name, inductor, seems a little strange to you, it is because inductors are very seldom used in DC circuits, the big exception being ignition coils. However, they are quite common in electronic circuits. In electronics a *choke* is a version of a passive two-terminal inductor, which is designed specifically for blocking higher-frequency alternating current (AC), while allowing lower frequency direct current (DC) to pass. The inductor on this alternator is doing just that.

The reason that this inductor is on this alternator lies in the instrument panels of the above mentioned tractors. The inductor is connected in series between the D+ excitation terminal on the alternator (the post just below the inductor in *Figure 2*) and the wiring harness leading to the charge-indicator lamp, which happens to be a light-emitting diode (LED) mounted in a fully electronic instrument panel. LED indicator lamps cannot pass enough current to excite a trio-powered field circuit by themselves. There has to be a resistor in the instrument cluster in parallel with the LED to provide the current required for excitation—about 250 mA (milliamps), which happens to match the amperage rating on the inductor in the photo.

Once excitation takes place, the D+, or trio terminal, becomes an output which will supply power to the field (source of field current) and turn off the indicator lamp (LED in this case). When the first of these tractors was initially assembled, there was no inductor on the alternator, and the electronic instrument panel immediately began having problems dealing with the erratic voltage coming back from the D+ terminal on the alternator. A quick fix was needed, and it was too late to build it into the instrument panel which was already in production. This inductor was the solution.

The inductor is used to smooth the D+ voltage output from the trio. D+ output is what turns off the LED once the alternator begins charging. It also back-feeds through the parallel resistor into the instrument cluster's power supply. The B+ output of an alternator needs no inductor since it is always connected directly to a battery, which acts as a huge capacitor, smoothing output voltage. However, trio or D+ output is not connected to a battery. It is connected only to the field circuit, and in this case, the instrument cluster's key-on power supply. If you have ever looked at D+ output voltage from any trio on an oscilloscope, you have likely noticed that it is not nearly as clean as the charging voltage on the B+ terminal. This "noisy" output is primarily a result of the regulator rapidly switching the field current on and off.

So how does this little black box smooth fluctuations in voltage? After all, capacitors are connected in parallel. The inductor is connected in series. The science behind the inductor lies in the iron core, where magnetism is temporarily stored whenever current flows through the coil. When that current varies or changes, the magnetic field induces a voltage in the conductor that opposes the change in current that created it. In other words, the inductor is an amperage shock absorber. You might think of the magnetic field in the iron core as the spring. Because of Ohm's Law, when voltage changes in a circuit, amperage must follow, and vice versa. Clean up the amperage and you clean up the voltage.

Now that you know what this little black box is and how it operates, we will explain the problem that you may encounter with one. It is relatively simple enough. The coil in this inductor is prone to go open. In other words, the wire in the coil inside breaks or burns out, and no current can flow through it. When this happens, the charge lamp does not get a ground and cannot illuminate, even with the key on and engine off. In addition, the D+ never gets the excitation current it requires to turn the alternator on, so it cannot charge. Most operators will not notice that the charge lamp does not illuminate prior to starting with the key on. Also, most will assume that the alternator is charging when the engine is running and the warning lamp is not illuminated. This scenario almost always ends with a dead battery in the middle of a field, with the job at hand incomplete.

While inductance is measured in Henries, which requires an LC meter

(See INDUCTOR, pg. 15)



Figure 2—This part is an inductor

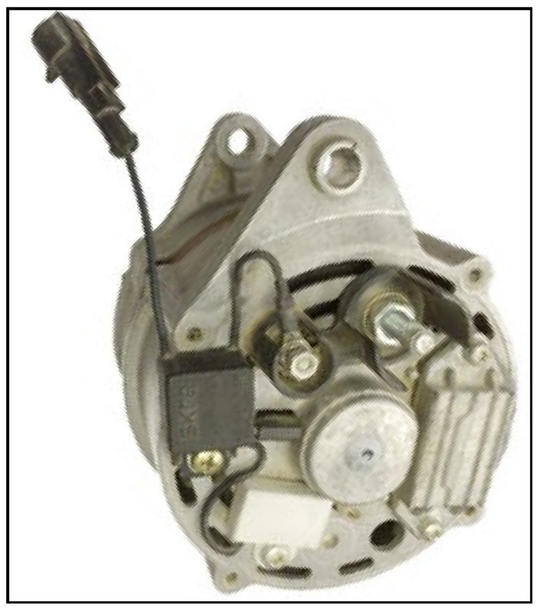

Figure 3—Iskra/Letrika 11.203.302



Figure 4—Testing with LC meter



Figure 5—Testing resistance

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STRENGTHEN

(Continued from page 4)

is necessary to fuel the enterprise. So enters the bread or coffee supply man. Believe it or not, in my area, and maybe in the other large metropolitan areas in America, the "bread and coffee men" were responsible for putting scores of people into their own businesses. All you had to do was exclusively buy their bread or coffee and pay what you could on the loan each week. In my lifetime, I've known a bunch of these restaurant folks and their kids personally. According to them, this is how they did it. It worked and everybody won! The big guy grew his business by helping the smaller guy grow his business. By the way, most times this was done on a handshake! Lastly, at no time did the big guy try to infringe on the smaller guy's turf. There were lines drawn, and most respected them.

In our industry, there was a lot of the above occurring also. Working out of Chicagoland was a fellow named Al Mansfield. He owned International Products and Machine (IPM). IPM was actually a foundational organization on which, in part, the modern rebuilding industry was built. If you needed parts, tools or equipment then, that's where you bought them. There is just no telling how many folks Al Mansfield put into business. He either supplied the tools and equipment to set someone up to make parts for him, or he helped upgrade and modernize a rebuilding shop so that they could facilitate a larger customer. Bottom line was that the big helped the small (or the not-yet-existent) to either start-up or become far more than they were. The road to fame and fortune was found and travelled by all through working collectively, rather than the larger trying to eat the smaller.

Working out of Detroit was a fellow named Barney Kaplan. He owned and operated BKS, Barney Kaplan Surplus. How Barney established his contacts with Ford, Delco and Prestolite will probably remain a mystery, but if you wanted cores of any type, Barney was the guy to see. Barney was also a foundational organization. In those days, there weren't boat loads of new offshore units. If you wanted to rebuild, you needed cores, and Barney had them. I don't know who started first, Barney or Al, but I do know that Barney started "moving and shaking" while Harry Truman was president. (Remember "Give 'em Hell, Harry?")

Barney either helped all sorts of folks get started or assisted in expanding many businesses. It wasn't beyond Barney to drop off a truck load or a trailer load of cores and tell the recipient to pay for them when they could. And he was just as helpful to the small guys. Whether it was units or components, if the rebuilder couldn't immediately pay, Barney would say, "Start sending me some money once you get some of this stuff sold." I was one of the recipients of Barney's generous assistance, so I can personally testify to the accuracy of this. A lot of folks still around today wouldn't be here if it weren't for Barney's help at an earlier time.

I talked about immigrants, restaurants and donut shops ... and the importance of the "bread and coffee man" to these guys. I shifted over to IPM and BKS and the influence they had on our industry. By this time, if I haven't put you to sleep, you might be asking yourself, where I'm going with this.

Let me end this where I started. Wes and Bob, at The Exchange, want articles that will help strengthen and preserve our industry. Remember the two cents I wanted to contribute? Well, here it is: We will never return to the past, and I doubt what's left here is coming back either. Yet, we all can do a little better when it comes to supporting one another and also spending some of our dollars with the few domestic shops and suppliers that remain. We built great big things, orbited the earth, landed on the moon and returned. We built the world's greatest economy and achieved the highest standard of living that the world has ever known! We did this without the global economic system and offshore manufacturing. We did this by working together for the benefit of ourselves, our communities and our nation. How could trying to recapture some of this spirit hurt rebuilding? I think it could only help.

Look around you. Our industry is one of the last surviving, independent small businesses out there. For everyone's sake, including my own, I'd like to see it survive. For that to happen, I think we'll need to dust off some of the successful principles that got us here and vacate the slippery slope some of us have found ourselves on. Besides, you would think that we would get tired of building up some other country's economy at the expense of our own. Try throwing your neighbor a bone. Not only is it the right thing to do, but you will also feel good about doing it.

May God strengthen and preserve our industry.

Rob Buksar is owner of Hoosier Electric Co., Gary, Ind.

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Power Steering Racks
A New Opportunity

BY RICHARD VENSEL

Most of the tools and equipment that you need to rebuild a power steering rack and pinion are already in your electrical rebuilding shop. We have found a program that has everything that an electrical rebuilder needs to expand into rebuilding power rack and pinion assembles—including a few special tools, all of the parts and the training. Stop by our booth #106 at the ERA Expo in Atlanta March 21-22 for more information.

Power steering rack and pinion assemblies are being replaced on many vehicles today long before the alternators or starters fail. Generally, this is because the seals are leaking fluid. New seals and mounting bushings can be bought for less than $50 to rebuild a power steering rack and pinion assembly that might sell for $800 new and $350 remanufactured. This is a relatively new rebuilding opportunity. Few businesses are set up to rebuild these on an R&R basis. Any auto repair shop is a potential customer. If you are already selling to auto repair shops, you already have the customer base.

Today, there are over 1,300 different power steering rack and pinion assemblies, and more than 800 of those are for import applications. In many cases, the seal kits are not available from normal suppliers. Our program has developed relationships with suppliers and rebuilders throughout the world. This program has all of the parts you need to rebuild almost any power steering rack.

Anyone with a rebuilding shop can get into power steering rack and pinion assemblies for an investment that fits his or her budget. You don't have to stock inventory unless you want to. Kits are available for specific part numbers that you can buy and have delivered the next day. Training can be fine tuned to fit your needs. Please stop by our booth #106 at the show in Atlanta to discuss this program if you are interested.

ERA

SHOW *(Continued from page 1)*

Testing COM Terminal Alternators Both On and Off the Vehicle—Gene Kaiser and Dave Kaplan of Regitar USA will explain what a COM terminal is and how regulators with COM terminals operate. As more auto manufacturers move to this technology, it becomes even more important to know how to test them both on and off the vehicle.

Rebuilding 39MT Starters—John Kaiser of the Ryder Rebuild Center in Atlanta will share his experience with the most common heavy duty starter in use today. Ryder Truck has been rebuilding their own starters and alternators for over 30 years and are currently rebuilding 200 to 300 39MT starters a month.

Pictorial Presentation of Rebuilding Newer Starters and Alternators, and Some Related Case-Studies—Mohammad Samii, one of the most respected rebuilders in the industry, will share his experience with late model alternators and starters, both on and off the vehicles.

Rebuilder's Roundtable — Dan Smith of Arrowhead Electrical will moderate this forum with help from a panel of experienced peers. Bring your questions, share your answers or just sit back and listen.

Diagnosing Computer Controlled Domestic Alternators — Dan Marinucci has a way of explaining even the most complicated of automotive electrical systems so that everyone in the room understands. He is back again with even more to share on this topic, including a description of how these charging systems operate and what can prevent them from working properly on the vehicle.

ERA

APRA European Symposium Meets in Sunny Rimini this Spring

APRA PRESS RELEASE

May 21-23, 2014

APRA Europe has organised a Remanufacturing Symposium and Expo for Rimini, Italy this May 21-23. The unique modular structure of the event will give you the opportunity to decide whether you want to join as an exhibitor, a delegate or even a sponsor. You will then be able to choose presentations and/or events that are of specific interest to you.

This year APRA Italian member SERMEC will be hosting one of the plant visits. SERMEC has one of the most professional and technically advanced remanufacturing plants in the world. Managing Director and Owner, Mr. Giovanni Ricci and this team, welcome all Symposium participants to their plant to see the future of remanufacturing today.

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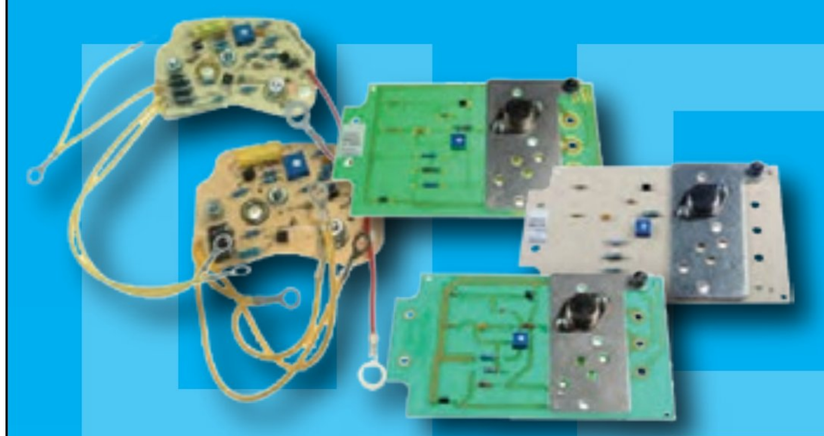

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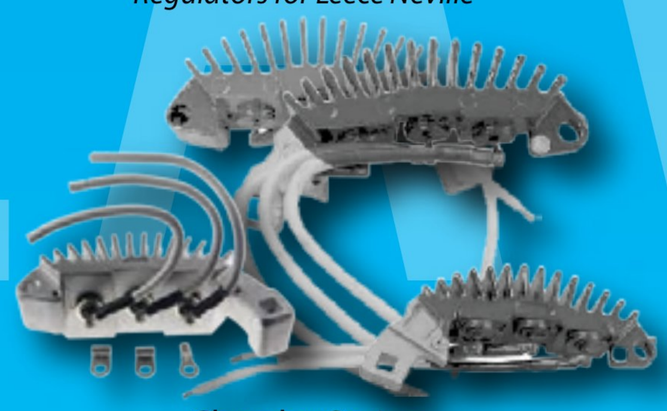

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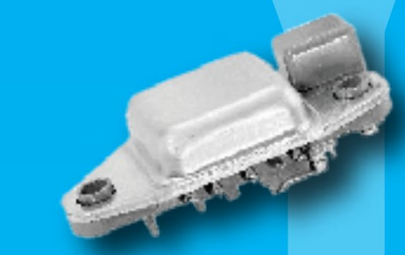

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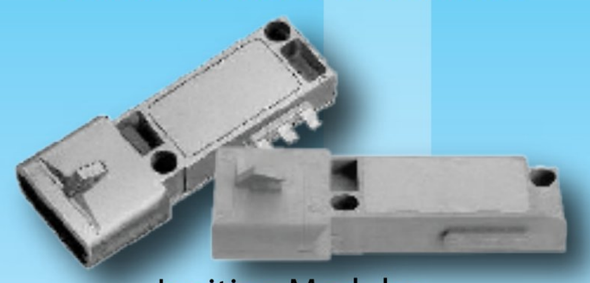

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21SI and 22SI Alternators
Similar but different

BY BOB THOMAS

Delco-Remy 21SI and 22SI alternators have been around for many years, but they look similar enough on the outside that some rebuilders still get them confused or find it difficult to differentiate between them. This article will explain the differences between the two, why the 22SI replaced the 21SI and some common problems that you might encounter rebuilding them (see *Figures 1 and 2*).

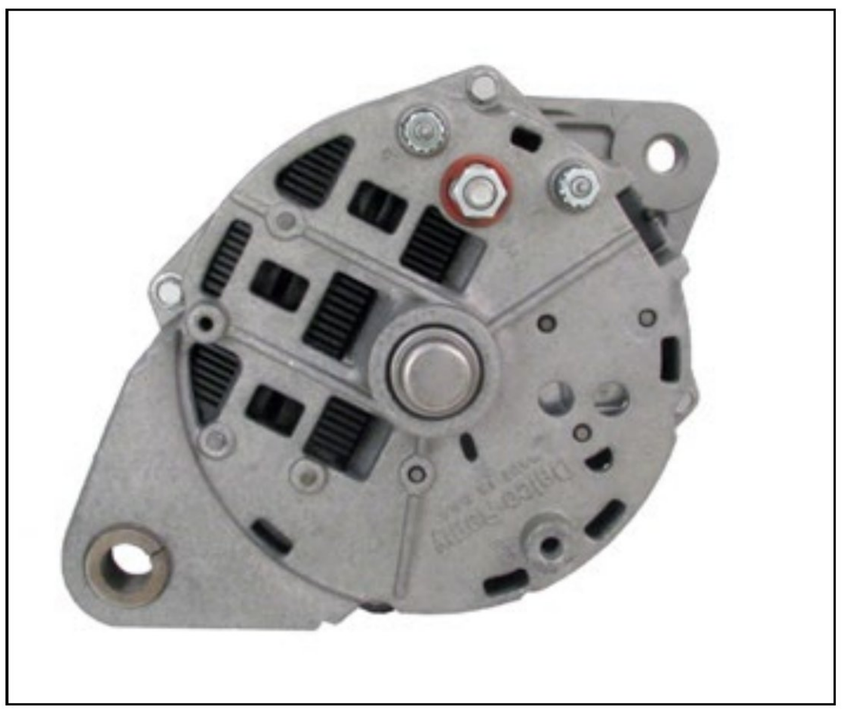

Figure 1—21SI alternator

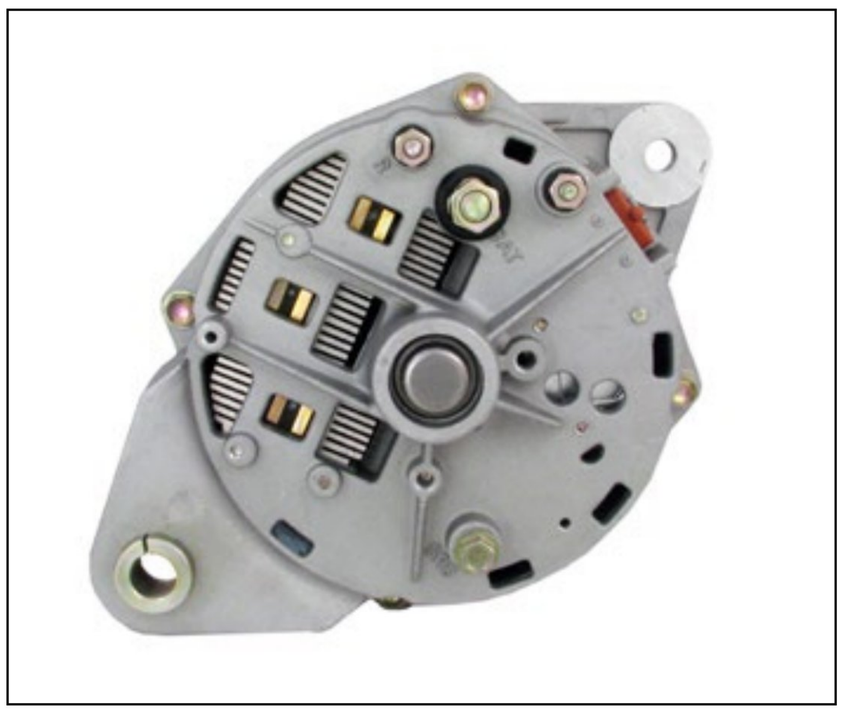

Figure 2—22SI alternator (aftermarket without "22SI logo)

The 21SI was introduced in 1986 to replace the 27SI type 200 on medium duty diesel truck applications. The 22SI was introduced in 1993 to address the early brush failure and performance issues of the 21SI. The 21SI was made for only J-mount applications, but the 22SI was made for both J-mount and pad-mount configurations. Amperage ratings at 12 volts vary from 100 amps to 160 amps. Both offer a wide variety of terminal options to fit almost any application.

Original Delco-Remy 22SI alternators have the raised one-inch characters "22SI" molded on the SRE housing (see *Figure 3*), but aftermarket SRE housings and alternators do not. The absence of these characters does not mean that the alternator in question is a 21SI. The through bolts are the easiest way to identify these alternators from the outside. The 21SI has 10-24 through bolts, while the 22SI has noticeably larger 6mm metric through bolts (see *Figure 4*). The DE and SRE frames are not interchangeable between the two alternator types, and neither are the rotors. The 21SI rotor has a slip-ring diameter of 30 mm, while the 22SI has a slip ring diameter of 26.7 mm. However, both series alternators share the same stator dimensions with the CS144.

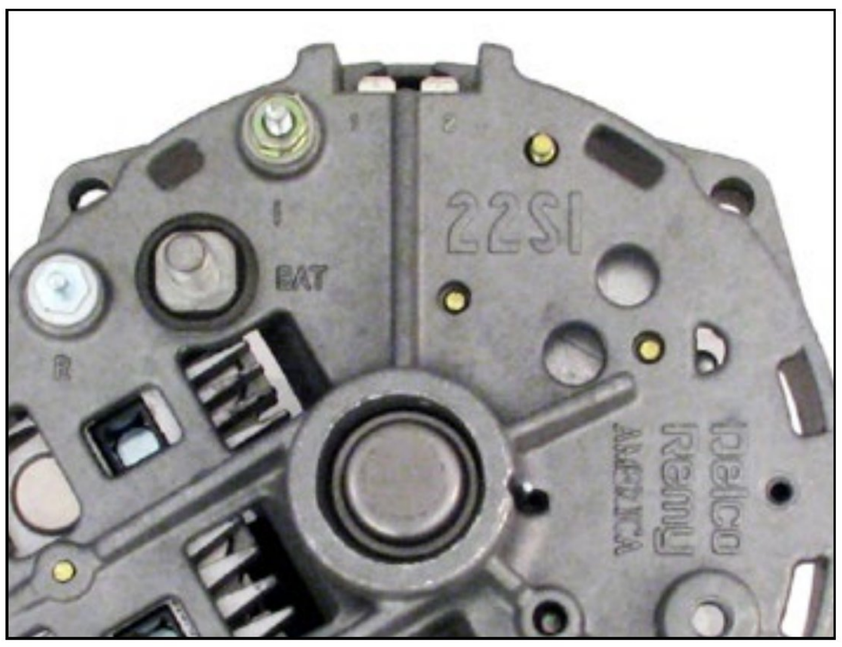

Figure 3—OE 22SI alternator with logo identifcation

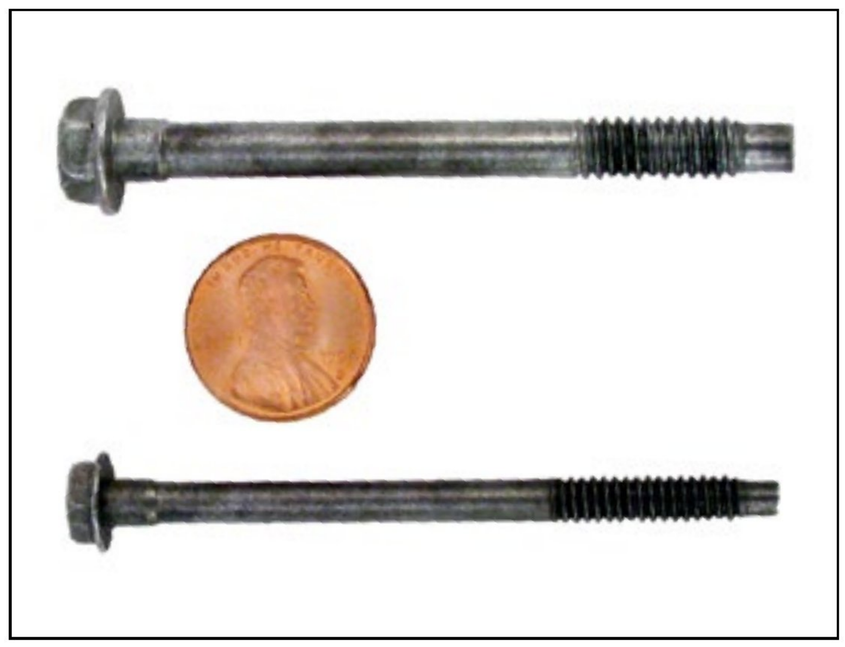

Figure 4—22SI through bolts on top (6mm threads) and 21SI through bolts on bottom (10-24 threads).

The 21SI originally used a short SRE roller bearing. It was later revised to a longer bearing (see *Figure 5*). The SRE housings and rotors were modified at the same time to accommodate the longer roller bearing, so when you are rebuilding a 21 SI, you must be sure that the rotor, the SRE housing and the roller bearing are all matched. Both alternators use a 6305 bearing in the DE housing. The rectifiers are the same dimensions, although there are many different part numbers available (see *Figures 6, 7 and 8*). The latest versions with press-fit diodes and welded lead-frame connections, are the most robust and long lasting—especially in the high amperage applications. Both alternators use the same SI series regulators. Individual part numbers are dependent upon the application. Either alternator can be one-wire self-exciting or three-wire with charge-lamp excitation, using the standard two-wire 10SI plug (see *Figures 9 and 10*). You can tell them apart by the terminal bridge on the self-

(See 21SI and 22SI, pg. 13)



Figure 5—Early 21SI roller bearing on right. Late 21SI and 22SI roller bearing on left.



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Schedule of Events

Friday, March 21

Seminar—7 to 8:20 a.m., Panel Discussion – Ronnie Charnes, Mike Dietrich and Lynn Gross, "*How to Treat or Not Treat Your Customers*"

Plant tour—8:30 a.m. to 12:30 p.m., BPS tour and BBQ lunch

Seminar—12:30 to 2:20 p.m., Joe Davis—"*What I've Learned Since I Retired—About Rebuilding, Business and Life*"

Seminar—2:30 to 4 p.m., Marshall Townsend—Bosch Technical Sales Specialist, "*Flash Reprogramming—Your New Profit Center*"

Reception—4 to 5 p.m., Hors d'oeuvres and cash bar

EXHIBITION/Live demos—5 to 8 p.m.

Demos: ERA Booth—*ERA Theater featuring the latest technical training videos*

Seminar—8 to 9:30 p.m., Shawn Bray—Romaine Electric, "*How to Price Yourself Into or Out of the Market*"

Saturday , March 22

Seminar—7 to 8:20 a.m., Dan Bell—Apptrak, "*Understanding Battery Technologies and Their Effects on the Charging System*"

Seminar—8:30 to 9:50 a.m., Gene Kaiser and Dave Kaplan—Regitar, "*Testing COM Terminal Alternators—On And Off The Vehicle*"

Seminar—10 a.m. to 11 a.m., John Kaiser—Ryder Rebuild Center, "*Rebuilding 39MT Starters*"

EXHIBITION/Live demos—11a.m. to 4 p.m.

Demos: ERA Booth—*ERA Theater featuring the latest technical training videos*

Seminar—4 to 5:20 p.m., Mohammad Samii—Sammy's Auto Electric Service Inc., "*Pictorial Presentation of Rebuiding Newer Starters and Alternators, and Some Related Case-Studies*"

Rebuilder's Roundtable—5:30 to 7 p.m., Dan Smith—Arrowhead Electrical Products, Inc. will moderate an open discussion about rebuilding topics

Sunday , March 23

ERA Annual Meeting/Breakfast —7 to 8:45 a.m.

Seminar—9 to 11:30 a.m., Dan Marinucci—"*Diagnosing Computer Controlled Domestic Alternators*"

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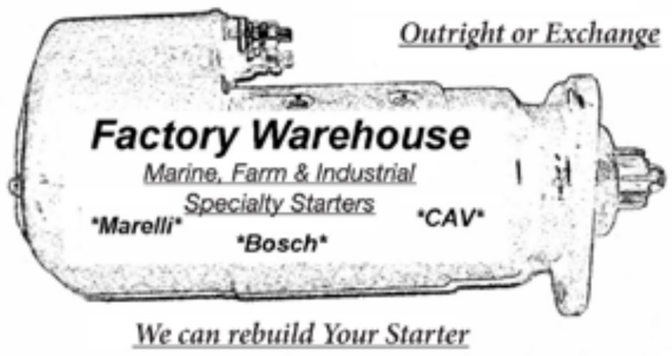

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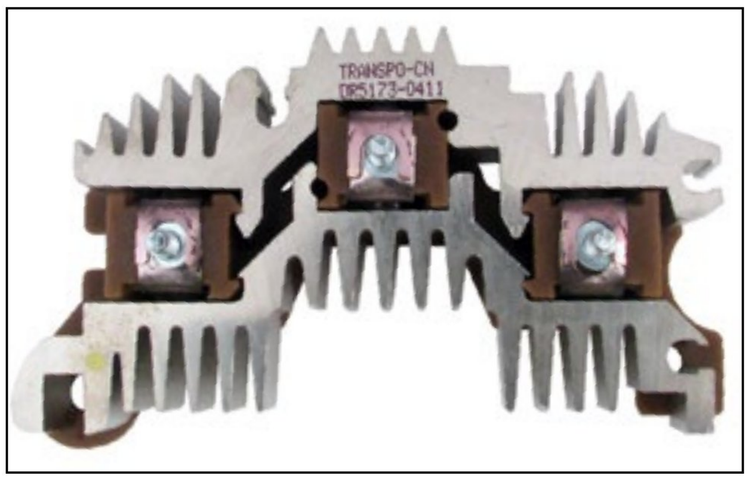

Figure 6—Early style rectifier with soldered button diodes.

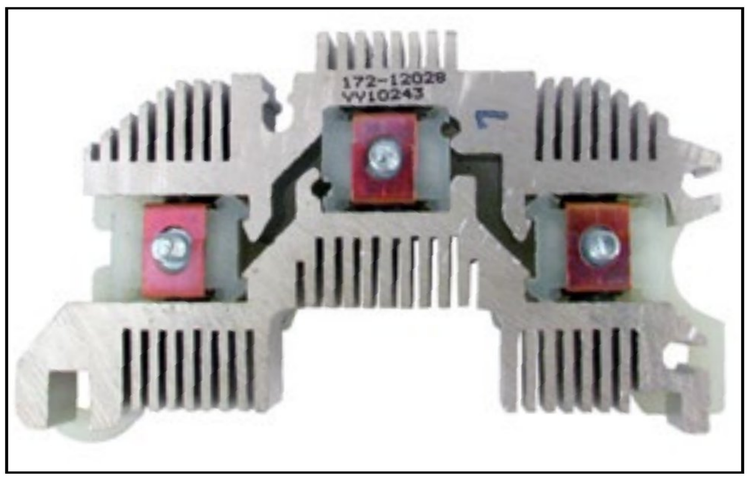

Figure 7—Early style rectifier with soldered button diodes and heat sink designed for improved cooling.

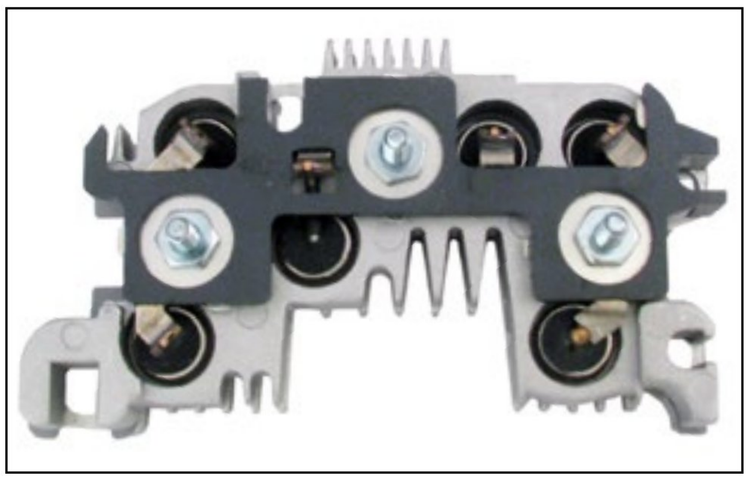

Figure 8—Late style rectifier with press-fit diodes and welded connections to lead frame.

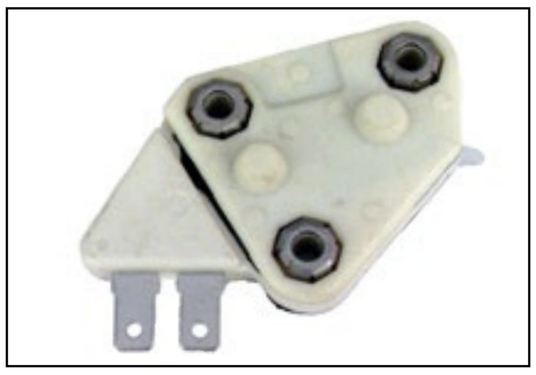

Figure 9—Heavy duty SI series voltage regulator for three-wire systems with lamp terminal.

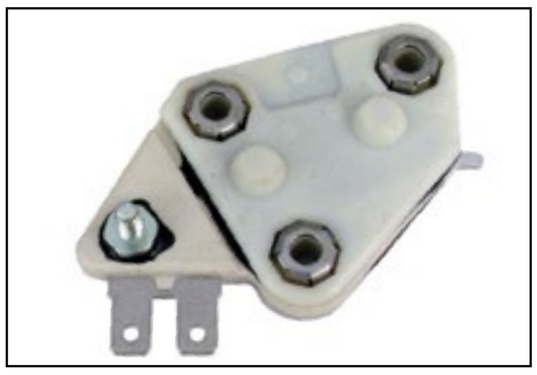

Figure 10—Heavy duty SI series regulator for one-wire self-exciting applications.

21SI and 22SI

(Continued from page 9)

exciting regulators.

The two internal component differences that stand out, are the brush holders and the diode trios (see *Figures 11 and 12*). Both were design improvements for the 22SI. The 21SI used a swing-arm brush holder like the one used in type-116 10SI industrial and agricultural alternators (see *Figure 13*). Short brush life proved to be a problem. The 22SI was introduced with a new brush holder, making use of constant-pressure springs and extra long brushes (see *Figure 14*).

The 21SI has a conventional SI series diode trio and the same capacitor that was used on 12SI alternators (see *Figure 15*). In one-wire self-exciting applications, particularly if the

(See 21SI and 22SI, pg. 18)

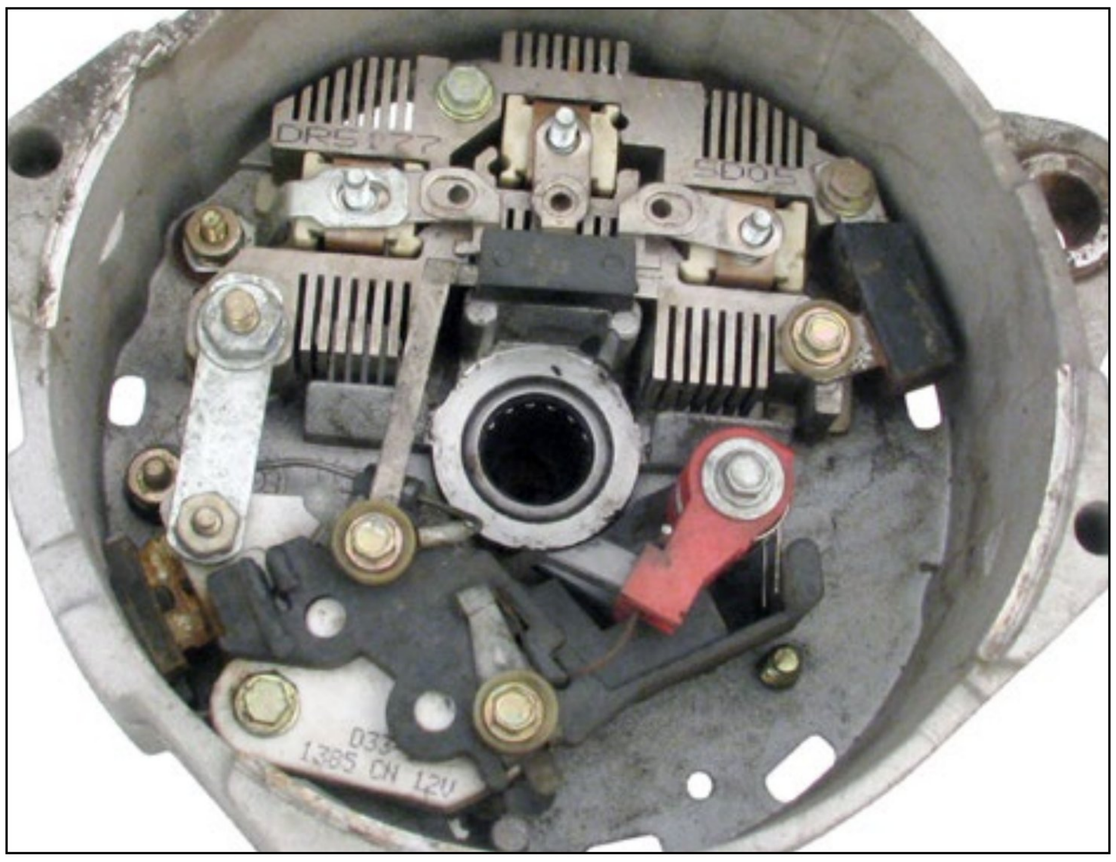

Figure 11—21SI alternator SRE assembly—note conventional diode trio, capacitor and swing-arm type brush holder.





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Tech Tip
Removing Delco-Remy Generator Bushings

BY ERE STAFF

The best tool to remove a Delco-Remy generator bushing is a simple 5/8-11 tap. It will remove the bushing faster than you can change grippers in your bushing puller. The tap will start easily into the soft bushing material, quickly cutting threads as it goes in. Once the tap bottoms out in the housing, it will push the bushing right out.

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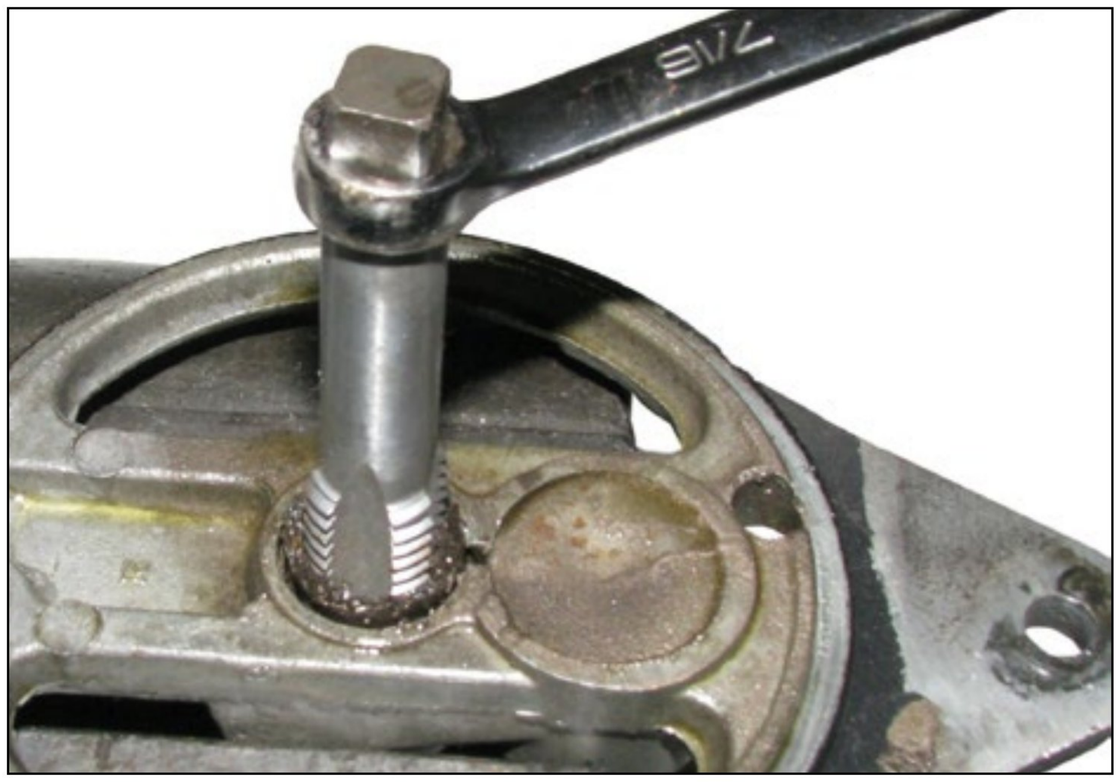

Figure 1—Start the tap square with SRE housing.

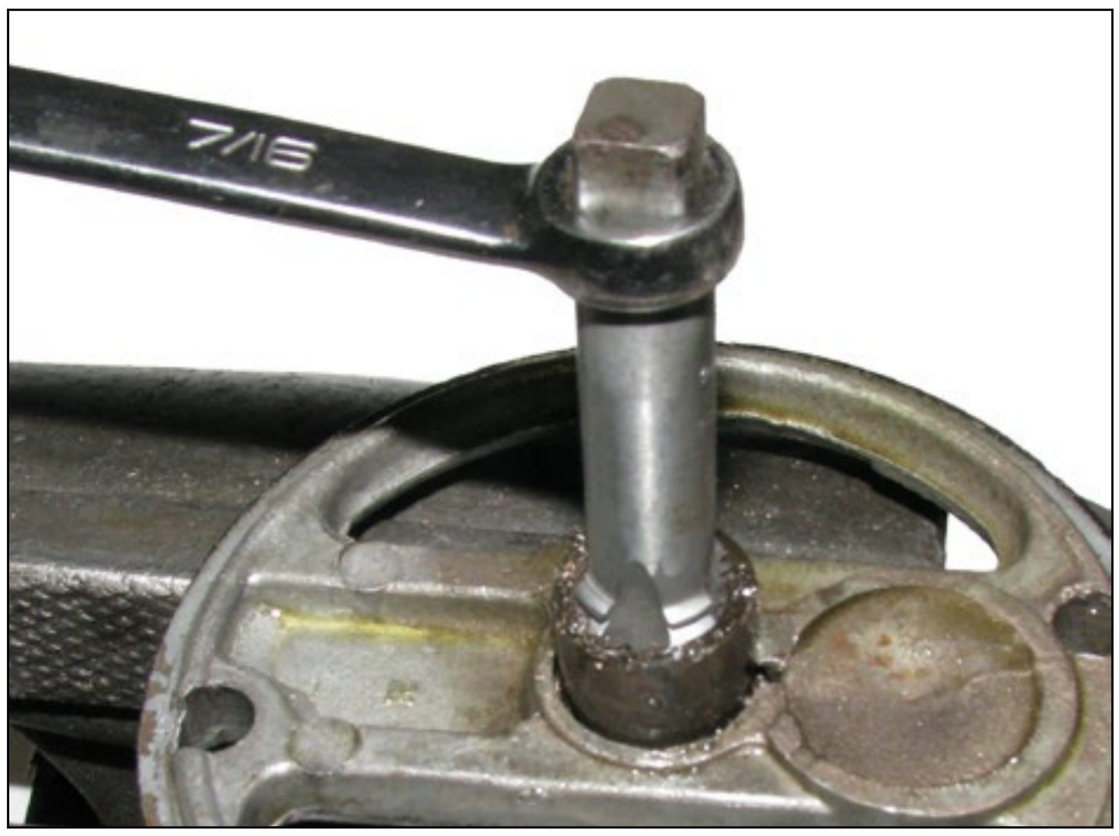

Figure 2—Here the tap has bottomed out and the bushing is coming up.

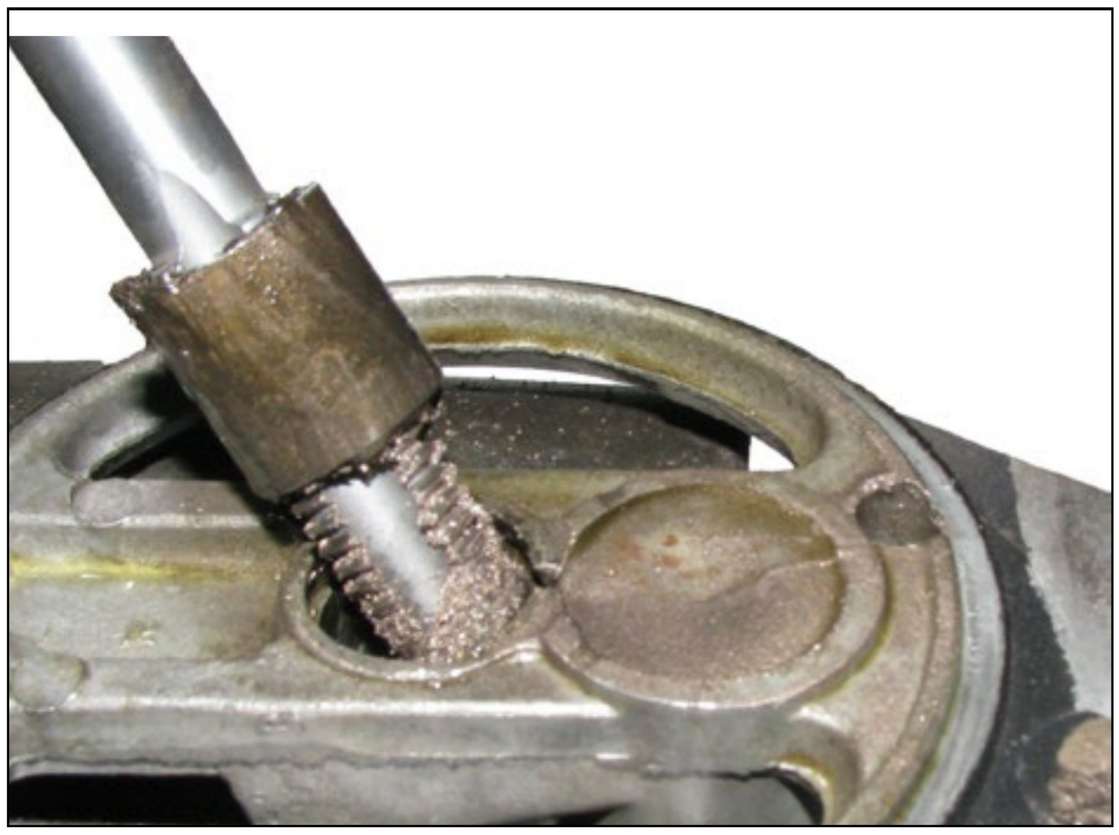

Figure 3—A few more turn and the bushing is removed

Tech Tip
21SI and 22SI Brush Holders

BY KEN PLOURDE

Corrosion is a big problem in northern states where salt is used on the roads to melt ice in the winter. Brush leads on 21SI and 22SI alternators seem to be particularly susceptible. The salt causes them to corrode away, resulting in alternator failure. The solution to this problem that has worked for me, is to use dielectric grease on the brush leads with these alternators.

The application is easy to do and takes only a minute. Simply put a small amount of dielectric grease between your index finger and thumb, then pinch along the brush lead from one end to the other. This coats the fine strands of copper wire and seals out air and moisture. It works for marine applications, too. We have been doing this for many years and have not had a single unit returned with corroded brush leads since using this procedure. It is an inexpensive and quick method of preventing a warranty return because of a corroded brush lead.

Ken Plourde owns Guy's Electric Service, South Windsor, Conn.

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Figure 1—Rub dielectric into the brush lead to prevent corrosion.

A & S

(Continued from page 1)

coming in." They do this by explaining the advantages of rebuilding the original equipment unit to the customer.

"I started working for the shop as the bookkeeper," Mary said, "but I thought I would like to try rebuilding alternators. Since I had grown up with four older brothers, and there were few girls in the neighborhood, I turned out to be a total tomboy. I never minded getting my hands dirty, as it washes off. Rebuilding is a challenge, even though it is basically the same thing over and over. Each customer's unit has its own problems. It is never boring, even after 24 years.

"We rebuild every unit as if we were rebuilding it for our own or family use," she added. "If it is not good enough for us, then it is definitely not good enough for our customers.

"One day, the Good Lord willing, Danny will take over the shop," Mary said. "He has a friendly, helpful approach to customer concerns. We are confident that he will do an excellent job. All three of us enjoy talking with and helping our customers, which is also our approach to working with each other."

Sonny is 72 years old now and still enjoys the challenges. "I was going to retire at 62, and then again at 65," he said, "but I feel like you have to do something, and I love this job."

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INDUCTOR

(Continued from page 5)

to test, you can check this inductor with an ohm meter, too. After all, the problem we have noted is just an open circuit. As you can see in the photo, the LC meter reads just below the 20 millihenries rating on the inductor (see *Figure 4*). Resistance measures quite low, below one ohm (see *Figure 5*). It is, after all, just a short coil of wire.

One word of caution when working with this inductor. Do not attempt to test it by running 12 volts through it. Any load over 250 mA will likely destroy it. Likewise, applying B+ to this inductor to excite the alternator will also burn it out. To excite this alternator you must bypass the inductor and flash B+ directly to the D+ terminal.

Rebuilders who do a lot of agricultural business or see a large number of tractor alternators, might want to stock this relatively inexpensive part. It is less than $15 when you order it through a Letrika distributor. One rebuilder told us that it is more than five times that price when purchased from the tractor dealership. On top of the price differential, consider the value of getting your customer's tractor, which is stuck in the field with a dead battery, back to work on the job at hand. That's sure to build customer goodwill!

Special thanks to Juan Grube and Mike Schroeder for their help in making this information available.

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Tech Tip - Valeo Stators
Getting Them Centered

BY BOB THOMAS

Some Valeo alternators incorporate a design that we will call a "floating stator" for lack of an actual manufacturer's term. The stators on these alternators are not held in position by fitting tightly into the end frames, as they are on most other alternators. These Valeo stators are held in place by bolts, or in some cases, by a hard rubber compound. All of these stators require exact alignment during unit assembly, and this is a critical part of rebuilding these alternators.

We cannot be sure of the reasoning behind this engineering, but it is certain that failure to keep an **even** air-gap between the rotor and the stator all the way around, can lead to overheating problems and reduced alternator performance. Merely preventing the rotor and stator from physically touching is not sufficient. The easiest way to properly center these stators before fixing them into position, is by using shims.

Valeo offers a one-piece plastic shim in their hardware package for these alternators, but this long strip is very difficult to position. We prefer cutting six individual shims from stiffer 42MT CE insulators (which are much more manageable.) We insert them by each rotor pole to ensure that the air-gap is even all the way around. Once the stator has been secured in place, the shims can be easily removed and saved for use the next time.

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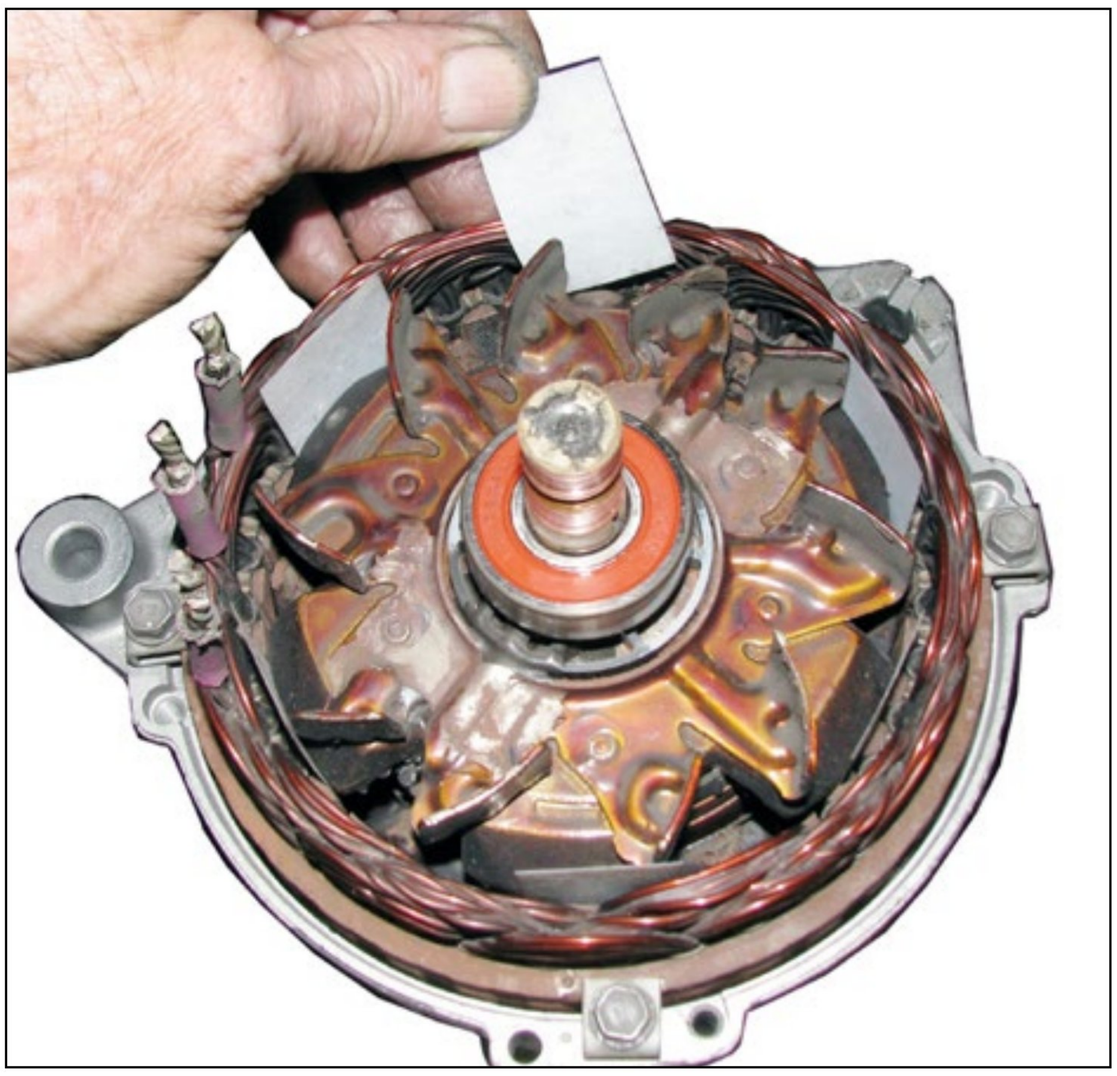

Figure 2—With stator screws loose, insert the shims by each rotor poles



Figure 1—Typical Valeo alternator with a"floating" stator

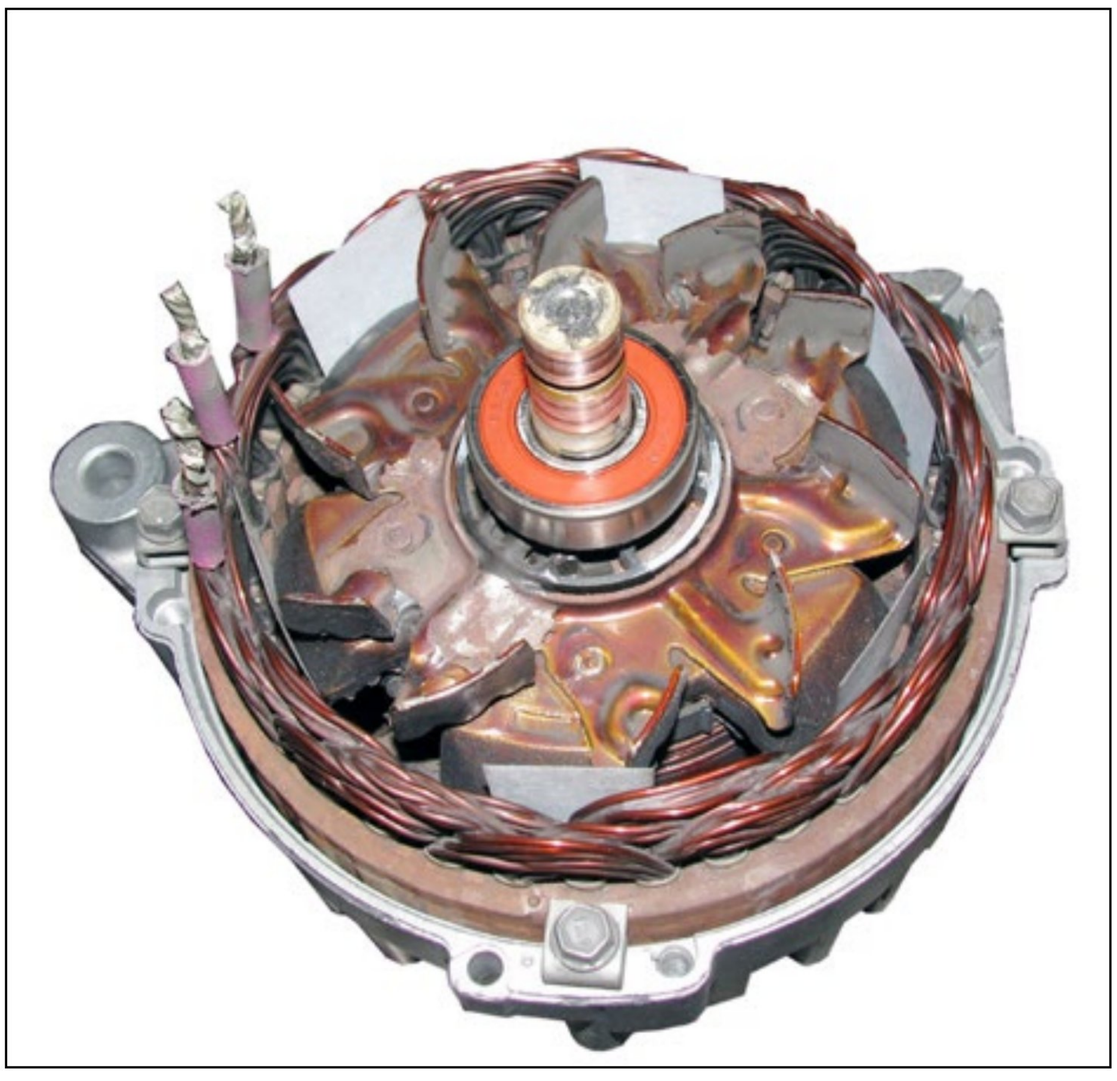

Figure 3—With all shims in place, tighten the screws and remove the shims.

PATH

(Continued from page 2)

sometimes sell a new aftermarket unit at the same price as their rebuilt unit and at a similar profit margin, with no physical work involved. Every new unit sale generated a free core as a bonus. The opportunity seemed too good to be true. Of course, many times, the rebuilders had the tools, knowledge and parts on hand to rebuild the original unit, but it was relatively easy to convince the customer that the "new" unit was a better deal for them. Some rebuilders even convinced themselves of this.

Many rebuilders chose the path of least resistance. As a result, the demand for new aftermarket units increased, and the demand for component parts decreased. Suppliers followed those demands. Price competition for the new-unit business resulted in an avalanche of lowering prices, and the inconsistent quality control that inevitably comes with that. With all of the focus on new units, the demand for component parts diminished to the point where some suppliers actually seemed to be phasing them out altogether.

Rebuilding is evolving into retailing as a direct result of following the path of least resistance. The new unit availability makes it easy for anyone to open an auto electric business and simply resell alternators and starters. Equipment, tools, knowledge and physical labor are no longer required to open an alternator and starter business. There is no need to get your hands dirty either. Price competition between retailers has led to reduced margins for almost everyone involved. One by one, the niche markets have fallen to new units, too—heavy duty, agricultural, industrial and marine. Today, you can find a new aftermarket replacement unit for just about any application, unless the application is very old, very new, very specialized or very limited production.

I am not laying blame on anyone here. The past cannot be changed. Our industry's marketplace today is what it is—accept it. But the best rebuilders are still natural born problem solvers, at least those who have not yet completely evolved into retailers. Because of the proliferation of new units, cores are more plentiful and less expensive than ever before (compared to the current prices of armatures and rotors.) Many suppliers are still sourcing component parts for rebuilders. Please support them! Take care of your customers personally. Use your time to explain the value of rebuilding an original unit. It will last far longer than most aftermarket replacements. You know this—tell your customer the truth. This may not be the path of least resistance, but current will flow through circuits of higher resistance, too. It just requires a little more voltage.

ERA

Chrysler Charging Problem

Check the remote jump post

BY LARRY HAGEMEISTER

We recently had a local repair shop ask us to install an external regulator on a 1999 Chrysler 300 that was overcharging. They confirmed that they had checked all of the connections, and the PCM was determined to be causing the overcharging. I told them that they should let me check it out before going to the extreme of installing an external regulator.

What I found was low voltage being sensed by the PCM because of a bad connection at the remote jump post. The remote jump post is the connection point between the battery, the starter and the power distribution center. The loss of voltage was easily located with a volt meter, but it was not obvious until we took the remote jump-post connection apart. On some Chrysler vehicles, this connection point is part of the power distribution center.

The PCM was actually working properly on the Chrysler 300, and proper charging voltage was restored once we cleaned and re-tightened the jump post connection. We have found voltage drops at this connection on several other Chrysler vehicles, most recently on a 2004 Sebring.

Many times, repair shops throw an alternator at a charging problem on a Chrysler, and when that does not fix it, they assume that it is the PCM. Seldom do they check the actual PCM connections. You must check the ground and the power supply to the PCM before condemning it.

Larry Hagemeister is owner of Hagemeister Enterprises, Inc., Lebanon, Ore.

ERA



Remote jump post assembly(red)



Jump post up close



21SI and 22SI

(Continued from page 13)

vehicle is parked for extended periods, the residual magnetism in the rotor may not create enough voltage in the stator to get through the diodes in the trio. This can be a problem, especially when rotors or stators are replaced during rebuilding, and an increase in air gap results. Voltage in the stator must be in excess of 7/10ths of a volt to get through the trio diodes to supply any voltage to the field circuit.

Typically, in the self-exciting circuit, a resistor is used to bleed a small amount of current directly to the field circuit to aid turn-on. This resistor is connected between B+ and the positive brush. Of course, the down side is that this also creates a parasitic battery drain. The solution is to select a resistor that creates a current discharge which is small enough to not significantly drain the battery, but still provides enough current to retain good magnetism in the rotor.

The Auto Start trio (see *Figures 16 and 17*) allows a few milliamps of current at roughly ½ volt to stay on the rotor during shut down—just enough to ensure that some residual magnetism is retained. This is accomplished using a 1.4 mega-ohm resistor between the B+ and the field terminals of the Auto Start trio, which minimizes parasitic battery drain. The Auto Start trio also

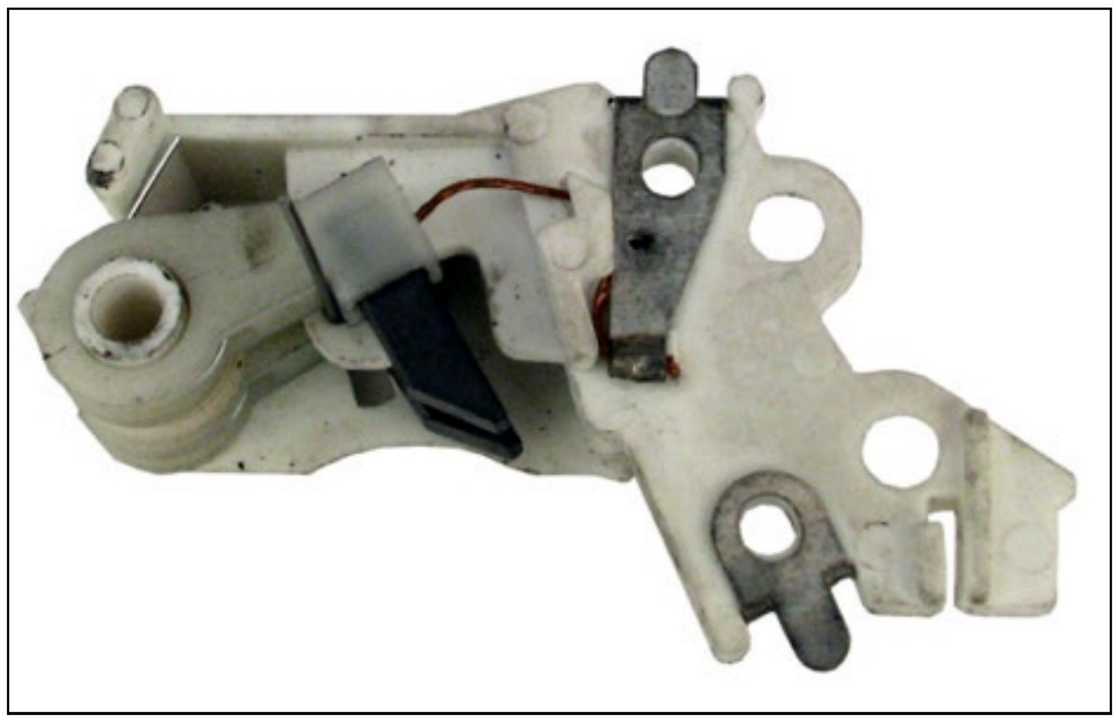

Figure 13—21SI brush holder is swing-arm type

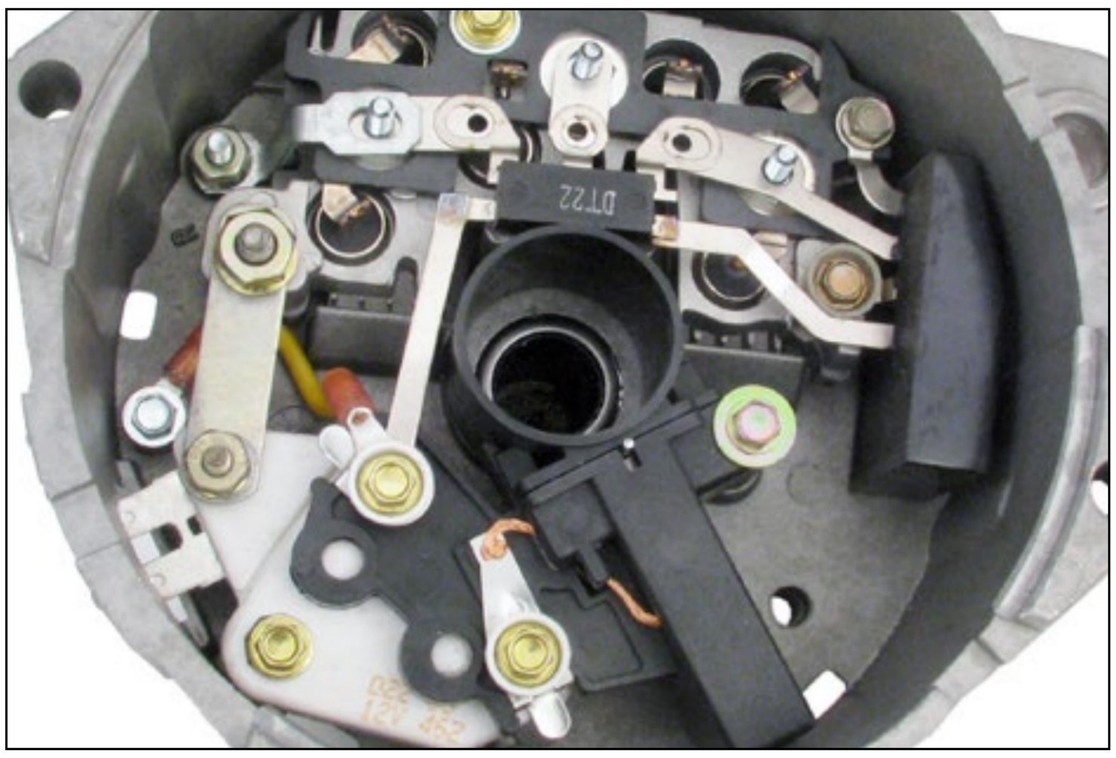

Figure 12—22SI alternator SRE assembly – note Auto Start trio with built in capacitor and new brush holder

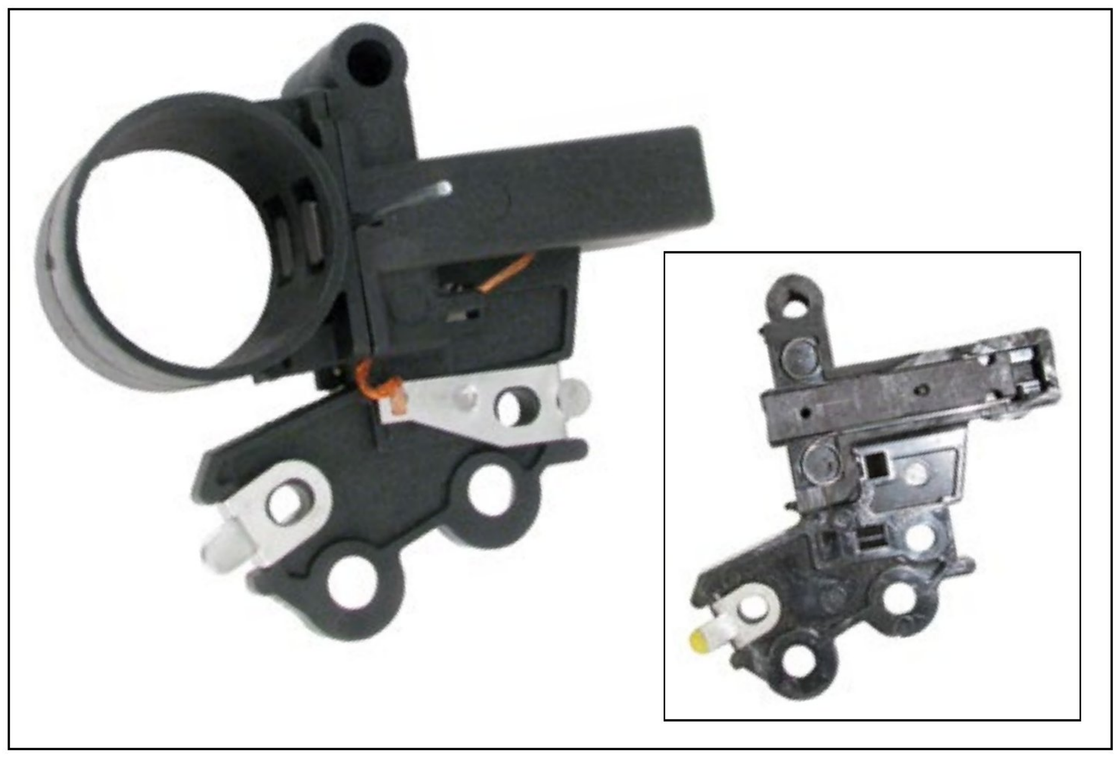

Figure 14—22SI brush holder with long-life brushes and constant-pressure springs. The cutaway in the inset shows brush length and constant-pressure springs.

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contains a circuit that monitors voltage on one of the stator terminals. Once the alternator begins turning, following engine start-up, voltage begins to build up in the stator windings, induced by the residual magnetism in the rotating rotor poles. When the phase-voltage in the stator reaches ½ volt AC, additional DC voltage is momentarily applied directly to the field to initiate immediate excitation. Then the trio's diodes take over as the sole source of field current.

The Auto Start trio ensures regulator turn-on within seconds of engine start up, even at idle. Auto Start trios may be used to replace the conventional trio and capacitor in a 21SI alternator. It is a definite advantage in self-exciting applications. If you are converting a 21SI alternator to Auto Start, be sure to remove any internal or external excitation resistors. You will not need them.

While Remy has now replaced both of these alternators with the internal fan 24SI, the 21SI and 22SI alternators will be around and will still require rebuilding for many years to come.

Thanks to Dave Kaplan (Regitar USA) for his help with this article.

ERA

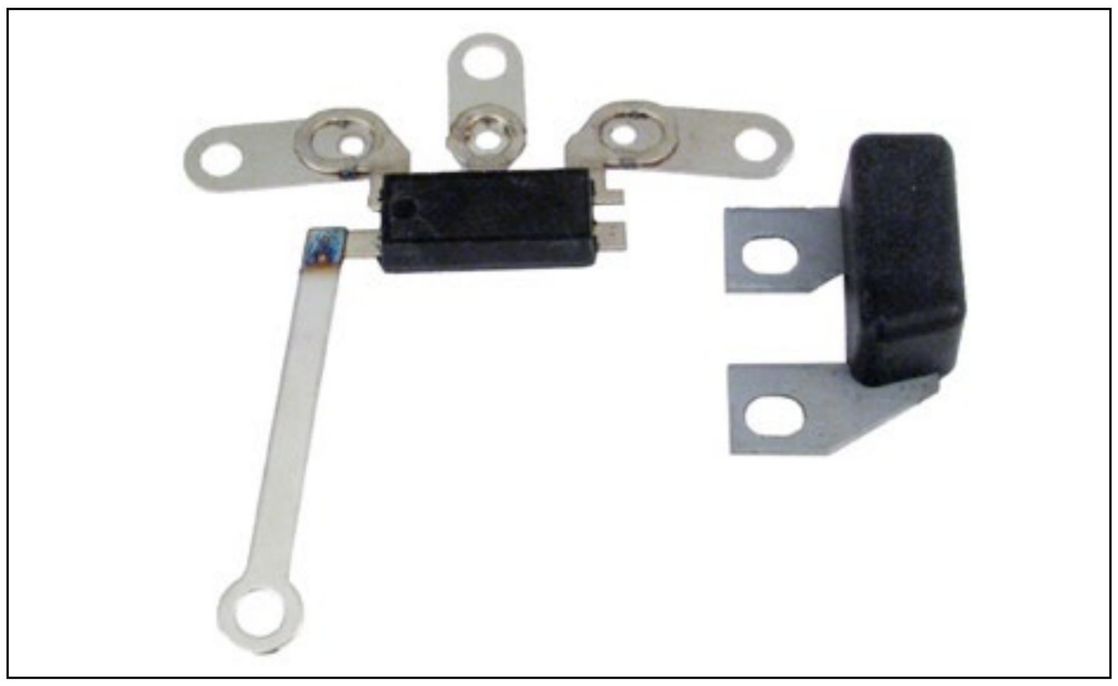

Figure 15—Conventional diode trio and capacitor used in 21SI alternators.

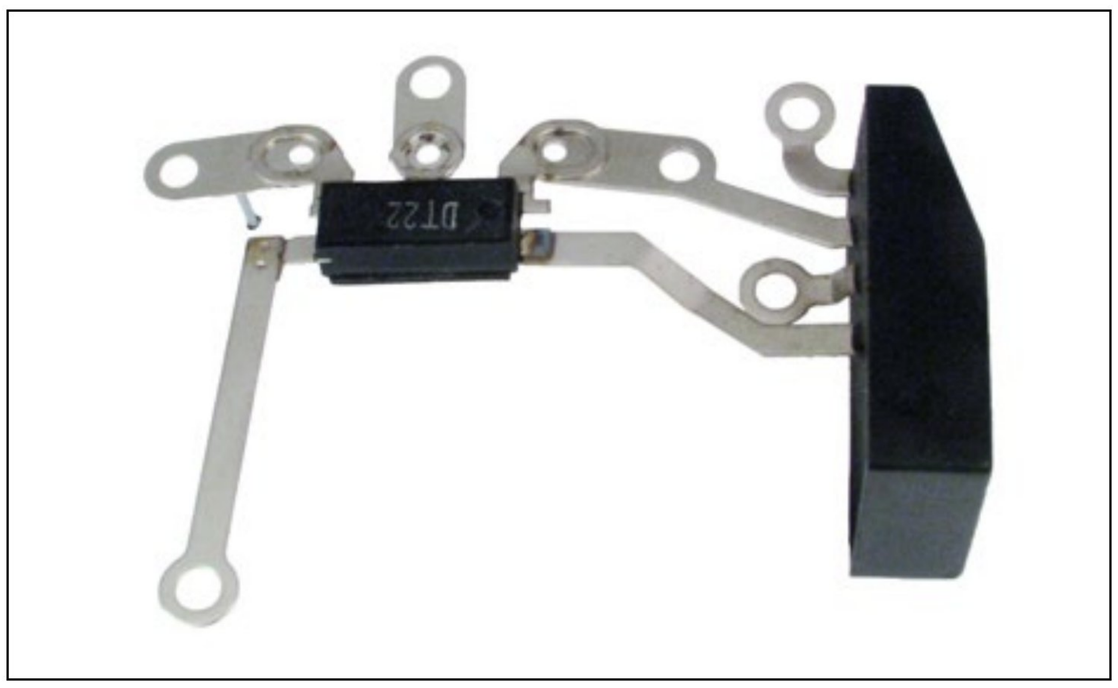

Figure 16—Auto Start trio that was introduced with the 22SI. This trio may be used in one-wire 21SI applications.

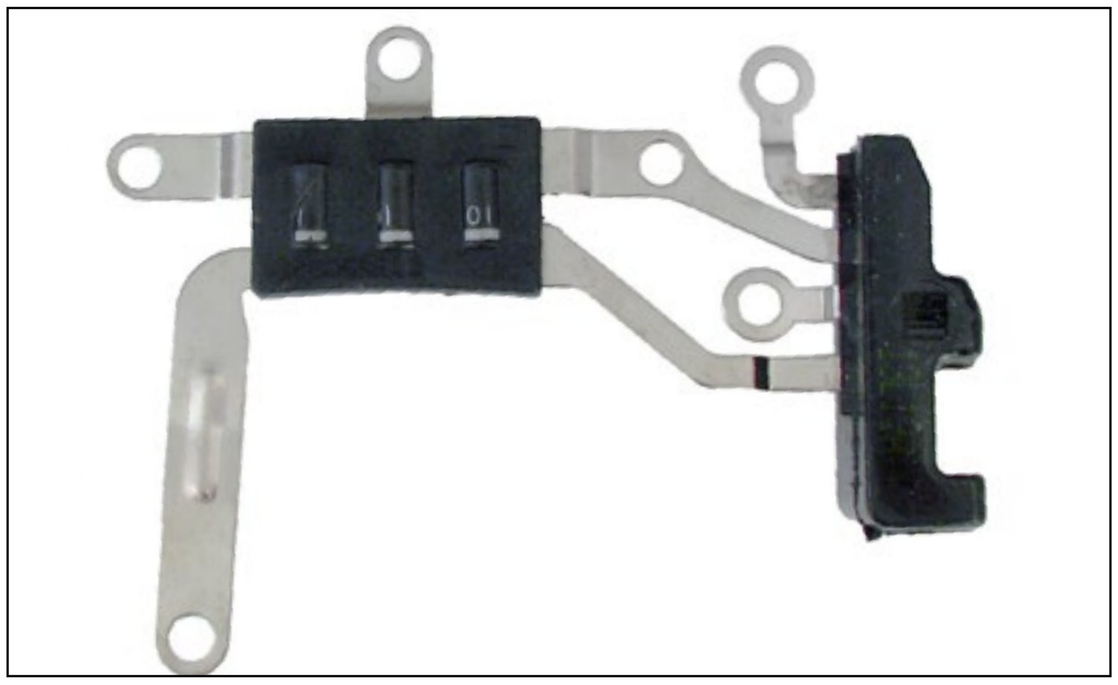

Figure 17—Latest version of the Auto Start trio. Note the extra large axial diodes—Remy part number 10517356.

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