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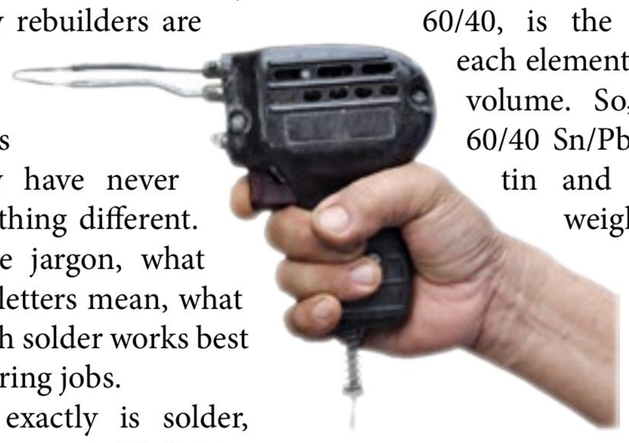
Solder Explained
What works where, why and how

BY BOB THOMAS

One item you are sure to find in every rebuilding shop, no matter its size, is a roll of solder. There was a time when solder choices were very limited. That is not the case today. Modern soldering tools allow even the smallest shop to take advantage of many options that were not available forty years ago. Yet many rebuilders are still using the same 60/40 solder that their grandfathers used, because they have never bothered to try anything different. We will explain the jargon, what those numbers and letters mean, what is available and which solder works best for a variety of soldering jobs.



First off, what exactly is solder, besides that "stuff" on a roll? Solder is a fusible metal alloy that is used to join two metal workpieces together. To do that, it must have a melting point below that of the workpieces. By alloy, we mean that it is composed of two or more metals. The metals most commonly used in our industry are tin (Sn), lead (Pb), Copper (Cu) and Silver (Ag). Tin is the base metal in most solder alloys, and it is usually listed first. Silver solder does contain silver, but the percentage of silver is generally below 10%, although there are exceptions that are used outside of our industry. Lead was once considered the best second metal, until they figured out how poisonous it is. We'll get back to that later. Copper is being used in many alloys today, because even a small amount can greatly enhance the properties of the solder.

The number designation, like 60/40, is the percentage of each element by weight, not volume. So, your typical 60/40 Sn/Pb solder is 60% tin and 40% lead by weight. Since lead is significantly heavier than tin, by volume the percentage of tin would be much higher. That is not really important, it's just an interesting fact. Although the most popular solders in rebuilding contain only two elements, there are many alloys containing three or even four metals. However, most of those are for specialized applications.

As with any kind of alloy, making

(See SOLDER, pg. 18)

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Unemployment Leads To Entrepreneurship

BY THE EXCHANGE STAFF

Tough times can lead to prosperity, given the right person and circumstances. Lynn Wimsatt of Tri-County Rebuilders in Lebanon, KY, found his way into electrical rebuilding the hard way. He finished high school early at seventeen years old and enrolled in a robotics program at Louisville Technical Institute, about an hour's drive from his home. Then he found a job in a fabrication shop in Louisville to help pay for the classes, but it didn't pay enough to live there, too. So he drove, every day, from home to work, followed by classes at LTI and then back home again. The job was a ten-hour shift. Classes were all scheduled in the late afternoon and evening. It made for a long day, every day.



Tri-County Rebuilders, Lebanon, Ky

"The course I was taking was advertised as hands-on training in industrial robotics," Wimsatt explained. "I knew I needed that kind of training to find and keep a good job. If you get a job at GE to work on that kind of equipment, you better know what you're doing. I was really looking forward to the training and the work. But after one year, it had all been only in the classroom. I had done well in all of my classes, and I learned a lot about physics, math and electricity, but I was worried about being able to do the actual work in a factory without the promised hands-on training. Then I met a girl who was six weeks from graduating in the same course that I was taking. I asked her how much hands-on training she had received in her second year. When she said 'none', I quit."

Wimsatt left the fabrication job to end the long drive every day and found work at a rebuilding shop closer to his home. He worked there for two years before the owner laid him off during a slow period. At the time, he didn't realize that those two years would prove to be important later on. Wimsatt then found employment with an electrical contractor who did both residential and commercial work. But during the winter, that business always slowed down. So in January of 1989, he found himself laid-off until things picked up again in the spring. That's when everything kind of fell into place.

It all came about because the only rebuilder in the county was closing his shop to retire, and the agent at the Farm Bureau, saw that as an opportunity. He was, what you might call, the local entrepreneur. He heard that Wimsatt, a hometown boy who had some rebuilding experience, was out of work, so he made the young man an offer. He would put up the money to buy the rebuilding business, if Wimsatt would run it. "In 1989 in Lebanon, KY, there were no jobs," Wimsatt explained. "I was out of work with nothing to do. What did I have to lose? I thought I might as well give it a try. He didn't know me from Adam, but suddenly I had his checkbook!"

"I still had a big learning curve to get over. That first year was a tough experience. If I hadn't still been living at home, I couldn't have done it. The Farm Bureau agent and I were partners for a year. Then I bought his share of the business, and we have remained friends ever since. In fact, he's sent me a lot of agricultural business."

Tri-County Rebuilders is still pretty much a one-person operation. "My son helps me out when he's out of school," Wimsatt said. "He's in his third year of college now. Other than that, I work alone." In 1998 he moved the business out onto the main highway. Later he added onto that building. "One cold winter day, I worked under a Mack truck

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Serving the automotive electrical aftermarket

SINCE • 1983

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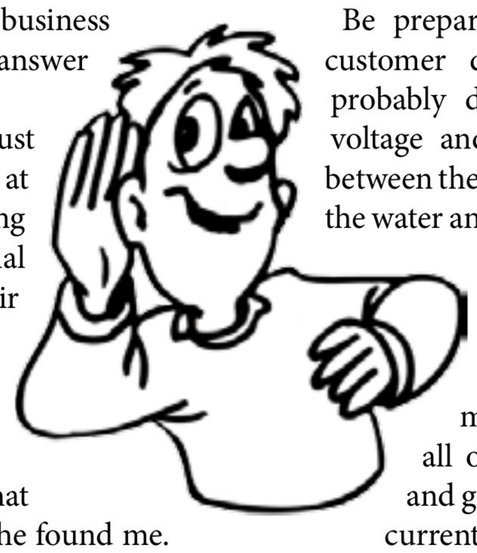
Customer Service
Part two: Responding to customer questions

BY BOB THOMAS

Last month, I explained how customers' first impressions weigh heavily in their decision making, even though they may not be aware of it. Making a good first impression on a customer is very important. However, the way that you respond to that customer's questions is just as important. Customers always have and will always ask questions. Like it or not, your business will be judged by how well you answer them.



Responding to a question must begin by listening. Look directly at your customer when you are being spoken to. Eye contact and facial expressions that respond to their words show that you care. This may seem like trivia, but it is what can separate your business from all others. Just today, someone told me about an experience that he just had at Auto Zone, before he found me. His exact words were, "They didn't seem to be a bit interested in me or my problem. It was obvious that they only wanted me to buy the part and leave." If you think that your customers don't notice the little things, then you are only fooling yourself. By the way, that particular person did not buy anything at Auto Zone. He bought what he needed from me, because I listened to him. He was sold before I even said a word to address his problem.

Understanding the customer and his question is paramount. Don't assume that a customer is correct in what he is saying. By that, I mean that most of your customers do not really understand the principles of DC electric current, and what they say to you may be based on their misunderstanding. Don't attempt to answer any question until you are sure that you understand it. For example, five different people might describe the same symptom five different ways, or five different symptoms might be explained the same way by those same people. Don't assume that you know what they mean – be sure that you know what they mean! Ask for clarification if you have any doubt.

So now you have listened attentively, and you understand what they have asked you. It is time to sell yourself and your business. This is your chance to prove that you are the expert in your field--to prove that you possess the necessary knowledge. But to convey all of that to the customer, you have to explain yourself on his level. Choose your words carefully. I once worked with someone who mistakenly believed that he could bamboozle customers simply by using terms that they didn't understand. Half of what he said would have made no sense at all if they had understood him. Some customers could see through it. Most of the others just felt insecure to be around him. He did bamboozle a few customers, but mostly he just bamboozled himself.

Be prepared to explain anything that the customer does not fully understand. I've probably described the difference between voltage and amperage and the relationship between them to thousands of customers, using the water analogy. (They can't see electrons, but they can see water.) Most of those customers could understand the difference between pounds per square inch and gallons per minute. I'm sure that if you gathered all of those customers together today and gave them a pop quiz on DC electric current, none of them would remember what I explained to them. But, you know what? ... it does not matter if they retained it. What matters to them is that I took the time to explain it to them. At that moment, they understood it.

Use props and printed handouts to get your answers across. I save a lot of bad parts, specifically to show customers how and why the parts failed. On a shelf near my front counter, there is an assortment of clutch pulleys and decoupler pulleys that have literally come apart. They are there so that customers can see what happens when these parts fail. On that same shelf are several roller clutch drives with the covers removed, both good ones, and some with collapsed springs. I also keep copies of technical documents printed from the ERA website, to use as handouts to help me explain things like testing for voltage drops and tightening battery posts on solenoids without breaking the caps.

On the rare occasion when a customer asks a question that you can't answer, be honest and admit that you don't know. If you have to guess, tell them that it's a guess. If there are several possible answers, explain them all. The next time a customer asks you a question--look, listen and take the time to give him a complete answer. That will exceed his expectations.

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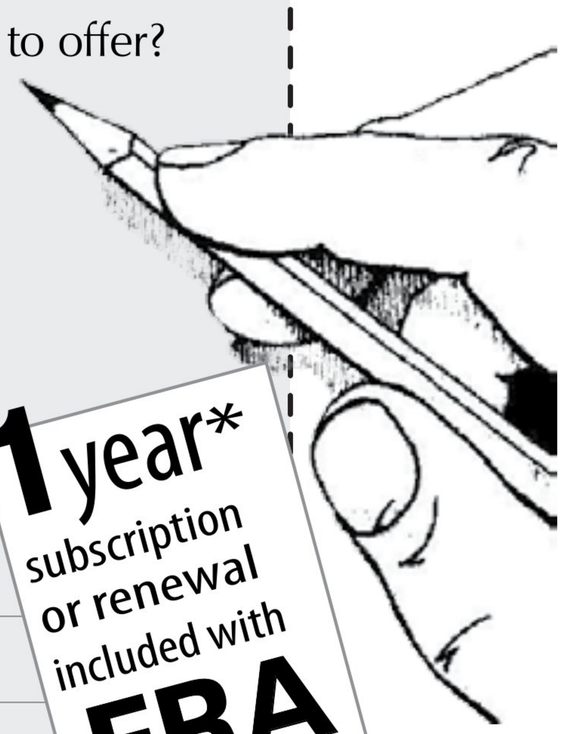

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From The President's Desk
I enjoy what I do!

COLUMN BY HANK HENKE



I recently read something that got me thinking about how lucky I am. I have worked in a real job since July 4, 1957, when I was fifteen years old. In today's world, I would never have had the job or the experience which laid the foundation for my working life. My love of anything mechanical that I could take apart and put together, took cheap roots at an early age. I worked in a full-service gas station—pumping gas, checking oil, cleaning windows, head lamps and tail lamps. I also washed and cleaned parts for the repair jobs going on in two service bays. We did it all, from engine overhauls to brake jobs. My employer was always willing to let me do whatever was there. The most important thing is that he was never too busy to answer questions like; Where does this go? What does this do? or How does this work? He asked me once if I would ever run out of questions. My answer was, not as long as he had an answer. I couldn't believe I was paid $35.00 a week and one tank of gas, I was in heaven. After working at Bill's Service for two and one half years, I was offered a job at a Napa Store to work on the parts counter. However, my interest was in what my boss was doing in the full-service machine shop. I persuaded him to train me to be a machinist. In a short time, the shop was mine to run. His comment was that my work was as good as his or better. Again, I had such a great mentor in my life. I had much more fun working in the shop and not being on the parts counter.

In June of 1963 the parts store changed ownership, and I was let go. It was the first time that I was without a job in six years. I thought my world was ending. I was married and had responsibilities. It took a while to find a job, working in production at a local plant. That was the most boring job I ever had. When a job opened in the maintenance department, I applied and got it. I gained another learning opportunity working on production machinery. There was a man there (probably two and one half times my age) who took me under his wing and taught me the many skills I use today. I asked him one day why he was willing to teach me. His answer was two reasons: "First, you ask questions and want to learn … and second, every time you learn to do something, it is another thing I don't have to do myself." He was the third mentor in my work life.

I left that job in the spring of 1970 to take a job in a truck dealership as a mechanic, eventually working my way up to shop foreman, then general foreman, and finally service manager. I later left the dealership to work at a truck parts store that was owned by a friend. My job was to take over the starter and alternator shop that was being run by my friend's father. Now the table was turned, as I became the mentor, sharing my knowledge with my crew. After leaving the truck parts store, I took a job as a foreman at a scrap yard located inside a steel mill. While working there, I opened my rebuilding business, United Starter & Alternator, in Lowell, Indiana in 1992. It began as a part-time thing, and it has grown into a full-time thing.

All this being said, I feel very lucky to have had many people in my life help me along my journey. I have been asked when I plan to retire. My desire is to be in good enough health to keep working for many years, until a customer comes into my shop and finds their unit all finished, along with me!

Hank Henke, ERA president, is owner of United Starter & Alternator, Lowell, Ind.

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Plain Talk
Is there a future in electrical rebuilding?

COLUMN BY ROB BUKSAR

Rob is on medical leave this month. For those readers who look forward to reading Plain Talk, The Exchange is reprinting his column from September 2001. We wish Rob a speedy recovery and look forward to having him back soon.



The effects of globalization are amazing! At this time no aspect of any of our lives is untouched. We could probably spend days discussing globalization and at the end of the final round realize we'd only scratched the surface.

Presently there are high-level debates taking place over some real heavy issues. How about this for a first course: Does the U.S. need to maintain basic industries any longer? The U.S. International Trade Commission continues to investigate alleged (ha-ha) dumping of steel by foreign producers. So far Washington is not answering a basic national security question: Does the U.S. need to maintain a viable domestic steel industry to ensure the country's national security? The same question is being asked about assuring domestic production capacity for aluminum machine tools, semiconductors, petroleum products, bearings, electric motors and repair parts, etc.

So where does all of this leave us as domestic electrical rebuilders and suppliers? Based on present conditions I'd say six miles north of purgatory. No matter which side of the debate you support this I can tell you—you have lost a whole bunch of market share and will continue to lose it and there isn't squat you can do about it. Of course there are a few lucky exceptions out there but they're far from the rule.

Those who support globalization (ironically these folks never own or operate small to medium domestic businesses) claim we don't need domestic industry and scoff at tariffs and protections for domestic business.

Martin Anderson, a senior lecturer in management at Babson College, Wellesley, MA, states: "To put it simply, protection is always a stupid and counterproductive policy. The easiest way to keep domestic industry is to open it to the full forces of global competition."

If there was one spec of viability to Anderson's argument we could still find a few American-made goods on the shelves of retailers and wholesalers alike. But as we're all painfully aware, there aren't any American goods left. Along with the productive capacity to make them—it's real gone also.

I always wonder if the Ph.D.'s working in the "think tanks" where this incredibly wild-eyed thinking comes from didn't arrive at their conclusions during a bad drug trip. The American worker has enjoyed a higher standard of living than most on the planet. Ask your help if they're willing to return to 14-hour sweatshop days in order to take on the full force of global competition. Will the American businessman be relieved of the heavy-duty state and federal mandates that must be complied with—hell no! Then as long as we have to play by the rules and global competition does not, we can all look forward to continually being blown away.

A few of the large U.S. rebuilders remaining are now dealing directly with China for sub-assemblies and complete units. More and more 40-foot containers full of cores are now sent to China to be rebuilt and returned. The shipping volume between the U.S. and China has

(See FUTURE, pg. 17)

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Tool Tip
Valeo alternator tool

BY BOB THOMAS

Valeo alternators are showing up on a cornucopia of applications, and sometimes it seems that no two are exactly alike. Rebuilding some Valeo alternators and salvaging the good parts along the way can be a real challenge, in particular, those with rectifier leads that are welded to heavily tinned stator leads. Not only are the small rectifier lead tabs welded tightly, but the heat from that process has soldered the rest of the rectifier leads to the stator leads. In many cases, the rectifier is part of the SRE housing. One tool that I have found invaluable for breaking this connection, is a wire-terminal crimping tool made by Thomas & Betts.

The secret to why it works so well is the wire cutter on the very end of the tool. This cutter uses a blade-and-anvil design, unlike the diagonal cutters or "dikes" that most of us commonly use to cut wire. Diagonal cutters force one blade against another blade. The Thomas & Betts cutter forces the blade against a flat surface. That flat anvil surface is what makes it work so well at breaking welded stator connections on all types of alternators without damaging the rectifier lead frame. As you can see in the photos, it allows the blade to split the lead frame tabs where they are welded, while the anvil protects the delicate back side of the lead frame. With a little practice, anyone can break most welds without damage to the rectifier leads or the stator leads.

This crimping tool is also one of the best small-terminal crimping tools and machine-screw cutters I've ever used. Any supply house that sells Thomas & Betts products will carry this crimping tool—part number WT-2000. You can also find it online from a wide variety of retailers.

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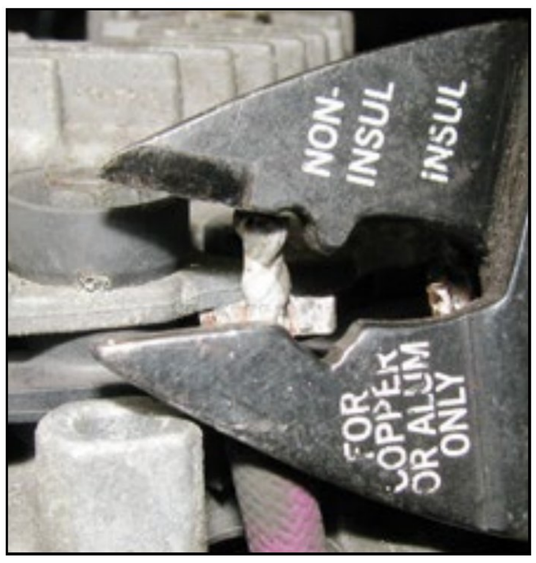
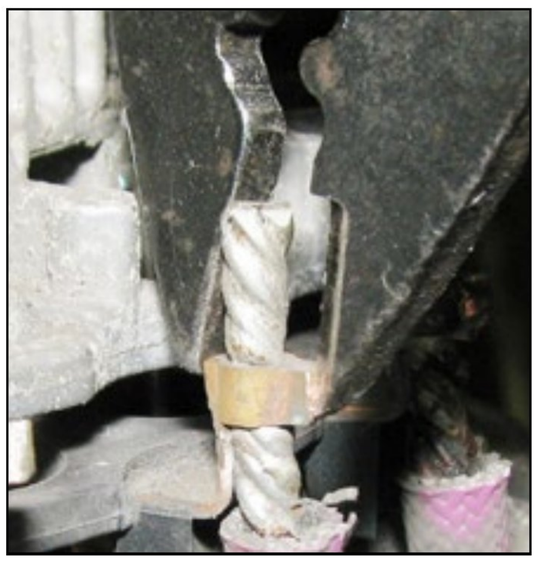


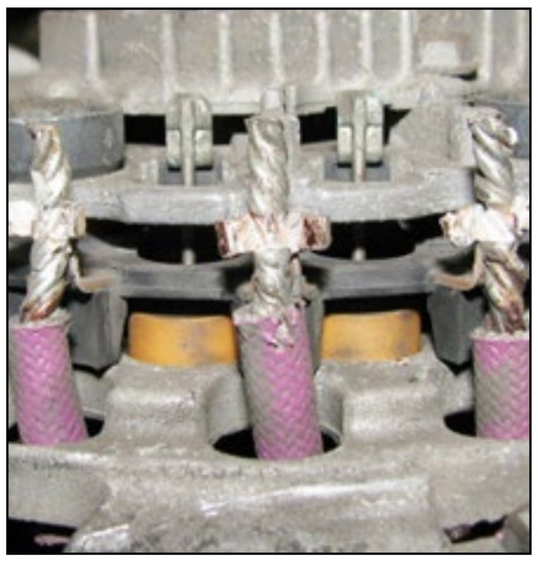
Blade and anvil cutter tips



Slight pressure will open the weld.



Twisting often opens tab without de-soldering



All these leads were opened in two minutes without heat.

View From The North

BY BILL SKILLINGS

In August, J&N Electric initiated a new program to make it easier and more affordable for Canadian rebuilders to place orders and receive parts on our side of the border. They have named it the Easy Freight Program. All shipments to Canada from the US must pass through Canadian Customs at the border, a task that must be handled by a broker, which incurs a minimum $50 fee per shipment. That makes it difficult and expensive for Canadians to order their parts and complete units from industry suppliers in the US. J&N found a way to change that.

Under the new program, J&N has consolidated the shipments. All of the day's orders pass through customs as one shipment, which is then broken down to be handled by UPS for delivery to the individual rebuilders, with a reduced brokerage fee added directly to the J&N invoice. J&N pays all of the costs involved, and then charges a much smaller brokerage fee right on the customer's invoice for each shipment. For orders under $300, the brokerage fee is just $10. For orders over $300, there is no brokerage fee at all.

J&N has simplified the whole process of Canadian duty and value-added-taxes as well, by listing them on the same invoice. Canadian rebuilders will now get same-day shipping on orders received up to 7p.m. on Monday through Thursday and by 6p.m. on Friday.



Bill Skillings of Eastwood Auto Electric receives the very first "Easy Freight Program" package from UPS driver Dave Parker

Dwayne Rose, a longtime veteran of the rebuilding industry in Canada, has been hired to call on rebuilders in all of the provinces and to service their needs. Canadians use the same excellent J&N website that rebuilders in the US have been using. It is fast, full of all the information rebuilders need, and makes placing an order easy. This gives rebuilders access to a wide array of OEM and aftermarket parts and units, as well as many brand name electrical accessory lines.

I received the very first shipment during a test of the new program on July 19th. The Easy Freight Program and the hiring of Dwayne Rose, just made life a lot easier for Canadian rebuilders.

Thanks to J&N Electric! ... one of the supplier members of the ERA … working to make our industry more efficient and profitable.

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What Can You Do To Grow Your Auto Electric Business?

BY JIM THOMAS



You may be working on the same old things day after day, when you start to notice a slowdown. You realize that you're just not doing the same volume of business that you used to do. So what do you do to increase your business? You step back to see just what has changed and what you can do in response to it. Here are some questions that you can ask yourself about your business and some suggestions on how to improve it.

If you have computer software that will give you reports, look back to see which customers are not coming in like they used to. Pick up the phone and call those customers. Ask them what they are doing, since they haven't been coming in to see you. Pay attention to their answers. The most common answer is: "We really haven't had much electrical work." Your response: "What has changed? What type of work is keeping you busy? Have you laid off any techs? What can we do to help you? ... provide more training for your techs about the late model charging systems? ... give you quicker service?" The answers to these questions will help you to understand in which direction your business needs to head in order to continue to grow. It takes only one or two phone calls a day to reach out to your customers and see what is going on.

Analyze your sales and your inventory. Try to determine which items you are selling, to be sure that you have enough product in stock to cover potential sales for any given time frame. Again, if you have good computer software, the reports should be at your fingertips. Are you using the software's full potential? Is your staff recording lost sales? Why not? Are you using the minimum/maximum and suggested ordering to stay ahead of shortfalls in inventory? Does your software allow you to adjust inventory seasonally? How do you handle part-obsolescence? Which items in your inventory are obsolete? How do you track them? What do you do when you decide that something is obsolete? Do you try to return an obsolete item to your supplier? If you wait too long, will your supplier not take it back, even with a surcharge? What's your next move? How much effort can you afford to invest in this item? When you find obsolesce and find a way to deal with it ... how are you handling the accounting side? Are you writing off the obsolete inventory? Have you talked with your CPA to know how to deal with obsolescence? Having a balanced and current inventory that matches the needs of your customer base is critical to future growth. Inventory is like a living, breathing monster that needs constant attention and care.

How well do you know your customers? What do you do to keep up with their changing needs? What equipment have they purchased recently that uses a special starter or alternator? What conditions does the equipment work in? How long is the new equipment warranted, and does the warranty cover normal wear parts like the starter and the alternator? Have you ever done a survey of your customers' equipment so that you are ready for their business? Do you know what the mix of different vehicles is in your market area? Do you know how to find out? What do you need to do when you have that data to work with? Is your business known for being able to rebuild almost anything, or do your customers think of you only when they have a Delco unit to be rebuilt? Why do your customers think of you that way? What can you do to change that image? Why is this important?

What have you done to keep your shop up-to-date? Do you have the ability to test almost anything that comes in the door, including the new computer-controlled alternators? Can you be absolutely sure that you have thoroughly tested a unit that you have rebuilt, and do you know with certainty that it will work on the intended vehicle? If not … why not? Have you updated your regulator tester recently? Do you realize that regulators have undergone a major revamp since 2005? Are you aware that things are continuing to change every year ... more than they ever have in the past? Have you looked at your shop efficiency lately? How many wasted steps could be eliminated just by the reorganization of the work area? When customers see your rebuilding shop ... what do they see? Why? Your image is what defines your customers' expectations of quality. What is your source of tech info? How do you determine how to test a unit that you have never seen before? Do you know that improper testing can damage many of the newer alternators? How do you handle a customer when you don't have the correct tech info on a unit that he asks you to test while he waits? Do you say, "I don't know,", or do you say, "I will find out"?

How do you keep up with what's new? What are your sources of information? Are you looking for new items that could work for your customer base? Where do you look? Do you ever ask suppliers for free samples of products or a reduced price for a sample product to show to your customers? If there were an updated starter or alternator that could improve your customers' product-useable-lifetime, would you mention it to them or not? Why?

These questions are meant to stimulate positive thinking and to help you make some good moves that will grow the business that you have spent many years cultivating. I hope some of these thoughts will be useful.

Jim Thomas is the owner of Smith Auto Electric, Yakima, Wash. and served as ERA President 2007–2009

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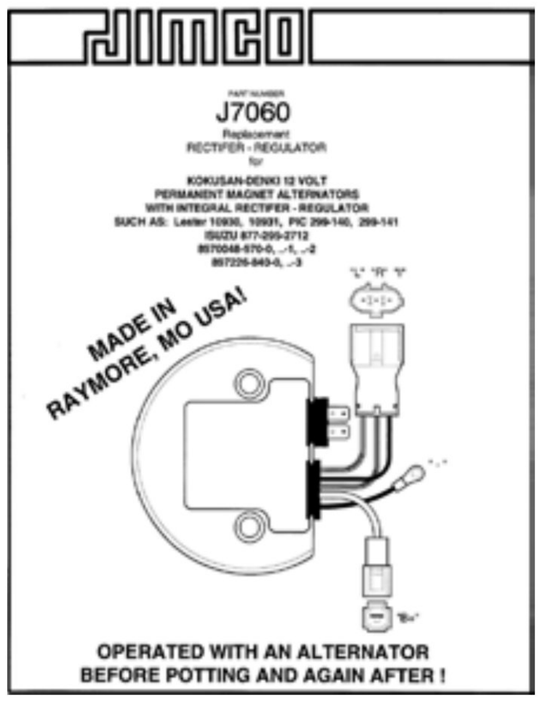

■ **Dubois Marketing** urges all rebuilders to sign up for their new online order site. With over 250,000 cross references, you can look up parts and units, view our inventory and see your pricing.

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New Rebuilder Follows Old Pro's Advice

I grew up in the cotton patches of eastern Arkansas as one of seven kids. I learned what hard work was early in life as the oldest son of a sharecropper. I also learned that there could be a better future for me other than farming. I did get a high school diploma, which paved the way for me to join the Navy.

Because of my test scores, I was sent to a naval electrician school, where I received the background to be an aircraft electrician. After two tours in Vietnam, I was sent to the Navy school as an instructor. That is where I learned more than the students did! After a couple of trips to the Mediterranean Sea on an aircraft carrier, I was sent back to school, where I completed my twenty-year service.

I worked in industry for a few years around the Southeast. I came back to Arkansas and started raising hay and running a few cows. I did that until a couple of years ago, when I decided to try something else.

There was a rebuilder in my county, but he quit. I decided to try my luck at it. I went and talked to a rebuilder in another county, and he told me that a 12'x20' building would be large enough. I also bought out a man that had closed his rebuilding shop about two years before, due to health reasons. The best advice I got from him was to spend $200 and join the ERA. It didn't take me long to find out that was a good investment!

Knowing how starters and alternators work is not all that is necessary to rebuild them.

After sending in my $200, I got a letter from the ERA that had a phone number on it for a help line. I called and found out that there was a man who had answers to all of my questions, regardless of how insignificant they might be. I also found that he never cut me short. I have a long way to go to be experienced enough to not have to call on him. I want to thank Bob Thomas for all of his help.

I would also put a plug in for J & N Electric. They also have been very helpful to me, a greenhorn. When I order parts, they, too, have never given me the idea that I didn't know what I was doing, even though if they did, they probably would have been right.

I would encourage all rebuilders to join the ERA if they haven't already. With access to all of the information available online, along with Bob Thomas, it has made my job easier and fun.

Thank you,
J. C. Rodden
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Puzzle Of The Chinese Tractor Charging System Is Solved

BY BOB THOMAS

It is easy to see why someone with limited resources would buy a Chinese compact tractor, especially if its planned use is limited and the owner has the skills and desire to do all of the maintenance himself. It is a true bargain for what you get—a basic small diesel tractor with a front loader included, for less than half the price of a similarly sized John Deere without a loader. This is not to say that they are as well made as the modern green or red American-made farm tractor. They are not. But these tractors are simple to work on. They are reminiscent of American-made tractors from the 1960s, and their repair parts are relatively inexpensive, if you don't mind waiting for a few days.

Not long ago, I had the opportunity to check the charging system on a Nortrac 254, which is essentially a re-badged Jinma tractor (*see Figure 1*). It was a pleasure to work on such a simple piece of equipment. All of the controls were easy to find and use. Originally, the customer brought me only the alternator, which I tested and found to be working perfectly. It is an externally regulated B-circuit alternator. The identification plate serves as a cover for the brush holder. By removing it, I could quickly inspect the brushes, and they showed minimal wear (*see Figures 3 and 4*). Not knowing what I was getting myself into, I suggested that the customer bring me the tractor so that I could test the entire charging system.

The ammeter indicated no charging, and a reading of 12.6 volts at the battery verified this. There was battery voltage on the B+ terminal of the alternator, but there was no voltage on the field terminal with the engine running. It was easy to locate the electronic voltage regulator, which plugged into the side of the fuse panel (*see Figure 5*). After testing the fuses (which are clearly labeled) for the alternator and the regulator, I removed the regulator, identified the terminals (which are labeled on the back) checked the B+ terminal in the regulator terminal block to verify that it had voltage and jumped it to field. The alternator began charging! So the regulator must be bad, right? To be sure, I tested the regulator, using a VR101 Transpo regulator tester, and it worked perfectly off the tractor -(*see Figure 6*). What did I miss?

I re-tested all of the terminals in the regulator terminal block, which is identical to the most common five-pin relay plug used with Bosch-style relays. The B+ terminal is actually an ignition terminal which turns the regulator on (*see Figure 2*). It also serves as the sense terminal. But when I probed the ground wire, I noticed that it was loose in the terminal block. Could the problem be that simple? I plugged the regulator back into the terminal block while pushing on the ground wire from the rear. The alternator immediately began charging normally. I removed the ground wire from the terminal block and bent the tang (to ensure a good connection). This fixed the charging system—no parts required!

A little research showed that the alternator and the regulator are both available from several Chinese tractor distributors at reasonable prices. The alternator itself is simple, low amperage and very likely to last a long time. In a pinch, a standard electronic Ford voltage regulator could be used with this system without any major wiring changes.

Wikipedia Facts: The Jinma tractor brand is a product of the Jiangsu Yueda Tractor Manufacturing Company of China. The company was born out of the Jiangsu Yueda Yancheng Tractor Factory, established in 1959 as a Chinese state-owned company of the Machinery Ministry. The company makes the Jinma brand of small (20-75 horsepower) wheeled tractors, in addition to the Huanghai brand of walking tractors. Jinma tractors are exported to Southeast Asia, the Middle East, Europe, and North America. In the United States, Jinma tractors are assembled and resold under a variety of brand names including Nortrac, Agracat, Farmpro, and Emerybuilt.

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Figure 1—Nortrac 254 tractor

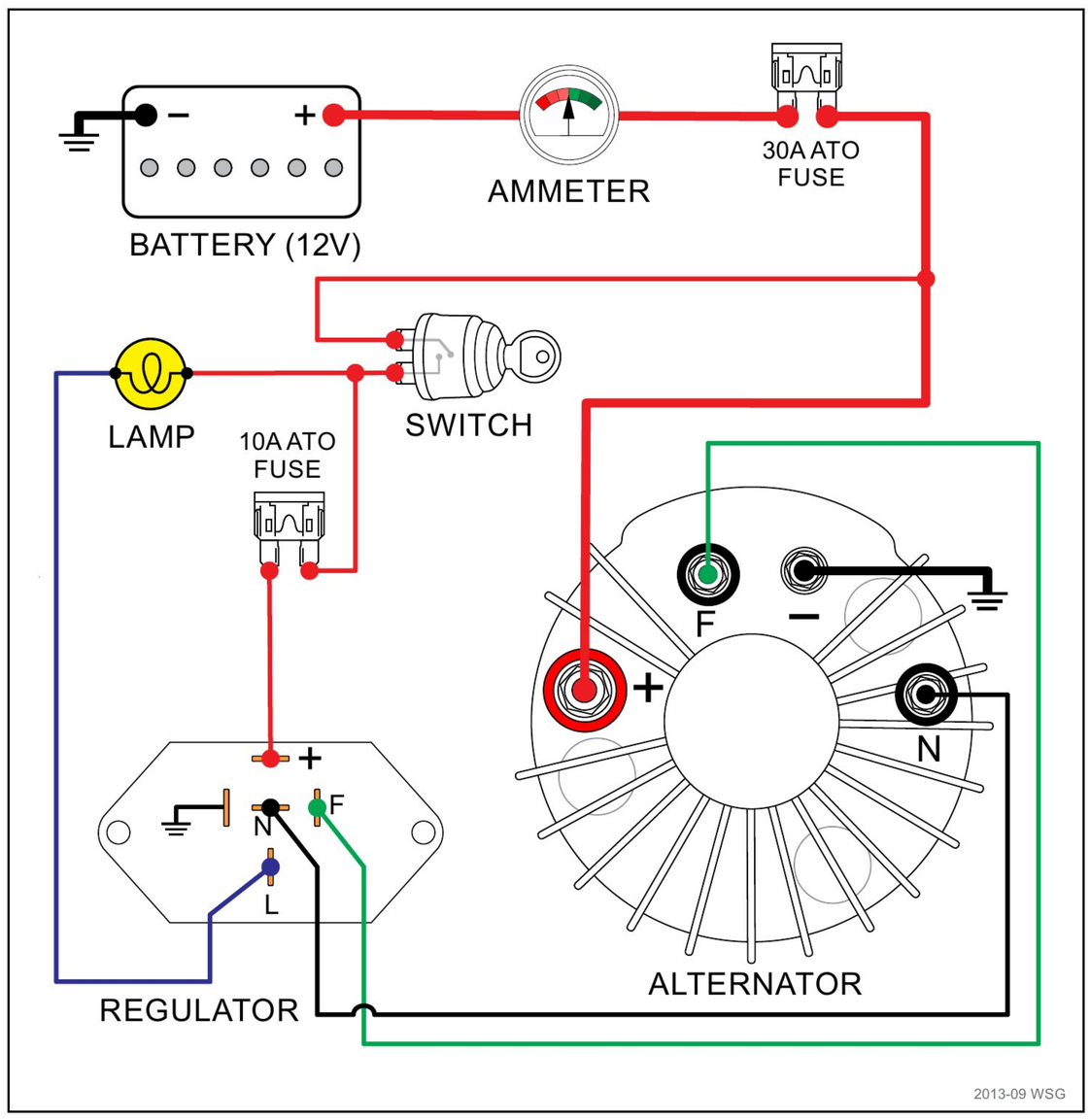

Figure 2—Nortrac 254 wiring diagram





Figure 3—Nortrac alternator

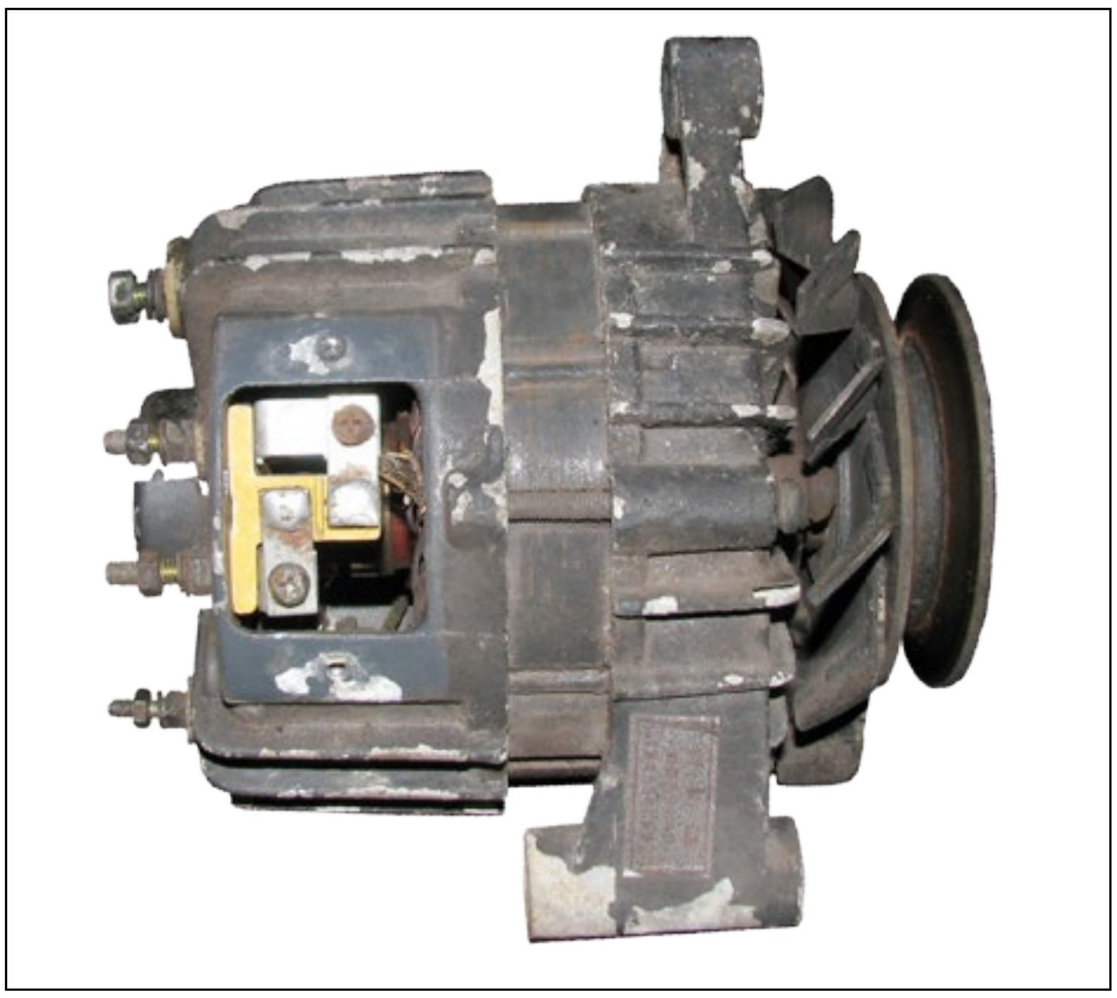

Figure 4—Nortrac alternator with inspection plate removed.

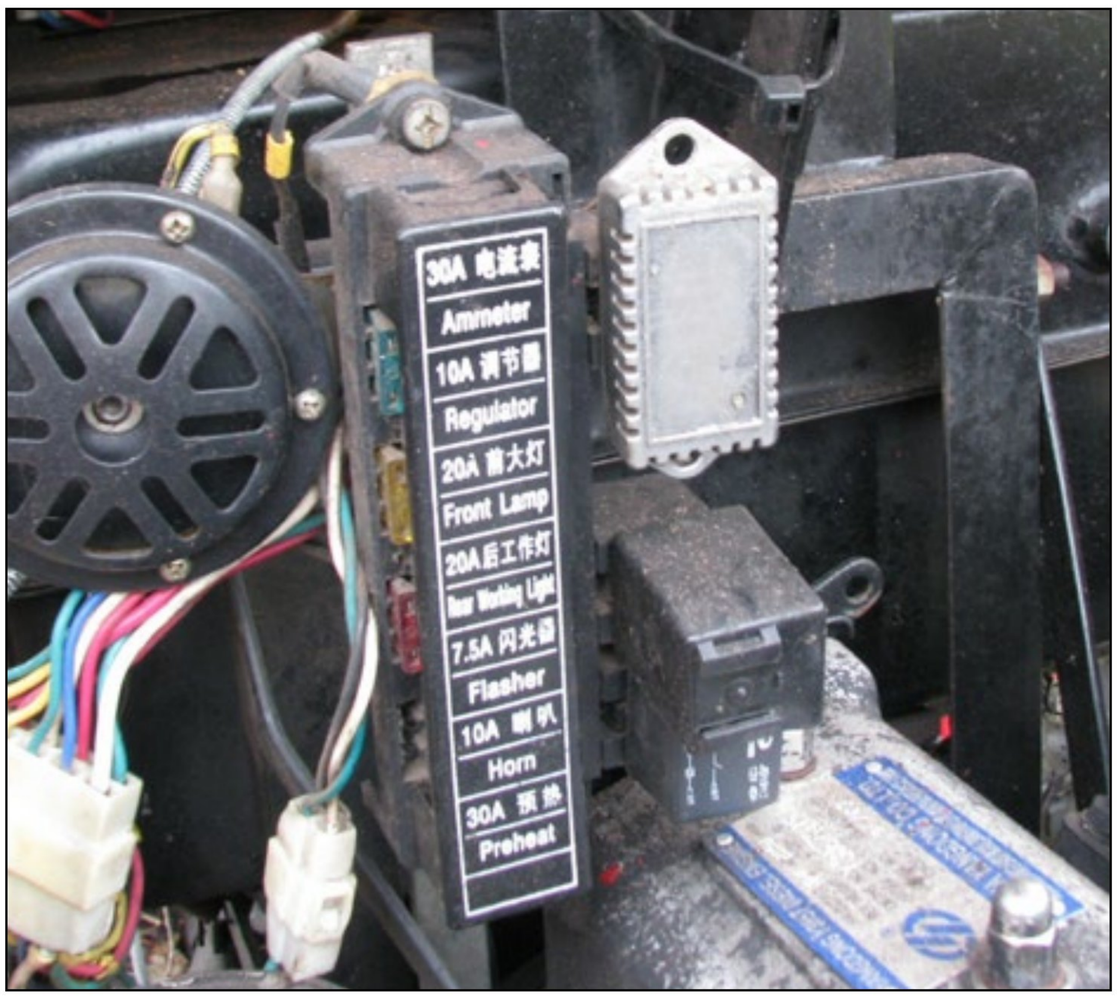

Figure 5—The Nortrac fuse and relay panel.

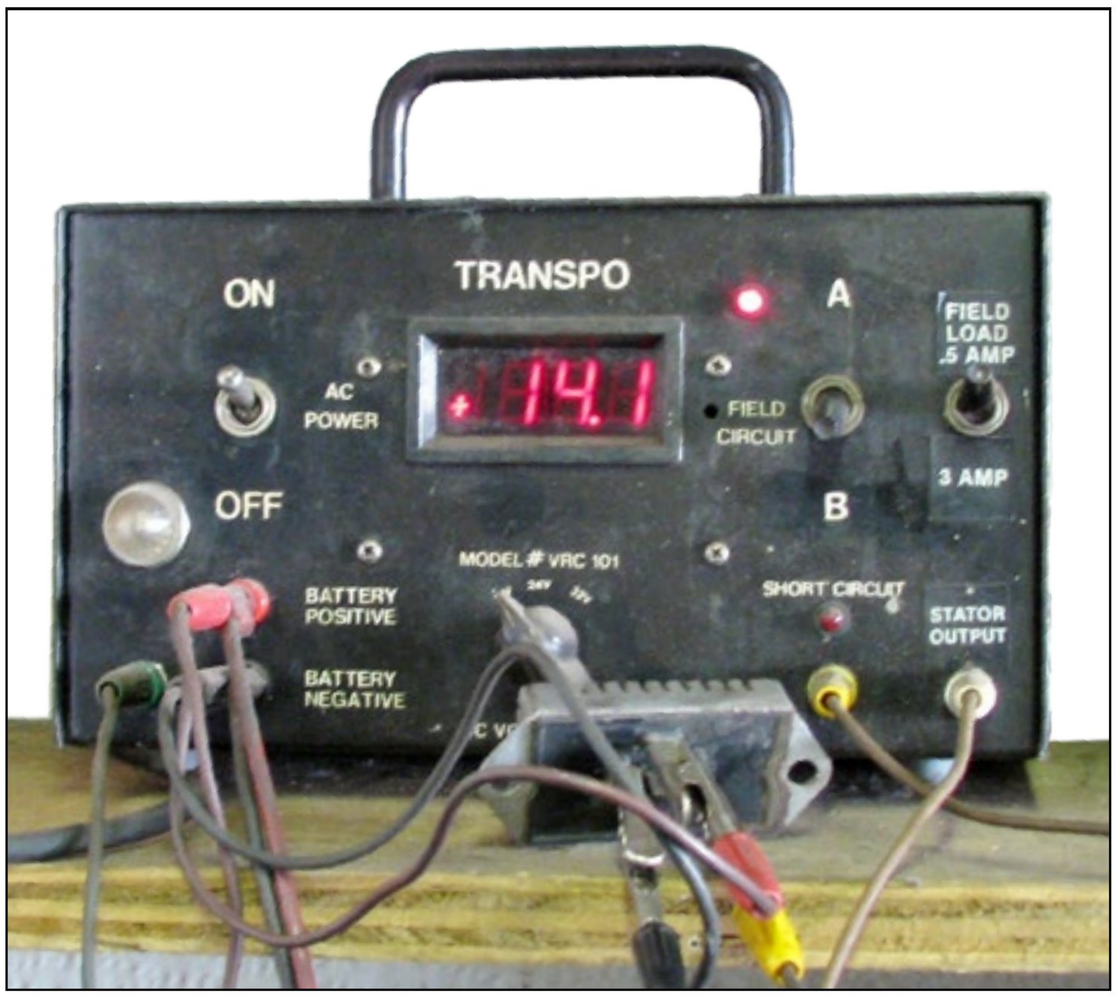

Figure 6—Testing the Nortrac voltage regulator.

TRI-COUNTY

(Continued from page 1)

in the rain. When I got home that night, I told my wife that I was putting on an addition to get trucks inside. I called the DOT the next day and asked them the maximum allowed height of a semi trailer. Then I made the door six inches higher than that on a 40'x60' addition."

"I do almost as much on-car electrical work today as I do rebuilding," Wimsatt explained. "I have always had an interest in electricity. I took electronics classes at LTI, but many times it seemed like the students knew more than the instructor did. I understood the basics, but until I took Vince Fischelli's classes, I did not really know how to apply them. I can't say enough about how much those classes helped me. -I flew down to Dallas twice, spending a week each time. It was expensive to pay for airline tickets, rooms and meals, but it was the best investment I've ever made. I told Vince that he could have told me something 100 times, but it would never compare with seeing it on a live circuit board." Fischelli uses live circuit boards with real live problems in them for students to find in class. It is real hands-on practical training, unlike anything else in the automotive industry. "I would recommend this course to anyone doing electrical work on vehicles of any kind," Wimsatt added. "It has helped me immensely."

"In 1999 I bought a JIMCO test bench, unaware of the quality of the help I'd receive after the sale. Juan Grube and Bob Newman did so much to help me at the time. They still spend so much time on the phone with me and never get paid for it."

"So many other people in the industry have helped me as well, like Dick Vensel, Joe Davis and Hank Henke. If you call them up with a question, they bend over backwards to help you find the answer."

Wimsatt credits the 2000 Rebuilder's Exchange E+ Show in Indianapolis for proving to him that a trade show can be much more than just a crowd of people walking past rows of booths. "Everyone—vendors and rebuilders, wanted to talk to me. It was different from any show I'd ever been to. As soon as the ERA was announced, I joined. The newspaper and website provide so much information. But what I like most is the willingness of members to help one another."

As if running a rebuilding business is not enough, Wimsatt also operates a 120-acre farm, raising cows and growing hay. The property is part of the 1,000-acre family farm that he grew up on. "Some of my cows were calving last year in April and caused me to miss the 2013 ERA show in Indianapolis," Wimsatt said. "I really hated that. But I can't leave them alone when it's time, and I really have no control over that. I'm hoping it won't happen again in March of next year when the show will be in Atlanta."

In spite of the hard road he's followed, Wimsatt has appreciation for where it has led him. "A friend of mine, who spent ten years self-employed as a farmer, works at UPS now. He told me that most of his fellow employees are always complaining about their jobs, the work, the other employees, the customers or the company. He told them that they should try digging a living out of the dirt or a cow's back side and then tell him how bad their job is. Any time you have a small business, you have to like it, or you won't survive," Wimsatt said. "This has been a good business. I'm proud of it. It has been good to me."

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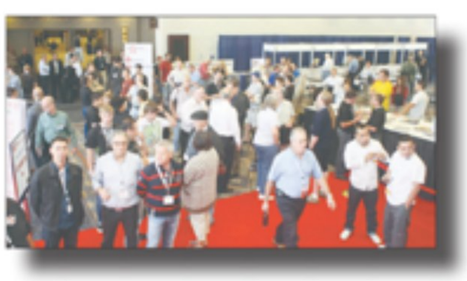

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Preliminary Schedule

Friday, November 1st
10:00 am - 6:00 pm Exhibitor Move-in

Saturday, November 2nd
8:00 am - 6:00 pm Exhibitor Move-in cont.

8:00 am - 5:00 pm Registration

8:45 am - 5:00 pm *Ticketed Event*
Grow, Expand & Profit Electrical Clinic

3:00 pm - 4:30 pm *Ticketed Event*
Advanced Cleaning Techniques - Eugene Park, NY State Pollution Prevention Institute at RIT

6:00 pm - 7:30 pm "Make a Splash" Industry Reception *Free Admission* - *Two free drinks with full registration*

Sunday, November 3rd
8:00 am - 5:00 pm Registration

8:00 am - 9:00 am *Ticketed Event*
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- *Preparing for Obamacare* - Ed Sterczek, MMIC Inc.
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- *The Hybrid Battery Reman Business* - Craig Van Batenburg, CEO, ACDC
- *Business and Benefits with Remanufacturing: A Look Across the Pond and Across the Fence* - Frank Kuebler, Remanufacturing Engineer, Fraunhofer Bayreuth
- *eCleanER Technologies: Cleaning of Electronic Components and Assemblies for Remanufacturing* - Dr. Stefan Schweinstig, VP, Remanufacturing R&D, Fraunhofer Bayreuth and Marco Bauer, Remanufacturing Engineer, Fraunhofer Bayreuth

11:00 am - 5:00 pm
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Noon - 1:00 pm Export Seminar *Free Admission*

12:30 pm - 2:00 pm Past Chairman's Luncheon *Invitation Only*

3:30 pm - 4:45 pm *Ticketed Event*
Opportunities for Remanufacturers - Mike Haselkorn, Research Faculty at the Golisano Institute for Sustainability at RIT

5:00 pm - 6:00 pm *Free Admission*
Core Supplier Roundtable Discussion

Monday, November 4th
8:00 am - 1:00 pm Registration

8:00 am - 9:00 am *Ticketed Event*
Highlight Breakfast featuring Bret D. Jordan, CFA, BB&T Capital Markets Mr. Jordan is very well known in the automotive aftermarket, managing financials for many highly visable aftermarket firms. Also, a *Salute to Bill Gager* on his 35 years of service to APRA.

9:30 am - 10:30 am *Free Admission*
Multi-generational Workforce - Bill Haas, ESi

9:00 am - 1:00 pm
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10:00 am - 11:00 am *Free Admission*
What Causes MPG to Diminish in Hybrids? - Craig Van Batenburg, ACDC

10:00 am - 11:00 am *Free Admission*
Tuning Up Your Reman Business - Jeff Susbauer, Ph.D.

11:00 am - 12:00 pm *Free Admission*
Profiting with Social Media - Gary McCoy, Fairway Communications

11:15 am - 12:15 pm *Ticketed Event*
Non-destructive Inspection Technologies - Mike Haselkorn, Research Faculty at the Golisano Institute for Sustainability at RIT

1:00 pm - 4:00 pm *Ticketed Event*
Going the Distance with Common Rail - Omar Cueto, L & J Diesel Service Inc.

1:01 pm - 9:00 pm Exhibitor Move-out

Tues, Nov 5th - Thurs Nov 7th
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Grow, Expand & Profit Electrical Clinic (O1) *Saturday*	$95	$110	
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Opportunities for Remanufacturers - RIT Seminar (O3) *Sunday*	$60	$70	
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Homemade Test Leads!

BY MOHAMMAD SAMII

I was showing a couple of test leads that I had made from discarded connectors and scrap wire to Bob Thomas at the ERA Trade Show in Indianapolis last April. He suggested that I should share these with The Exchange readers from time to time, even if they may have been published already in my monthly column "Auto Electric Corner" which appears in the APRA's newspaper, the Global Connection. So here is the first installment:

CS/AD Voltage Fluctuation

There are cases when a flickering headlight or dome light becomes so annoying that some action must be taken to correct it. Generally speaking, voltage fluctuation is almost always a "sensing" problem. That is to say, either because of corrosion or deterioration of certain connectors or fuse holders—even so small that it is not visibly detectable or barely measurable, the resulting change to the regulator's sense pin voltage (S-terminal) can cause the system voltage to yo-yo.

There are also rare internal problems with the voltage regulators, either in their electronic circuits or power and ground connections, that will cause the same problem and fluctuating voltage. So if there was an easy way to isolate this problem, determining if it is on the car side or if it is internal to the alternator, then the diagnostic path becomes more direct, and the culprit could be easily identified.

To do this, I have made this connector from a good used CS oval plug and a discarded regulator. I cut the connector off of the regulator and soldered three wires, onto it—one to each of the following pins (L-I/F- S), making my own male regulator connector. I know that this lead is already commercially available, but I went the economical route (Read: Cheap!) out of necessity to save money (*see Figure 1*).

Once the wires were connected, I connected another wire to the "S" terminal. This wire ends in an alligator clip. I have also exposed the "L" terminal for other diagnostic issues such as fault detection.

On a troubled vehicle, I simply connect this contraption in-line with the vehicle connector, and connect the alligator clip to a solid clean +B. If the voltage fluctuation stops, I know the problem is in the car wiring. If it doesn't, then I suspect internal alternator/regulator issues.

Generator Regulator Adjustment

The next one is a simple 3-wire loom with appropriate ends that runs between a generator and its regulator with the use of a few separate jumper wires (*see Figure 2*).

I use this both on the vehicle, when a regulator needs to be set up and be adjusted, or on the test bench, to make a stable platform for testing and adjusting (*see Figure 3*).

Running a regulator for the purpose of voltage and current adjustments with an actual generator is a more precise way of going at it, even better than some of the old regulator testers which are still around. The switching field contacts of the regulator and its interaction with an actual generator field coil (which has its own specific inductance and is working in a big magnetic field—within all sorts of electromagnetic activity) will count for a more precise adjustment of the regulator than a generator regulator tester with a simple resistive load … in my opinion.

None of the above test leads are new revelations, and by no means are anything special. But using available scraps that are lying around the shop and putting them to good use to facilitate diagnostics is something that makes the work easier, and at minimal cost, which consequently, will make you happier!

I will try to share a few such connectors with The Exchange readers from time to time.

Mohammad Samii is the president of Sammy's Auto Electric Service, Champaign, Ill.

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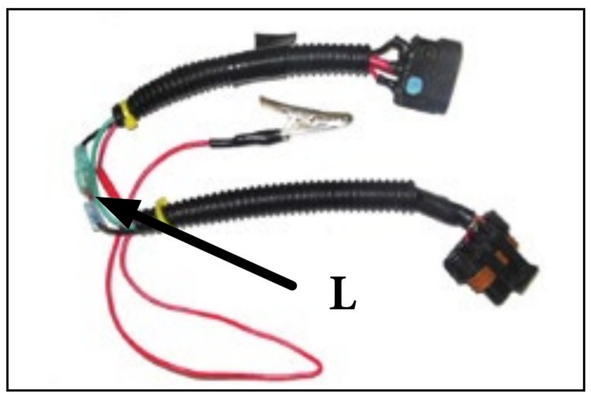

Figure 1—AD/CS test lead with "S" clip and accessible "L" terminal.

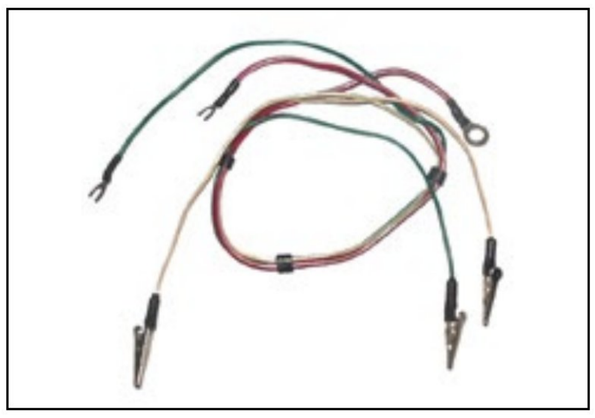

Figure 2—Generator-to-regulator test lead

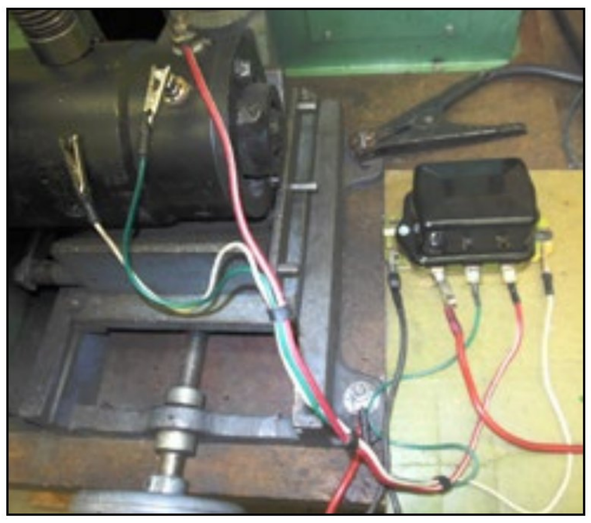

Figure 3—Running on the test bench.

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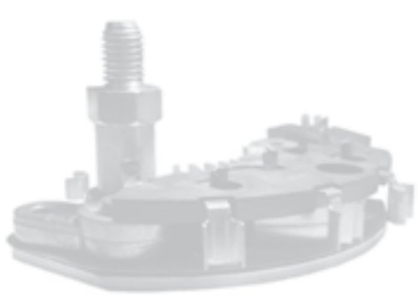

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Soldering The Old Fashioned Way

BY RICHARD VENSEL

When the first starter was repaired many years ago, you can bet the stud and brushes were connected/soldered using a battery, a ground clamp and a carbon rod. 110V resistance power-supplies were not in use at this time. Did you know that you can solder, silver solder and de-solder today using this same method? Simply hook your heavy duty soldering handle up to a 6, 12 or 24 volt battery. It may sound very old fashioned, and it is, but it can save you a lot of money, and with the correct tooling, work very well. This method can also save time, up to 80% , over using a soldering gun or iron. You can even solder ground brushes to the end plate using this method.

Battery voltage plays a big part in the success of this method. Old timers love this method and use it successfully today, but many who try this do not like it. Like everything else, practice is required, and trying other options like a 6V or 24V battery may make the difference. As Ohms Laws says, “The voltage makes a very big difference, and those who have given up after just trying a 12V battery, may have found success with a 6V or 24V battery ... you can’t argue with Ohms Law."

Before I tell you the secret, I do have one warning: This process gets very hot very fast, and steps need to be taken to make sure that the heat is directed to the joint rather then up into the handle. When you step on the foot switch and see the steel turning red, your filler metal, silver solder or paste will melt, and you should let off of the foot switch. There is a good demonstration of this on my website in the Tech Tips From Dick Section. Go to www.venselenterprises.com and click on the "Tech Tips from Dick" button. A whole library of advice and information can be found there. More information can be found in my online catalog. Click the "Online Catalog" button, then the "Soldering/Welding" index button, and check out the demonstration on page 117.

All you need to get started is:

- A 12V charged battery. Even a bad battery will work (*see below*)
- A soldering/welding handle with battery terminal ends. Even small attachments like the Triton Hot Lips will work. (*See Figures 1–3 for samples of a single holder, double holder and silver soldering handle*)
- A foot switch (like a floor mounted starter foot switch—*see Figure 4*)
- Practice, practice and more practice

Practice makes perfect, so before making any production connections , practice using all your available fluxes and filler material, solder and silver solder. Do not use acid flux anywhere!!

Your success in making a good connection lies in cycling the foot switch, so practice this.

SET-UP:

Simply hook up one side of the battery to the foot switch and the other side of the foot switch to one side of the hand-held soldering too, then connect the other side of the battery to the remaining lead on the hand-held soldering tool.

OPERATIONAL TIPS:

- Use the largest diameter electrode possible for your soldering application
- Using a battery to solder/weld provides very high current which in turn makes your soldering time very short
- Ventilation is necessary
- Electrode tips can reach in excess of 6000 degrees Fahrenheit.
- Positive electrodes will wear faster, so watch them closely, and keep the electrodes at the same length
- The arc is bright, and proper safety glasses should be used due to IR and UV waves
- Use pure carbon electrodes
- The battery voltage provides the wattage for this type of heating, so you can go up or down in wattage by using batteries of different voltage like 6V and 24V.

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Figure 1—Single Electrode Holder



Figure 2—Double Electrode Holder



Figure 3—Silver Soldering Handle

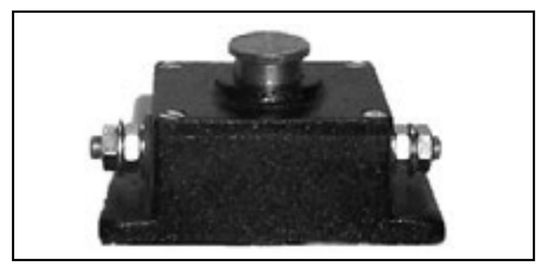

Figure 4—Foot Switch

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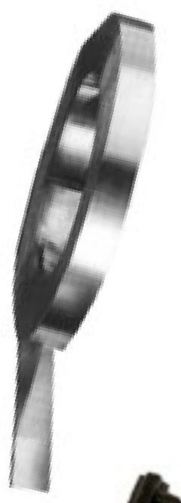

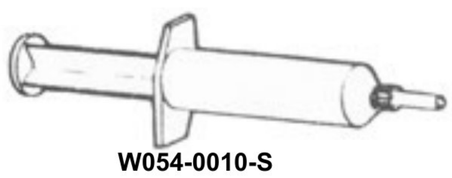

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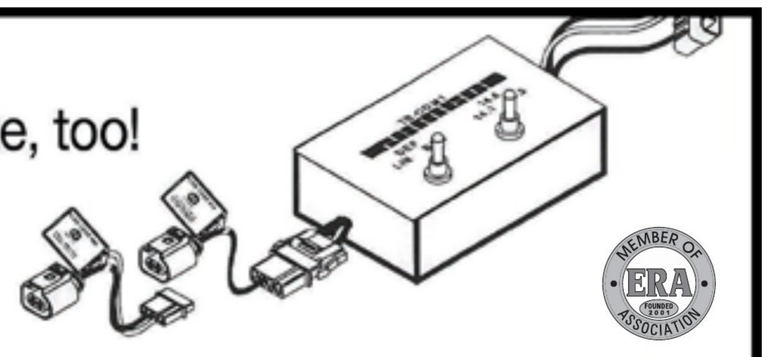

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FUTURE

(Continued from page 4)

become awesome. You can actually do a round-trip container to China and back cheaper than a round-trip from Chicago to California and back. Cheap freight, no rules or regulations, and sweatshop labor has some real financial appeal. Although when you quit producing you give up capacity and along with capacity, "know-how" goes out the window also.

More and more smaller rebuilders are finding it attractive to unload their expensive skilled help and buy complete units for resale. I recently called a sizable supplier friend to ask about the condition of his business. He said sales were better than ever. He also said complete units now comprised over 50 percent of his business. Growing numbers of his rebuilder customers are moving away from actually rebuilding and becoming somewhat of a sales agent for Delco and the offshore boys.

When I asked my friend what he thought of this trend he said, "'It looks pretty good and fairly profitable short term. However, once more guys jump on the same bandwagon the complete units will become overly competitive and the only winners will be Delco and the offshore boys." We'll end up distributing for these guys for nothing—what a deal!

At the same time rebuilders will have let go or lost their skilled, experienced help. This means few will remain who actually know how to fix anything. Let's face facts: Once you turn all the work over to other nations to do it's only a short time before "know-how" is lost. If you don't use it, you'll lose it At the rate we're going in the near future someone will be paying a Chinese consultant big bucks to tell us which hole takes the uninsulated screw in a 7127 brush holder. Don't laugh, crazier things have already happened.

Is there a future in electrical rebuilding? Of course there is. But only if you continue to rebuild and work at being a better and more productive rebuilder. If you have a decent game plan you are still far more profitable fixing the unit than buying and reselling one. The more you allow some other country to do your work the greater risk you put yourself at.

Look at items you've given up doing and are now buying foreign units. Maybe if you approached the job differently than you formerly had it could be profitable if changes in procedure were made. Bring someone in to help you that isn't as close to the situation as you are.

If you want to know about the water, don't ask a fish! All of us are too close to our situations. We cannot really step back and take an honest look at it Get help! If you want to know about opportunity in domestic electrical rebuilding check this out. The Japanese, the Chinese, the Germans and everyone else are jumping all over themselves trying to figure what Americans will buy next, and do. Now they're either a lot smarter than we are or maybe they're working harder at it where we've given up.

If any of us are going to have a future in this business we'll have to go back to work and start "Rebuilding 101" again.

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

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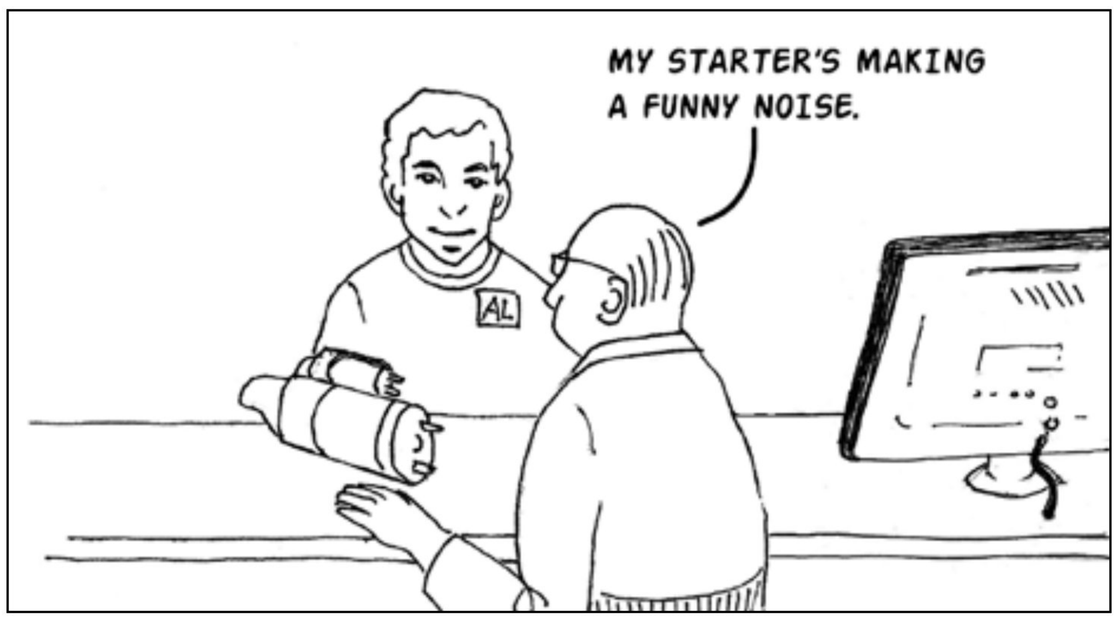
FIELD DAY—by Betsy Grueninger





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SOLDER

(Continued from page 1)

a small change in the metals or the percentage used, can make a significant difference in the properties. There are literally hundreds of different alloys of solder being manufactured today, most of them to fit specific property requirements. The most important properties for rebuilding are melting point, working range, conductivity and tensile strength.

Melting point, quite simply, is the temperature at which the solder goes from a solid to a liquid state. Solder can flow and bond only in the liquid state. The melting point is the exact temperature it needs to be in order to flow. By flow, we mean bond, the point at which you can literally see it flow out over the metal you are soldering. For example, 60/40 Sn/Pb solder has the lowest melting point of all tin/lead alloys at 370 F. The low melting point is one reason it was once the solder of choice in rebuilding. It was the quickest and easiest solder to use when working with a soldering iron or gun. Coincidentally, 60/40 Sn/Pb solder has no working range.

Most alloys, however, do have a working range, meaning that they do not change from solid to liquid all at once. The low temperature in the range is when the solder begins to melt. It becomes very soft and mushy looking, but it is not quite a liquid yet, and it cannot flow. The high temperature in the range is when it becomes completely liquid, and then it can flow. Alloys containing copper or silver will all have temperature ranges.

All solder alloys are conductors, but as you know, some conductors are better than others. Obviously, when the alloy contains silver or copper, it will be a better conductor than if it does not. Those solders also resist corrosion better than lead solders.



Tensile strength is simply the rigidity of the connection—how strong it is. Again, alloys containing silver and copper provide the best tensile strength. By now, you can see some of the advantages of using a lead-free solder. Here is another. Lead is highly poisonous, if either ingested or inhaled. For this reason, it has been removed from paint, gasoline and all solder used in water systems in the US. In Europe, lead has been totally banned from use in solder. Lead can build up in the body over the years, and it primarily affects the nervous system. One sure way to avoid this is to stop soldering with it!

Solder alloys containing silver, produce the strongest bonds. These are often grouped together as silver solder. However, you must remember that there can be significant differences in the properties of similar alloys. If you are soldering critical connections that must carry high-current loads, silver solders with a melting point above 1,000 F provide better protection against de-soldering.

Some solders are rosin-core, and others are solid or non-rosin. What is the difference? Before we explain that, you need to understand that for soldering to be successful, on an atomic level, everything, from the pieces being soldered to the solder itself, must be clean and free of all contamination. This most importantly includes oxidized metal. No matter how well you clean the pieces, the moment you stop cleaning, the bare metal surface begins to oxidize. You can't visually see it, but it is there, unless of course you are working in an oxygen-free environment, and there is not much chance of that. Flux is used in soldering to remove any oxidation immediately prior to soldering—and rosin, quite simply, is one kind of flux. If you are wondering why it's called rosin, well, that is what it is. It's a translucent gel comprised of pine rosin. The unique acidic properties of pine rosin make it perfect for removing all oxidation without interfering with the bonding or leaving any corrosive residue.

If there is a single solder that can do all that 60/40 does and more, it is 97/3 Sn/Cu. This lead-free solder bonds well with all metals—even aluminum and steel if the surface is properly prepared. The temperature range is 446 F to 482 F, higher than the old 60/40, but well within the reach of your typical resistance-soldering tool today. It has a higher tensile strength than 60/40 and much better conductivity. The only question is, why are so many rebuilders are still using 60/40? It must be out of habit. If you try a roll of 97/3, you'll fall in love with it.

It is worth emphasizing that flux does not clean the metal surfaces. Cleaning is the foundation for successful soldering. We will share some unique cleaning techniques next month.

Bob Thomas is the owner of B&H Electric, Orange Park, Fla.

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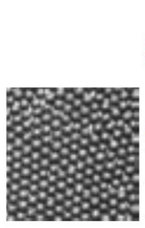

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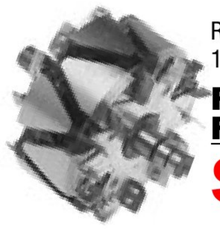

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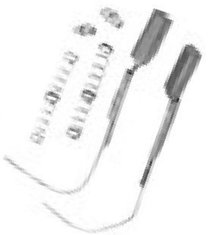

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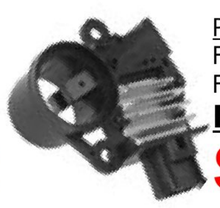

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