ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

MAY 2015 $12.95

LUCAS A127 ALTERNATORS
Thermistor Battery Sense

ALL ABOUT MAGNETS
Permanent magnets in starters and DC motors

HOW TO CHANGE
You gotta wanna!

PLAIN TALK | REPRIEVE OR RECOVERY?

Lucas A127 alternator ready to test

A WORD FROM THE PRESIDENT
Learn and look forward



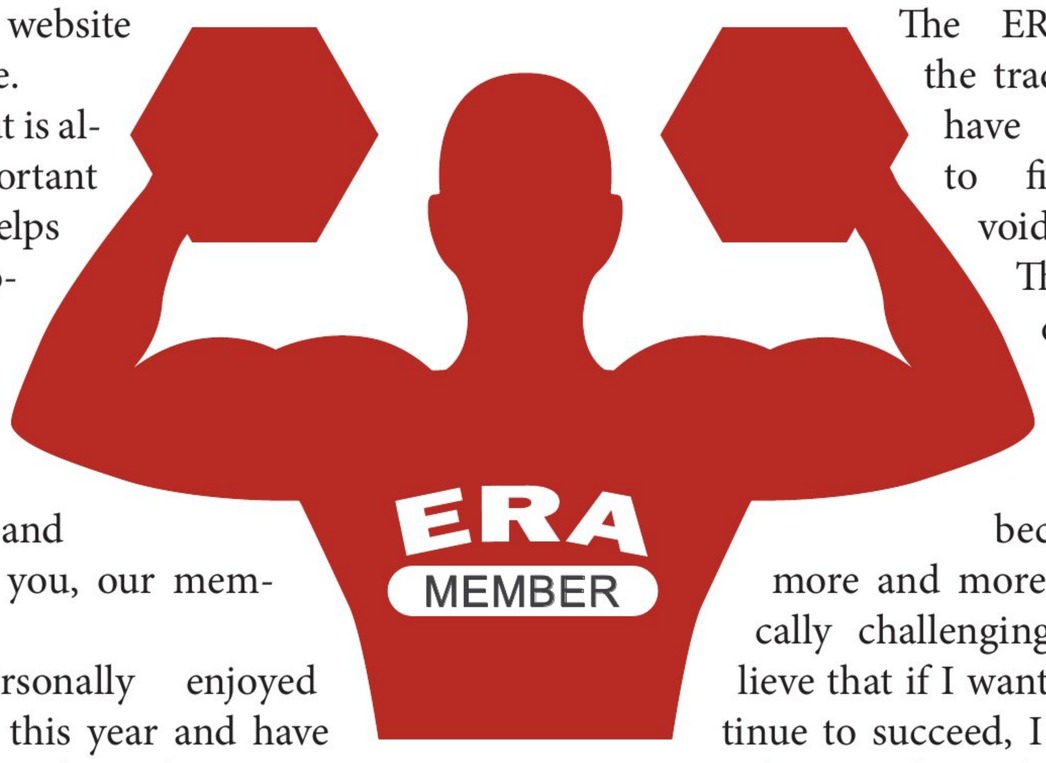
As you read this second edition of the new ERA Exchange, I hope you will find it even more appealing than the The Exchange newspaper. If you have any comments or suggestions, please feel free to post them on the ERA website forums, or contact any of the ERA board members listed in the Association Contacts section on the website homepage.

Your input is always important to us. It helps us to provide the content that is most interesting and useful to you, our members.

I personally enjoyed the show this year and have received a lot of positive feedback from both suppliers and rebuilders who attended. As a small business owner myself, every year I have to make a decision whether or not to budget the funds to attend the ERA show. A key deciding factor for me is this: did I get a return on my investment from the past year's show?

Well, the answer to that question is that I have not missed a single show over the last twenty years.

It used to be that with regional sales reps calling on me once a month and a lot more supplier-sponsored local training events, it was easier to keep up with what was going on in the rebuilding world and what was new in our industry. But those days are gone.



The ERA and the trade show have helped to fill that void for me.

This industry is changing and becoming more and more technically challenging. I believe that if I want to continue to succeed, I have to seek out the information that I need, learn from my mistakes and look forward in order to make as few mistakes as possible in the future. The ERA helps me apply that strategy.

A show committee is already searching for a location and is planning the 2016 event. They welcome your input. You can call or email any member of the ERA board if you have an idea or suggestion for the next show. It might be a city that we never thought of using, as Davenport was this year. A member actually suggested it. We understand that we cannot please everyone, but we try very hard to find a way to do so. Feedback from members is something we take seriously, and it is often discussed at meetings.

An association is only as strong as its members. That is you.

Mike Dietrich

NEW ERA MEMBERS

Auto Electric Services
Clarksville, Tenn.

Diesel Injection Service Co.
Louisville, Ky.

V&W Repair
Sioux Falls, S.D.

Autocosmosbiz
Pretoria, S. Africa

ABOUT THE COVER
A Lucas A127 is on a test stand ready for testing with a 200 ohm resistor connected between the sense and B+ terminals.

ERA EXCHANGE
Volume 32 Number 9
MAY 2015

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

EDITOR / Bob Thomas
ASSOCIATE EDITOR / Betsy Grueninger
DESIGN & PRODUCTION / Wes Grueninger, Sr.
CONTRIBUTING WRITERS / Rob Buksar, Mike Dietrich, Wes Grueninger, Sr., Bob Thomas, Nick Staub

CONTENTS

2 A WORD FROM THE PRESIDENT
2 NEW ERA MEMBERS
3 PLAIN TALK—Reprieve or Recovery?
5 LUCAS A127 ALTERNATORS—Thermistor battery sense on Ford Tractors
10 HOW TO CHANGE THINGS—You gotta wanna!
11 ERA IDENTIFICATION AND WARNING LABELS
12 ALL ABOUT MAGNETS—Permanent magnets in starters and DC motors
14 NEED HELP?—It's just a phone call away
15 CLASSIFIED ADS

Copyright 2015 • Printed in the United States

The publisher retains the right to edit for content, style or space. All submissions become the property of the ERA Exchange. Opinions expressed herein of contributing authors do not necessarily reflect the opinion of the staff or policy of the ERA Exchange. All advertisers herein warrant that they are duly authorized to engage in the business described by them when applying for advertising and further warrant they are duly authorized to use any copy, illustration and any trademarks or trade names which may be specified for use in their ad. The ERA Exchange limits its liability due to production errors or omissions to the running of a correction in the next issue.

PLAIN TALK
Reprieve or recovery?



BY ROB BUKSAR

Since my health calamity of September of 2013, I continue to learn from the experience. I was delusional when the ambulance hauled me into the Emergency Room. Later, I was told that I might have been 30 minutes, give or take, from a body bag! I was that close to checking out.

The next 6 weeks were spent on my back, connected to IVs and monitors. It took another 2 weeks to get me up, out of bed and on a walker. Two more months were pretty much spent at home between the bed and a La-Z-Boy® recliner, because I didn't have enough energy to do much else.

After those 2 months, I returned to work with some assistance. My contributions were limited, and my judgements had a lot to be desired. Yet, I showed up every day and kept swinging at the ball anytime it came close to the plate. Sometimes, I'd hit the ball, and many times I'd strike out.

I came to realize at that point that I was a long way from **recovery** on many levels and was only given a **reprieve**! To ensure that we all stay on the same page, I'll give you two definitions of reprieve, mine and the dictionary's.

Here's my understanding of reprieve. You're in a life boat in the middle of the ocean. You have run out of food and fresh water, and there's presently no land in sight. Yet, you know if you continue to row toward the west, that you'll run into some inhabited islands with plenty of food and water. The problem is, your food and water ran out 3 days earlier, and your energy is almost totally depleted. Now, all of your activities have to be re-evaluated, because there is no food or water, and you're trying to stay alive as long as possible. Survival is looking shakier by the moment, and certain death in knocking at the door!

All of a sudden, it starts to rain like crazy! You lay out a tarp and capture rainwater to replenish the water cans. The storm drives a school of fish to the surface and while they're jumping, a half dozen or so conveniently land right in your boat. Now, due to time, chance and circumstances, you've been given a reprieve. Where death was a certainty moments before, you now have enough water and sushi to last you for a week. Was it salvation or recovery from an eminent death? No! It was a reprieve, just temporary.

Prudent thinking and behavior would be to drink some water, eat some sushi, allow energy levels to recover a bit and immediately begin rowing west where the real salvation and recovery is. I'm pretty confident that lying idle waiting for another rain and more fish to jump into the boat is a bad idea.

The dictionary's take is as follows: Reprieve; (1) to delay the punishment of



Valeo

Visit our NEW website! wagneralt.com

Electrical Systems

Valeo OEM Alternators, Starters & Components



Authorized USA Master Distributor

WAGNER

Wagner Alternators & Supplies, Inc.
Sales (800) 345-5927 · (909) 465-1950
13352 Elliot Avenue Chino, CA 91710
www.wagneralt.com
email: sales@wagneralt.com

PLAIN TALK

someone, (such as a prisoner who is sentenced to death). (2) To prevent (someone or something) from being closed, destroyed, etc., for a period of time.

Getting back to where we started ... For me to recover requires a 100% commitment and effort doing whatever it takes to accomplish that goal. Sitting around waiting for another reprieve is not going to get me or anyone else recovered or saved. Yet, I'm here to tell you that a reprieve almost always provides relief and a false sense of security. That relief, even though welcomed and needed, is often mistaken for recovery. That, my friends, is where the problem resides.

Our country is really different than it was 20-25 years ago. Many good things have developed, but I think a lot of bad ones have occurred also. I can't tell you how often I used to hear the Mr. Doom & Gloom cracks and people saying that I'm focused on the empty part of the glass rather than the full. "Sticks and stones, folks." Call me all the names you like, but this is what I won't do. I will not focus on how nice the newly built deck looks while the rest of the house slips into a sinkhole! Sadly, that's what we seem to do in this country. Let's avoid all the bad stuff which is eating us alive, and maybe it will go away. Well, it ain't going away, and we are being eaten alive!

So, here's the ticket. Rebuilding starters and alternators ain't what it used to be, not even close. The glory days in this small business industry, like many others, has come and gone. **Do I think there's business out there to be had? Absolutely, and lots of it. Do I think it's in the places where it formerly was? Absolutely not!**

Now, this is where I'll try to tie this all together. If you get a burst of orders or sales from your traditional customer base, this is clearly very good and exciting. Just don't be mistaken or deceived here. What you got was a reprieve and not a recovery. The relief that a burst of business provides is as gratifying and satisfying as the temporary masking of pain. It's numbed for a while, but it's coming back, because the problem or the predicament remains.

The only way to achieve recovery is either treat the problem, eradicate the problem, move away from it somehow or die! As we're all aware, problems seldom, if ever, get better on their own, and when avoided, they take on a life of their own and get worse.

I'm not suggesting that anyone jump ship. Starting with myself, I think that we all need to recognize where we're at and plan, adjust and move in whatever direction makes sense. That's going to be the one who nets full recovery and salvation.

So, whether it's your job, your business, your health or whatever is important to you, none of us can go the distance living on reprieves. Look for the solutions and the opportunities that will get you where you need to be and start rowing in that direction immediately. Temporary fixes are just that, temporary. They use you up, burn your time and leave you no better off than you were when you started. Just like Tennessee Ernie Ford used to say, "Another day older and deeper in debt." Reach out for recovery—don't hold your breath waiting for the reprieves.

God Bless this country and our little industry.

Rob Buksar is the owner of Hoosier Electric Co., Gary, Indiana

ERA

LUCAS A127 ALTERNATORS
Thermistor battery sense on Ford Tractors



BY BOB THOMAS

The A127 series Lucas alternator (*see Figure 1*) was designed in the early 1980s, before the famed British manufacturer was sold off piecemeal to the highest bidders. Marelli took over this alternator, along with the internal fan LRA series that followed, and manufactured them both under their own name. Denso later acquired Marelli and continued production. As of this writing, these alternators are still being manufactured under the Marelli brand name by Denso in Europe. For this reason, there has been some confusion about who actually made A127. The answer is, all three, but the original design was Lucas. Replacements that look similar have been produced by Prestolite, Leece-Neville and Iskra, but their parts do not interchange with the original alternators.

The A127 was primarily used on Perkins engines, the majority of them being installed in Ford, New Holland and Massey Ferguson tractors. It was used on some tractor models all the way up until 2010. That is a long run for any alternator, and most of these tractors are still around today.

There were several different mounting configurations in the A127 series. Amperage ratings varied from 45 amps to 70 amps. Aftermarket versions have been manufactured with up to 100 amps. There were only two different regulators that were used with the 12 volt A127 alternators (*see Figure 2*). One was internally sensed (on the top), and the other was externally sensed through a **thermistor at the battery** (using the terminal at the end of the orange wire on the one on the bottom). The latter is the regulator that causes the most problems for rebuilders and their customers. That is the one we will focus on here. It was used on many applications after 1989.

A thermistor is simply a resistor that is exceptionally sensitive to temperature change. This is nothing new. All conductors, including resistors, are temperature sensitive to some degree. Michael Faraday discovered this property in 1833 when he noticed a dramatic decrease in the conductivity of silver sulfide as its temperature increased. But it was nearly 100 years later before the first commercially viable thermistor was patented. Up until then, available technologies found no use for it. Today, they are utilized to monitor temperatures in all kinds of applications, automotive and otherwise.

The purpose of the thermistor that is used with the Lucas A127 alternator is to modify the sense voltage to compensate for battery temperature. Lucas had used thermistors previously in these same tractor applications for this function, but they did not cause many problems for rebuilders. We will explain more about that later. So what is the purpose of adjusting charge voltage according to battery temperature?

All batteries have trouble accepting a charge once they get above a specific temperature. It will vary according to the battery type, but most wet-cell batteries will not accept much of a charge above 130 degrees Fahrenheit. Above that, you are no longer charging the battery, you are only boiling the electrolyte and evaporating water from the battery. Excessive heat damages the plates. As you know, charging also heats any battery. So on a summer day, working in the sun, a battery on a tractor can reach that 130-degree

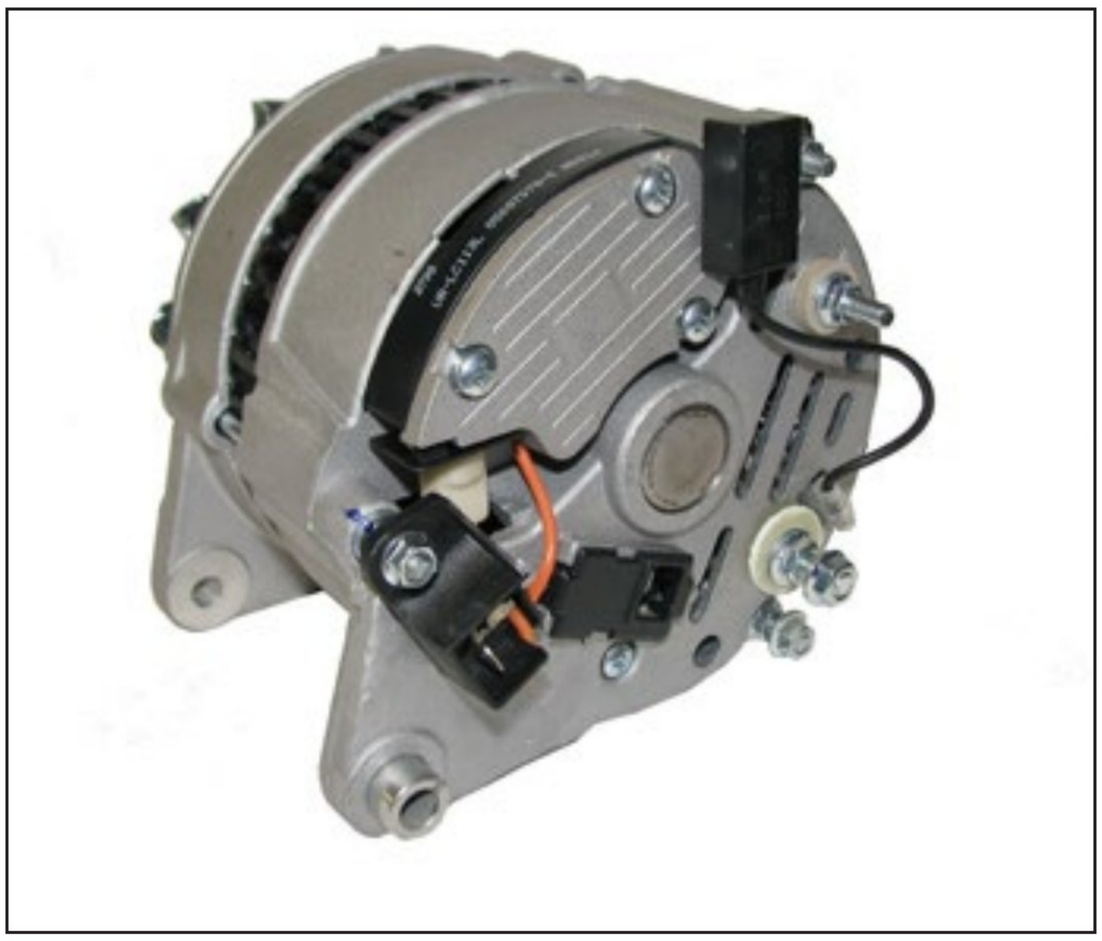


Figure 1—The Lucas A127 series alternator was used on many Case, Ford, New Holland and some Massey Ferguson tractor models from 1983 to 2010.

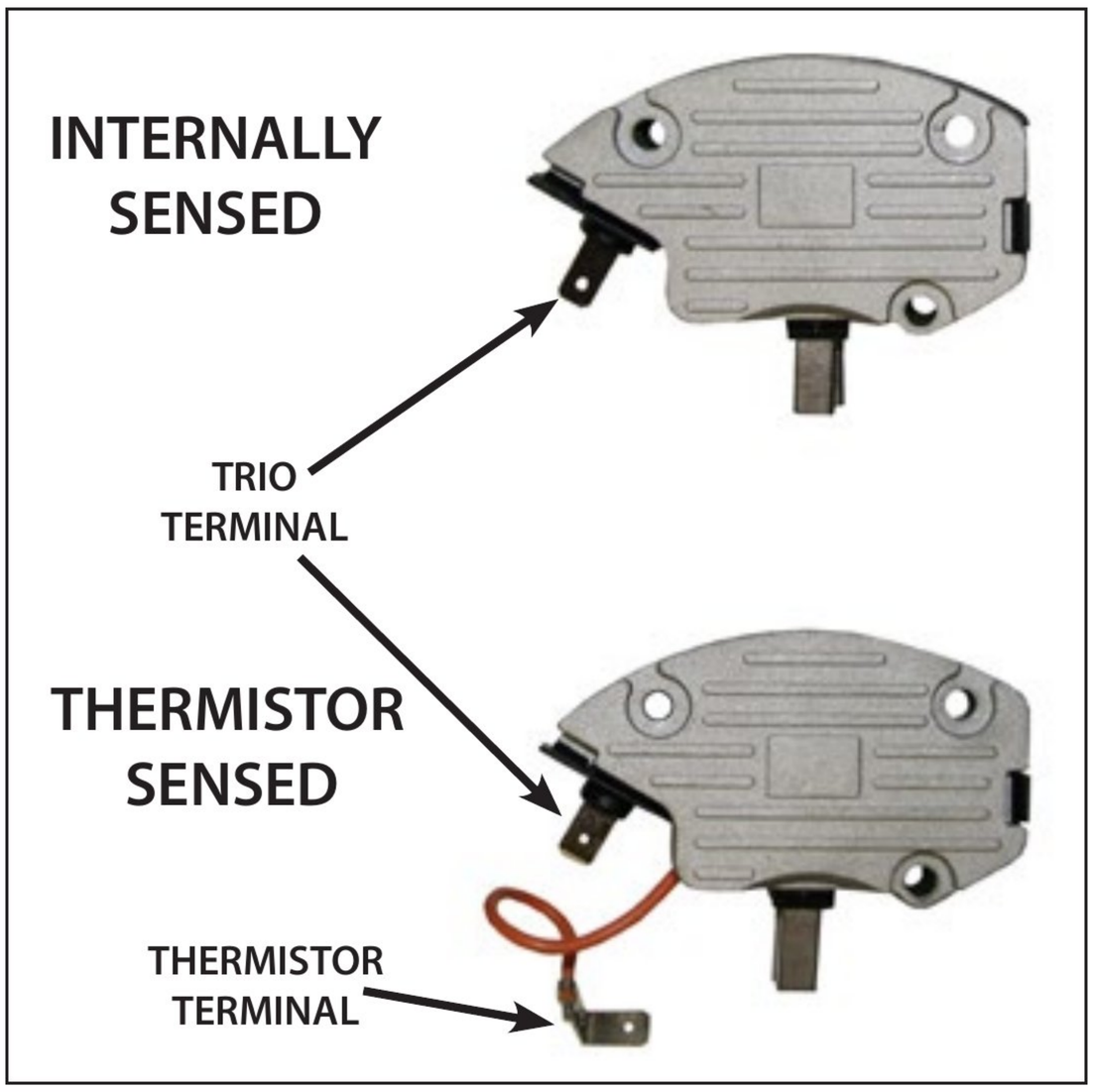


Figure 2—Two different regulators were used on the 12 volt A127 alternators. The regulator on the top is internally sensed directly from the trio terminal. The one on the bottom with the orange wire is sensed through a thermistor located on the positive cable at the battery. Do not apply direct B+ to the orange wire when testing or you will damage this regulator.

temperature pretty quickly. Overcharging any battery reduces its life expectancy.

Almost all electronic regulators utilize thermistors internally to compensate for the temperature within the engine compartment. You can observe this if you run an alternator under a heavy load on your test bench to heat it up. As the temperature of the alternator increases, the voltage will decrease by as much as one half of a volt, assuming that you run it long enough.

However, on most of these tractors, the battery is mounted above the engine, where it is exposed to rising engine heat. The temperature within the alternator can be very different from that of the battery. Thermistors have been used in some automotive applications, too, where the battery is located outside of the engine compartment, such as under the rear seat or in the trunk.

The problems that the owners of these tractors may be having today, have a lot to do with the age of their tractors and the conditions in which they are used. Many of these tractors are now over 20 years old. Some have spent much of their lives outdoors in all kinds of weather. Wiring harnesses that have been exposed to the elements can develop corrosion at connection points, which may change the resistance in that circuit. Farm animals are known to chew on wiring harnesses and damage them. Thermistors lead a rough life when they are mounted at the battery on a tractor. If the thermistor "goes open" internally, or if the sense wire breaks anywhere in the circuit, the alternator will appear not to charge at all.

We say "appear", because in actuality, it will turn on and charge with no voltage on the sense terminal. However, the real set point of this regulator is 12.5 volts. Of course, it cannot keep the battery charged with 12.5 volts at output. To make this scenario even worse, it will usually turn the charge lamp off, because the trio is producing voltage. The operator may very likely use the machine until the battery is totally discharged. You should be aware of this when an A127 alternator comes in your door, especially if it charges for you on your test bench—assuming that you are testing it properly.

Testing this alternator on your test stand requires a modification of the sense voltage. In other words, you must simulate the thermistor. **If you apply full battery voltage to the sense terminal (orange wire) you will destroy this regulator.** You must also modify the sense voltage whenever testing the regulator on a voltage regulator tester (*see Figure 3*).

A **200 ohm resistor** in series between the B+ terminal and the battery sense terminal will simulate the thermistor (*see Figure 4*). If everything is working properly, this alternator should produce about 14.2 volts using a 200 ohm resistor. The value of your resistor during testing will determine the charge voltage. Any resistor between 100 and 250 ohms will suffice, but the charge rate will vary from 13 to 15 volts, depending on what value you use. A higher value resistor will make the alternator charge higher. A lower value resistor will make the alternator charge less. We do not recommend using a resistor lower than 80 ohms. Be aware that full battery voltage will damage the regulator. A ¼ watt resistor is more than adequate, as this circuit requires very little current.

If you need to test one of these alternators and do not have a suitable resistor handy, you can connect five Delco 40 ohm resistors together in series to achieve the same results. These

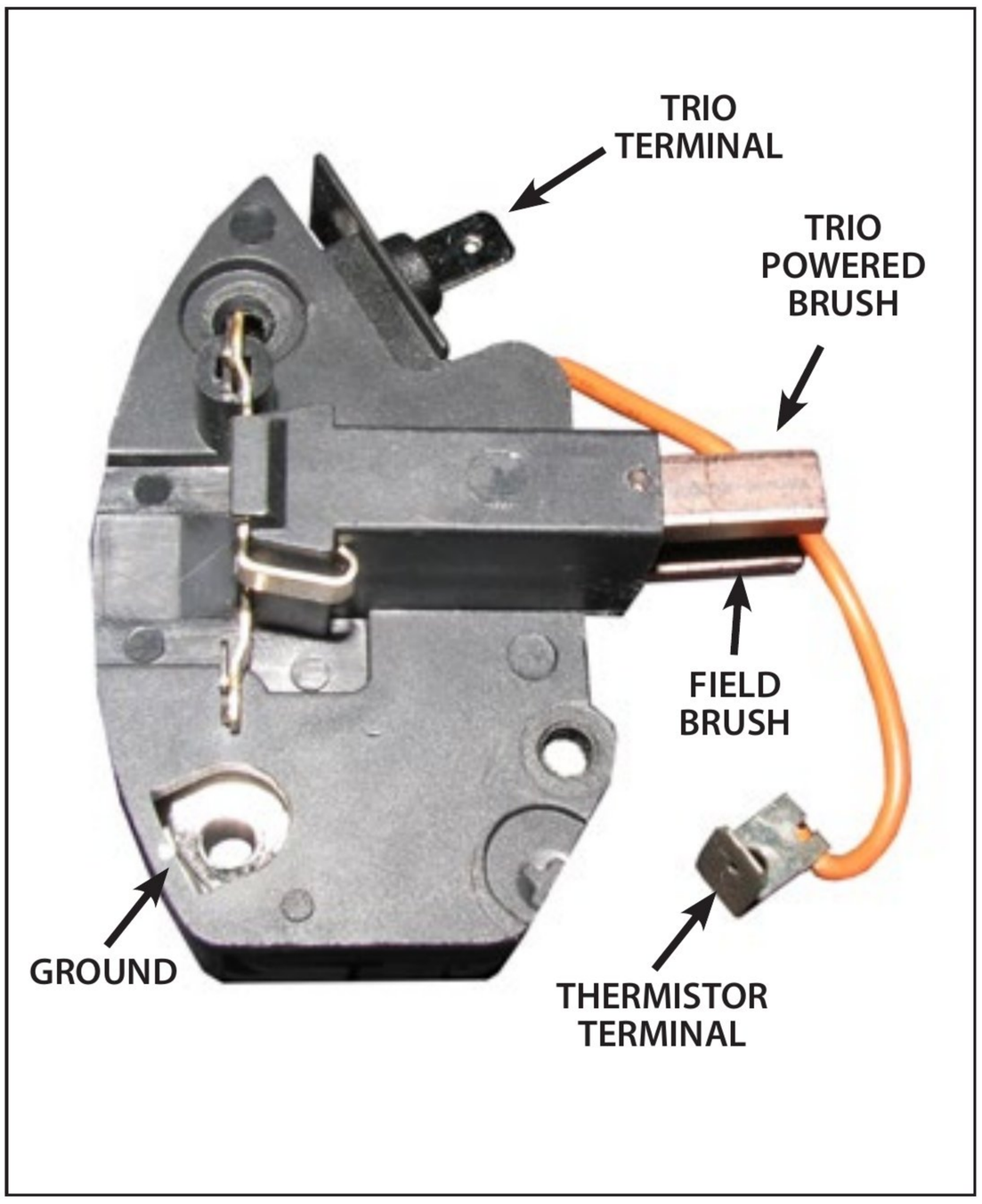


Figure 3—Use these connections when testing the regulator independently. It is an A-circuit.

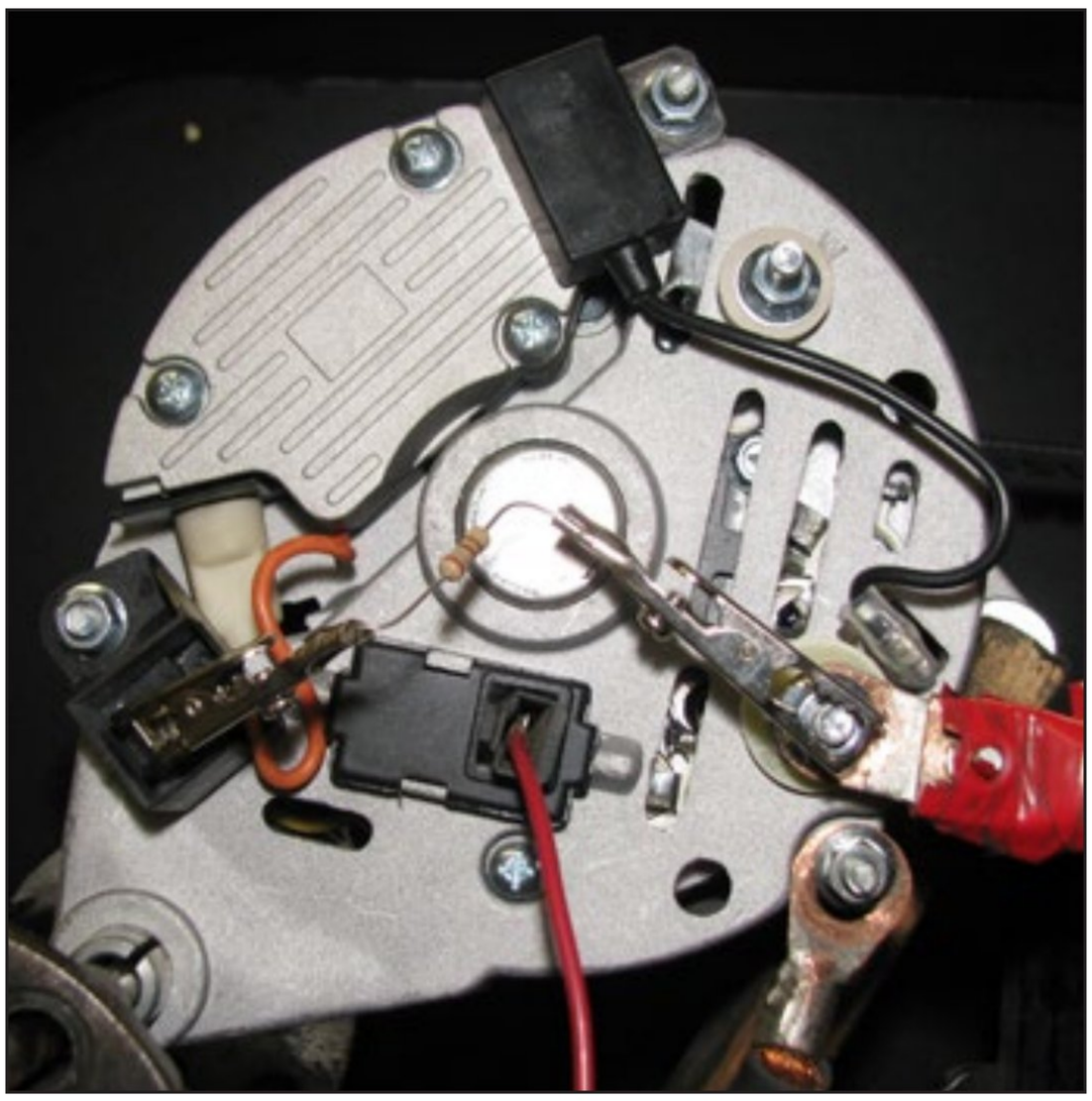


Figure 4—Testing this alternator requires that modified B+ must be attached to the orange sense wire as shown. A 200 ohm ¼ watt resistor should result in a charge voltage of 14.2 volts.

wirewound 40 ohm resistors were used in the SI series alternators to bypass the field circuit and turn on the charge lamp in the event of an open rotor or worn out brushes. Keep in mind that wirewound resistors will vary slightly in actual value. The ones we used all measured slightly higher than 40 ohms.

As shown in the photos in our test (see *Figures 5, 6, 7 and 8*), the voltage dropped as we decreased resistance. This is exactly what the thermistor does as the temperature of the battery rises during charging. Voltage readings will vary from one brand of regulator to the next. The measured voltage of our test regulator, using different resistance values, is listed below:

- 5 resistors – 208 ohms – 14.4 volts output
- 4 resistors – 164 ohms – 14.0 volts output
- 3 resistors – 124 ohms – 13.6 volts output
- 2 resistors – 84 ohms – 13.2 volts output

ASAP
ALTERNATORS STARTERS AND PARTS, INC.
www.asapstpaul.com
1475 Commerce Dr, Suite 200 • Mendota Heights, MN 55120
Distributors for
WAI, BOSCH, ISKRA•LETRIKA, LEECE-NEVILLE, DENSO, MITSUBISHI
> Full line WAI units & parts
> Hard-to-find AG & INDUSTRIAL units & parts
> Full line rewound Armatures, Stators, Rotors, Fields
(800) 833-9096 • (651) 688-7161 • Fax (651) 688-9285
NEXT DAY GROUND
Order by 5:00 pm, receive in IA, MN, WI, eastern ND, SD
UPS • SPEEDEE • FEDEX Ground
Expert Tech Support
Phones open until 6:00 pm

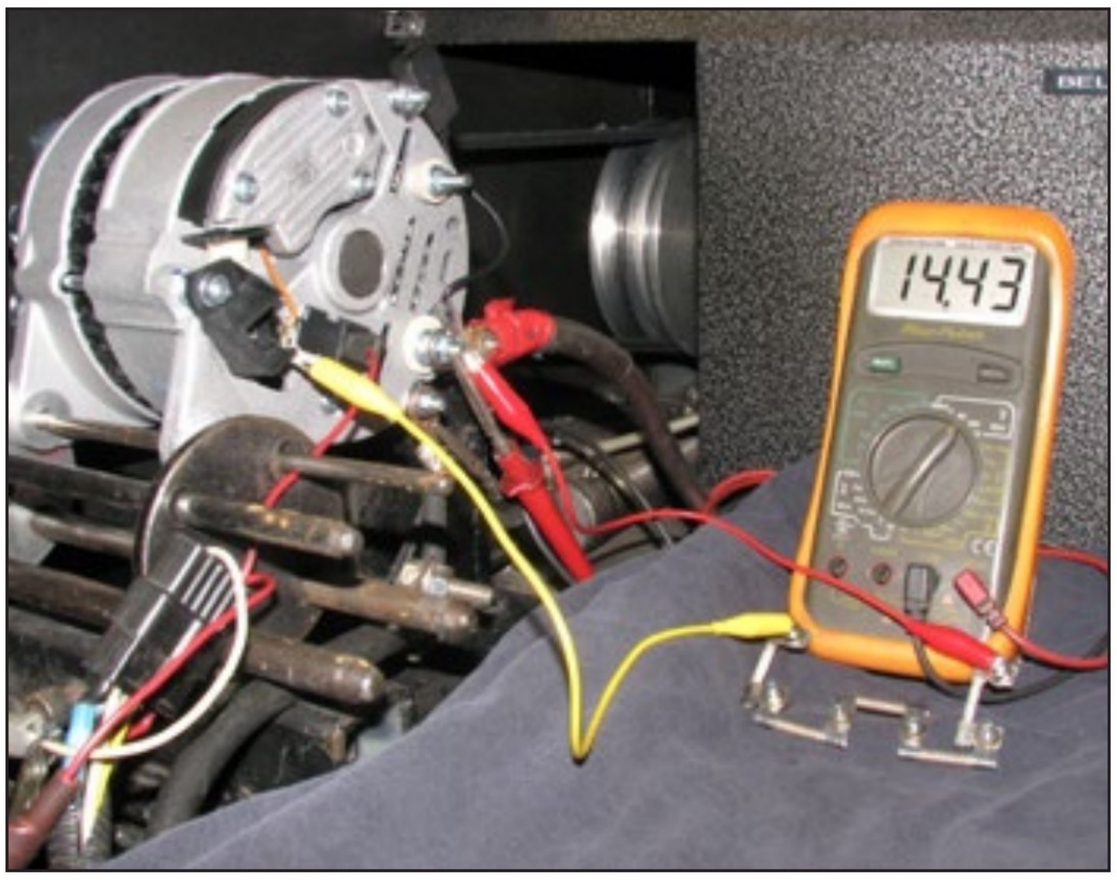


Figure 5—Voltage output is 14.4 volts using 208 ohms.

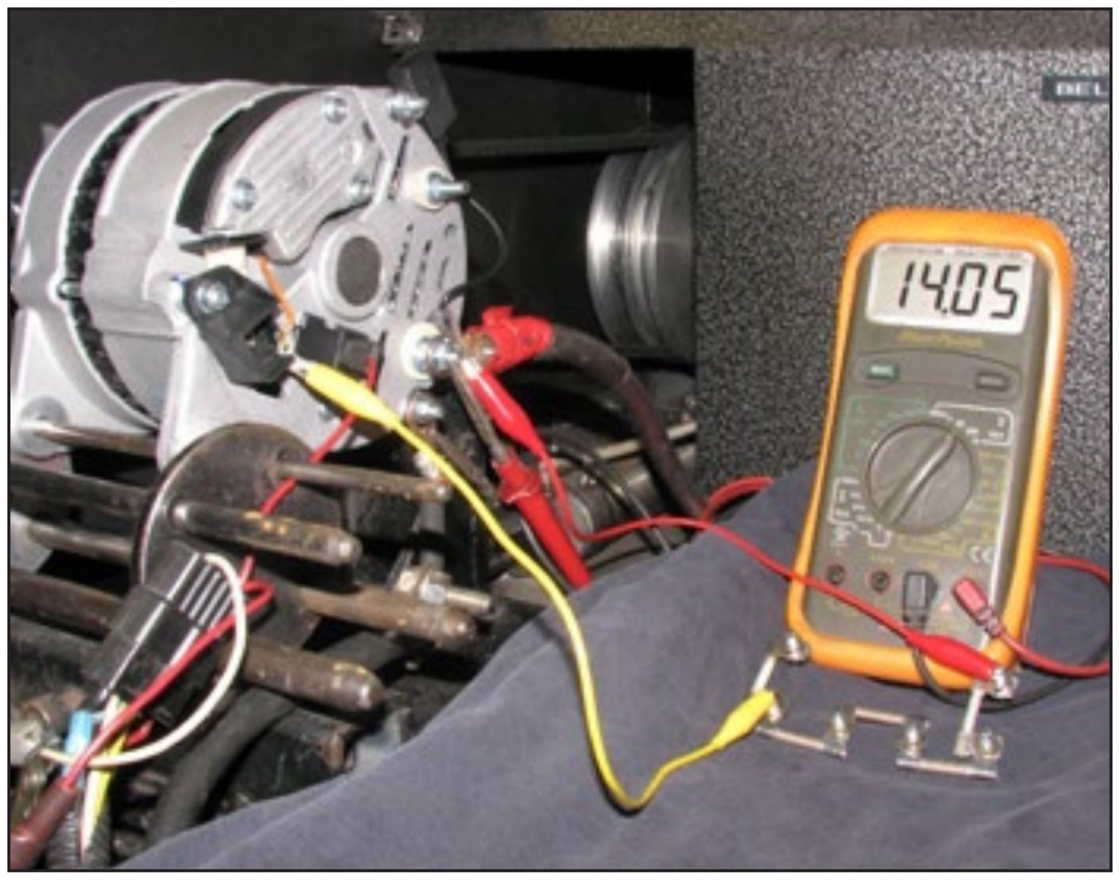


Figure 6—Voltage output is 14.0 volts using 164 ohms



Figure 7—Voltage output is 13.6 volts using 124 ohms.

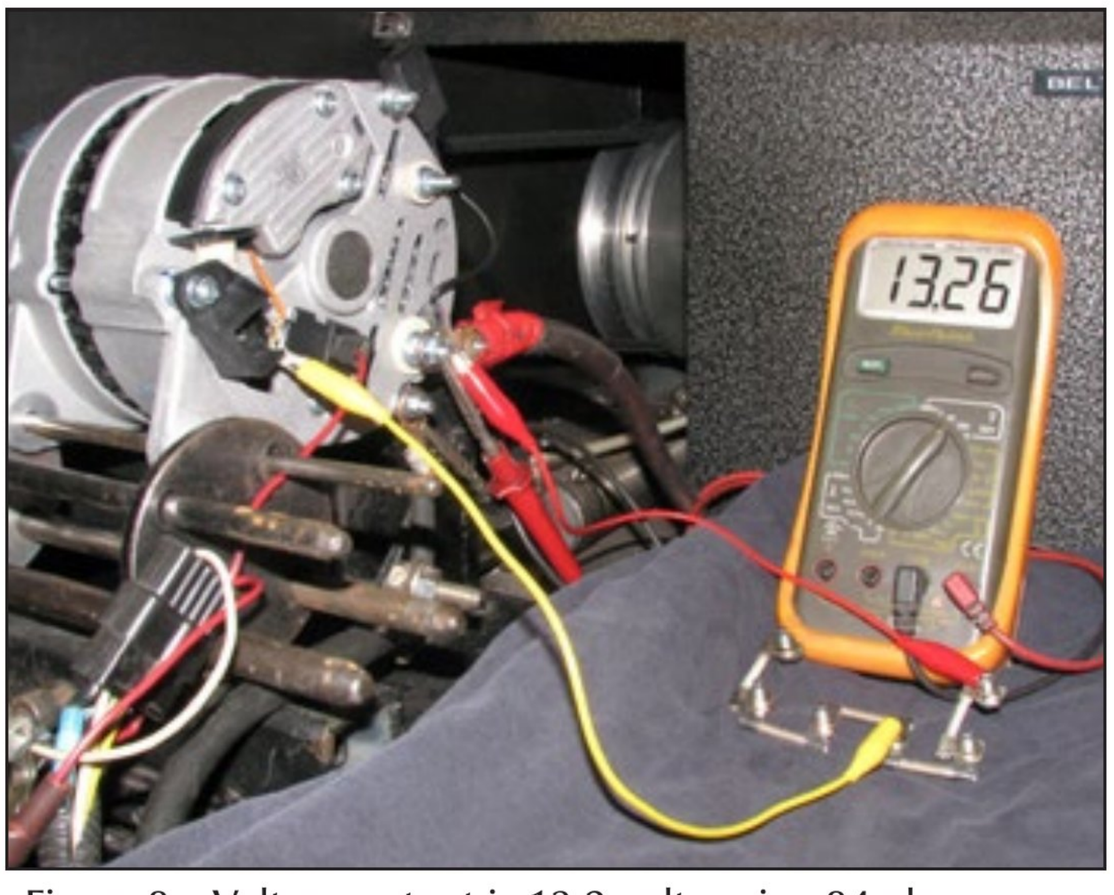


Figure 8—Voltage output is 13.2 volts using 84 ohms.

LUCAS A127 ALTERNATORS

We have been asked by rebuilders about replacing this regulator with an internal sense version when a customer is having problems getting one of these alternators to work properly on a tractor. When a tractor (or any vehicle for that matter) is new, customer expectations are high. But once the tractor gets 20 years on it, most owners just want it to be as reliable as possible. We would never swap regulators without taking the time to explain this system to the customer. Our view is that the customer should be made aware of the facts and be allowed to make the final decision. It is the customer who will have to live with it either way. But we do see this as a viable solution for both you and your customer when the condition of the thermistor is questionable, or it is known to be bad.

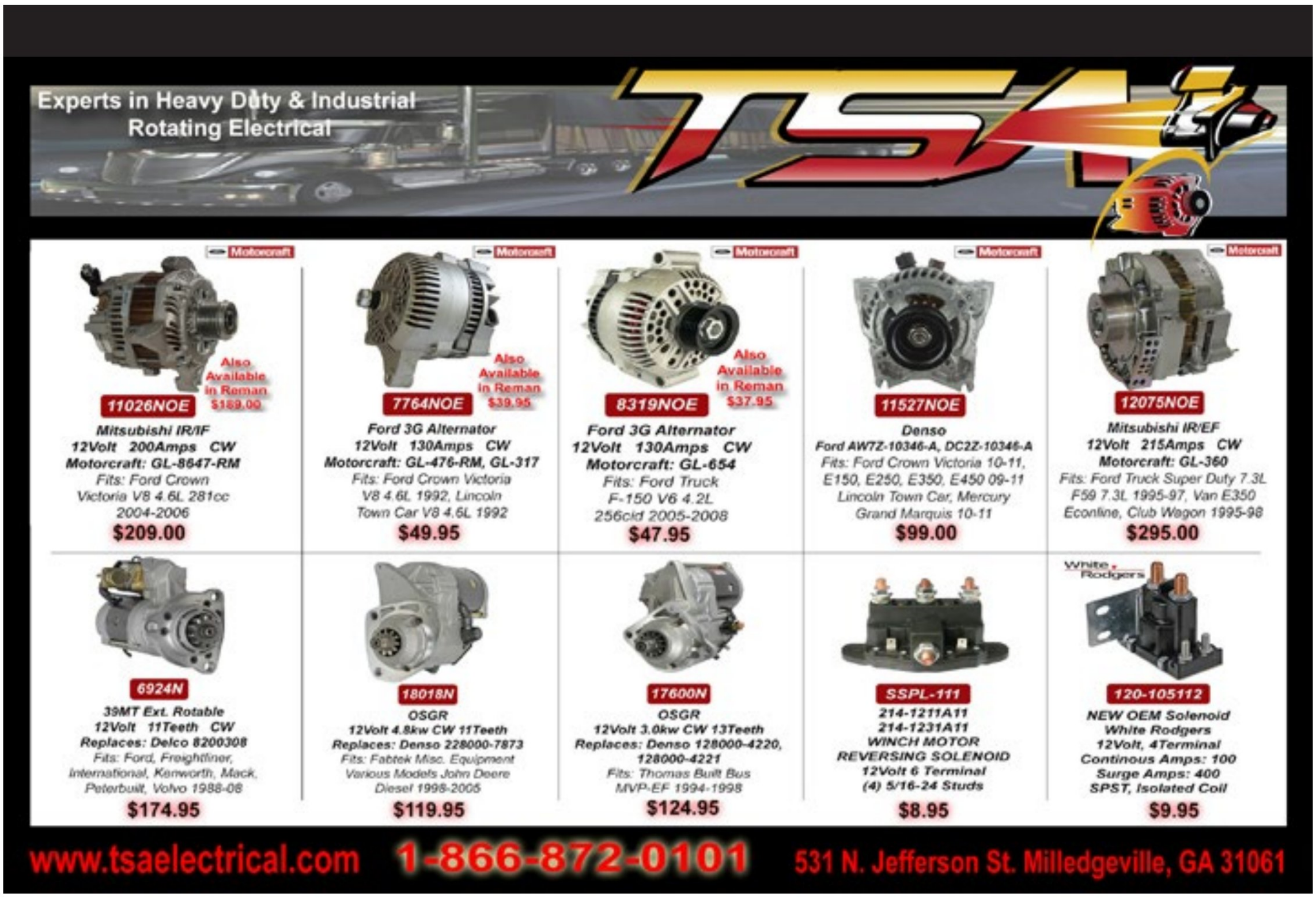
Changing this alternator over to the internally sensed regulator is as simple as bolting the new regulator in place of the old one. The internally sensed regulator does not have a sense wire. It senses voltage directly off the trio terminal. If you do this conversion, we suggest that you cut the sense terminal from the old regulator and leave it on the alternator. That way, your customer has something to hold the original sense wire, rather than cut it off or leave it dangling. Just remember to explain what you have done.

If your customer prefers to keep the system on his tractor original, you should stick with the thermistor regulator and not try to dissuade him. The purpose of this system is to prolong the battery life, especially under high-usage conditions. In those instances, it may be prudent to keep the charging system original.

The thermistor and sense wire can easily be tested on the tractor by reading voltage on the sense terminal at the alternator, both before starting the engine and with the engine running. Unplugged with the engine off, the thermistor wire should read close to battery voltage. Plugged in, you should still read voltage, but it will drop about two volts if the battery is cool and the thermistor is good. That is normal. If you happen to read no voltage either way, it means that the thermistor circuit is open. It could be a bad thermistor or a broken wire. Plugged in, with the engine running, you should read about two volts lower than battery voltage or close to the 12.5 volt set point of this regulator.

It is worth noting that Lucas produced ACR and A133 series alternators that used thermistors at the battery for the same purpose, going back to the early 1970s. But unlike the A127, those regulators all had a red B+ wire connected directly to the positive rectifier and an orange wire that connected to the thermistor sense terminal (*see Figure 9*).

Inside the regulator, the red wire provided sense voltage for the secondary regulation circuit. If the thermistor connection lost voltage because of a bad thermistor or a broken wire in the harness, that regulator would go into secondary regulation and charge at a set point based on the rectifier's output voltage—around 14.2 volts. The operator of the tractor had no way of knowing that the thermistor had failed, because the alternator hardly missed a beat. Those alternators seldom failed on



the machine because of a problem with the thermistor circuit.

As a side note to that, at least some of the aftermarket manufacturers simply made a replacement regulator for those early alternators with a dummy orange wire. This was done primarily to limit warranties for themselves and their customers due to problems outside the alternator. It reduced the cost to manufacture at the same time, which may be why Lucas abandoned the redundant circuit when they introduced the A127. If you happen to run into one of these, changing voltage on the dummy orange wire will not accomplish anything.

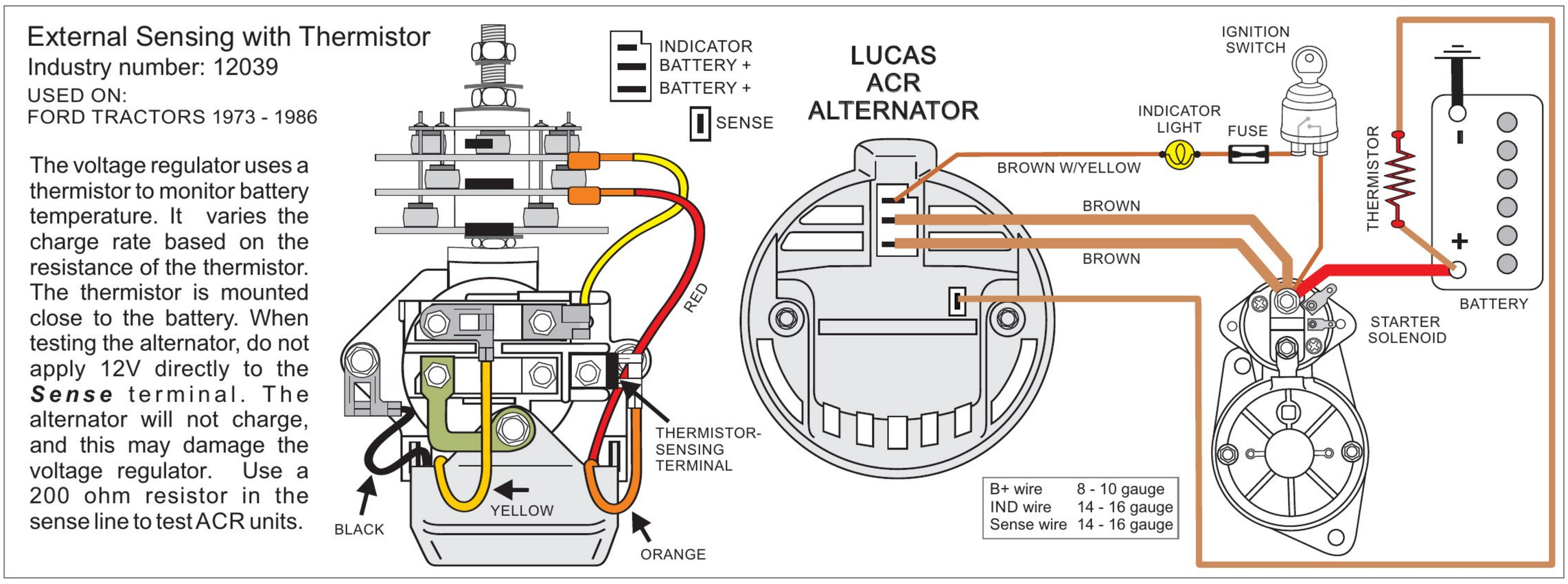


Figure 9—This diagram shows the Lucas ACR series alternator that was used before the A127 was introduced. Note that the ACR regulator had a red B+ sense wire and an orange wire connected to the thermistor at the battery. If the thermistor failed, this regulator went into secondary regulation to operate normally, sensed from the red B+ wire.

INFORMATION YOU NEED — AT YOUR FINGERTIPS!

Apptrak Online

CREATED BY A REBUILDER FOR REBUILDERS



- APPLICATION LOOK-UP
- UNIT CROSS REFERENCE
- PARTS BREAKDOWNS
- CLEAR UNIT PHOTOS & SPECS
- UNIT SUBSTITUTION INFORMATION
- UP TO DATE INDUSTRY PRICING
- KEEP YOUR OWN NOTES

$395/YEAR - INCLUDES 2 USERS PER BUSINESS
$249/YEAR - SPECIAL PRICE FOR ERA MEMBERS
Join the ERA Today and Save!

TRY BEFORE YOU BUY! 2-WEEK FREE TRIAL FOR REBUILDERS

Sign Up Today! 360-255-5990
dan.m.bell@whatcomelectric.com

HOW TO CHANGE THINGS
You gotta wanna!



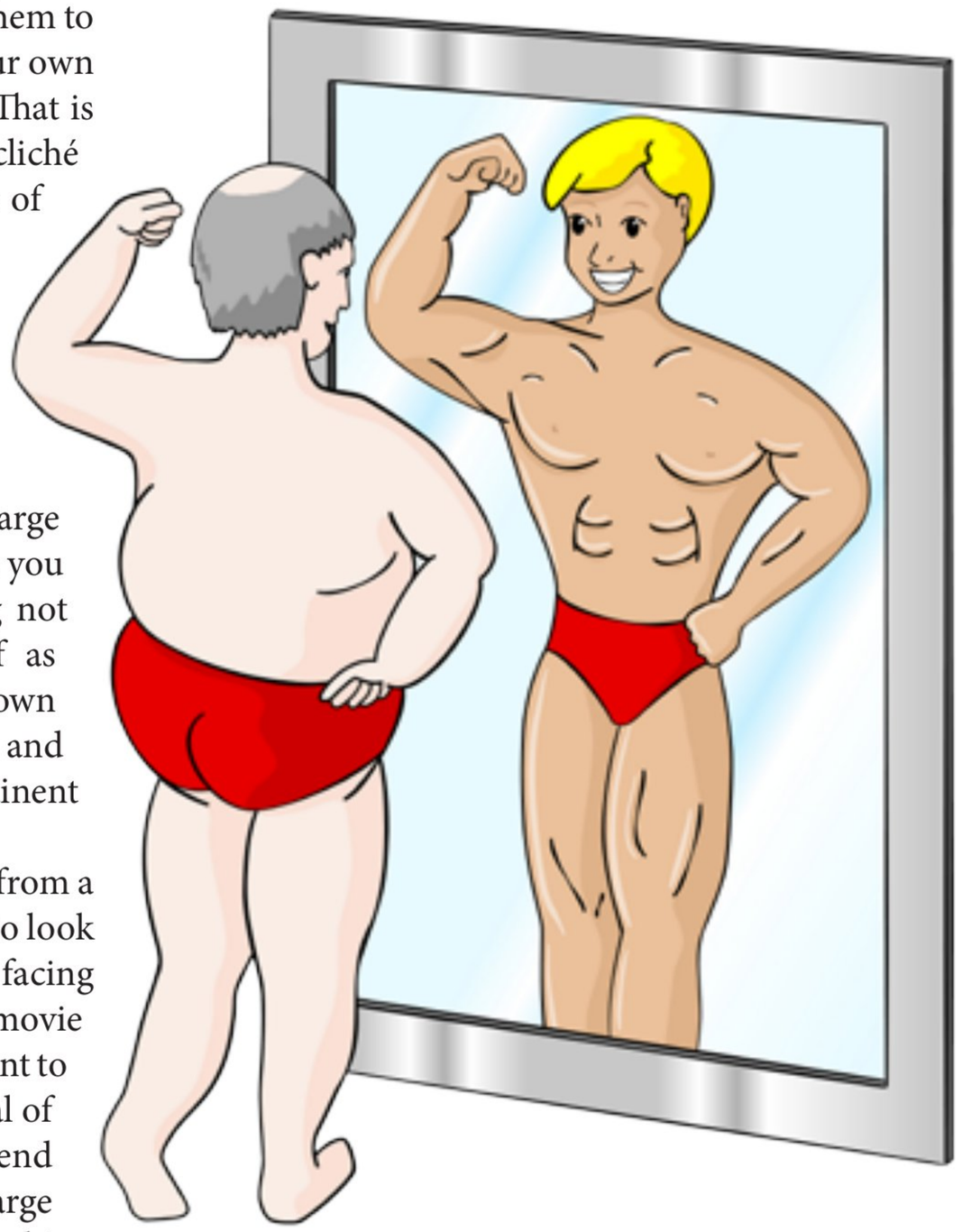
BY NICK STAUB

Clichés are clichés generally, because they are true. We all get tired of hearing them when we are growing up. Eventually, when you become a parent, you find yourself wielding them like weapons with your kids. "You can be whatever you want to be," I've said to my kids on a hundred different occasions: "Nothing in life is free", "Life is not fair", "It is not how you start, it is how you finish" and so many more. It can be so surreal when you consciously go from the memory of disregarding these sayings when your parents spouted them to you, to spouting them yourself to your own children, knowing them to be true. That is about the time you start using the cliché yourself, "Just wait till you have kids of your own."

Being a business owner is often very similar to being a parent. I know lots of people want to say that it's like babysitting, but that's really not what I mean. It really doesn't matter if you have a large organization or a small one, because you will need to be coaching. Coaching not only your employees, but yourself as well. The cliché that "We are our own worst enemies" is absolutely true, and that statement is never more pertinent than in business.

One of my favorite movie lines is from a movie called The Big Chill. (I refuse to look at the year it was made so as to avoid facing how old I'm getting.) Anyway, in the movie a bunch of mid-30-years-olds that went to college together reunite at the funeral of one of the group's members. They spend the weekend at another member's large house. The movie is a fun drama, and in one scene they are all gathered around the living room talking. One guy is a writer for People magazine and is being razzed by the others. The razzing is centered on the fact that his writing is all fluff and has no substance. Jeff Goldblum is the writer, and he says something along the lines of how people are entertained by him, and that makes his job quite noble and honorable. One of his friends says,"Oh that's just a rationalization!" to which Goldblum spouts my favorite line. "I don't know anyone who could get through the day without two or three juicy rationalizations. They're more important than sex."

I love that statement, because despite it being used for comedy in the movie, it's spectacularly true! Our worlds are built largely on a foundation of rationalizations. It truly is part and parcel of the human condition. We all have egos and mirrors, and therefore, we often tell ourselves whatever we have to so that the person we see in the mirror is acceptable. It is part of our entire life, especially our work where we spend so



many hours every day. We rarely achieve what we want and all too often rationalize our results to absolve ourselves of feeling poorly about our effort. There are infinite rationalizations at our disposal. However, one thing is consistent throughout them all. That is that we are excusing ourselves from not achieving what we set out to achieve. We say that there were mitigating circumstances outside of our control that caused our trains to derail prior to their destination.

A friend shared a statement that he got from a former employer. The guy who said it is also a customer. He said very simply, "***If you want to, you will. If you don't, you won't.***" Despite the fact that I truly despised the man who said it, I've used it countless times and believe it to be true. His statement is abbreviated to some degree, and when I use it, I also give the longer version of it which is, "If you want something—really want it—you'll do everything in your power to get it. If you want something but are not willing to do everything within your power to get it, you will not do it."

I've used this with my kids many times. I'm sure they hate it by now, but I would bet my bottom dollar that they will use it with their kids. I believe this principle to be true. Here are some examples.

If you want to reach out to old customers to find out why they have stopped buying, you will do so. If you think about it, but always rationalize not doing it because you're too busy, then I'd argue that you didn't want to, at least not badly enough. If you want your business to have an Internet presence—really want it—you'll make it happen … or you won't. If you want a clean shop that is more presentable to your walk-in customers, you will do it. If you don't want it badly enough, you won't do it. It's really the same throughout our entire life. Whether it's quitting smoking, losing weight, having a nice yard, whatever. These things happen largely because we do or do not have the will to have them.

I've certainly not mastered this principle by any means. However, I'm acutely aware of it and try my best (despite my genetic predisposition) to not rationalize the things that I don't do and rather accept that I haven't wanted them badly enough to do the things necessary to have them. In the end, **you gotta wanna!**

Nick Staub is the owner of Romaine Electric, Seattle, Washington.

ERA

ERA IDENTIFICATION AND WARNING LABELS

The ERA has made it easy for its members to identify their rebuilt products as required by law. All labels are printed in bright color on a heavy heat-resistant stock with high-bond adhesive backing. They are laminated with a clear layer that is resistant to oil, gas and water.

These labels will give your products a professional look that will set them apart from the competition. They are made to last.

All labels are affordably priced and can be ordered right off of the ERA website by clicking on "Labels" from the homepage's left side menu (**www.electricalrebuilders.com**). You can also order by phone by calling the ERA office at: **636-584-7400**. Order yours today. All prices include free shipping.



1-inch round ERA Member label. Identifies your part as rebuilt

Sold in sheets of 81

$15.00 1 sheet
$12.35 3 sheets
$ 9.00 6 sheets

The Brillman Company

We are your Premier Manufacturer of Cotton Braid Wire, Wiring Supplies, Wire Harnesses, Battery Cables, Spark Plug Wires & Wire Sets!

Family Owned for 30 Years!



List $9.00 ERA $7.20



List $7.00 ERA $5.60



List $7.00 ERA $5.60



List $7.00 ERA $5.60



List $7.00 ERA $5.60



List $7.00 ERA $5.60

Tags can be stamped add $7.25.
All Tags come with Rivets.

Phone 888-274-5562 ~ Fax 540-477-2980
2328 Pepper Road Mt. Jackson, VA 22824
www.Brillman.com ~ info@brillman.com



Warn your customers about water damage on marine units.

1.5 x 3.0 inches
Sold in sheets of 18

$6.50 1 sheet
$5.20 3 sheets
$4.20 6 sheets



Warn customers about the hazard of by-passing start systems.

1.5 x 3.0 inches
Sold in sheets of 18

$6.00 1 sheet
$4.70 3 sheets
$3.70 6 sheets



Warn customers to avoid damage to permanent magnet starters and motors.

1.5 x 3.0 inches
Sold in sheets of 18

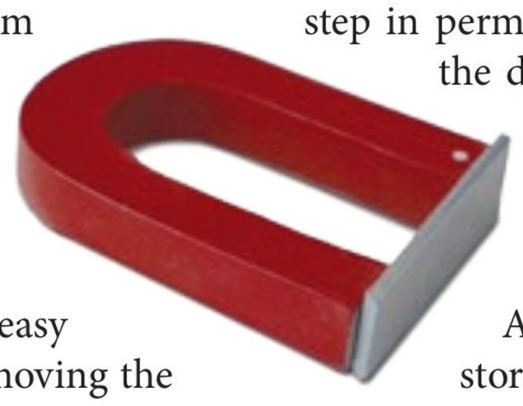
$6.00 1 sheet
$4.70 3 sheets
$3.70 6 sheets

ALL ABOUT MAGNETS
Permanent magnets in starters & DC motors



BY BOB THOMAS

Often taken for granted unless they are broken, permanent magnets have played an important part in the development of the compact and powerful starter motors seen today. Aside from being damaged by the shock of a hammer blow, field magnets have proven to be quite durable and long lasting. However, that has not always been the case, because the permanence of some magnets can be compromised under certain circumstances.



While it's simple to identify polarity, it's not so easy to measure the actual magnetic strength without removing the magnets from their field case or having access to some expensive scientific instruments. To make it even more difficult for rebuilders, there are a variety of different types of magnets that have been used in DC motors, and it is not always easy to identify them.

Permanent magnets have been around for thousands years in the form of iron ore that has been naturally affected by the earth's magnetic field. Magnetite, once called lodestone, was used by Chinese fortune tellers who discovered that it would swing to point in a predictable direction when suspended by a string. Sometime later, lodestone was used to make the first compass. Today, man-made permanent magnets, much stronger than natural magnetite, are being used in place of motor field coils in nearly all applications. Their use allows for a more compact design that produces more power from less current.

Permanent magnet DC motors were first introduced in the late 19th century, but they failed to gain widespread use because of the weak strength of the magnets available at that time. The first big step in permanent magnet technology came in the 1930s with the development of Alnico magnets. By adding small amounts of **al**uminum, **ni**ckel, **co**balt and **co**pper to the iron, the magnetic properties were greatly enhanced. Alnico can retain up to 17 times the magnetic force of magnetite. The downside of Alnico is its low resistance to demagnetization. If not stored or handled properly, Alnico magnets can lose most of their magnetic strength very quickly. The once-popular Alnico horseshoe magnet (that was sold at hardware stores up until the 1970s) came with a steel "keeper" bar to bridge the poles when it was stored. Without the keeper, its magnetic strength deteriorated.

If you find yourself working on an older permanent magnet motor, it would be wise to assume that it could have Alnico magnets. When you remove the armature, you must bridge those magnets with something. A similar-sized armature is an easy substitute that will act as a keeper. Failing to do this will cause the opposing unbridged magnets to demagnetize one another over a period of time that could be days or hours. Any time spent unbridged will cause some loss if you are working with Alnico magnets.

The first commercial ceramic magnets based on barium or

www.regitar.com

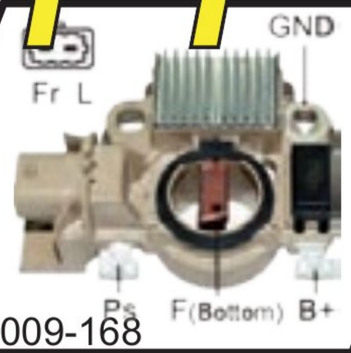
MORE GROUP

REGITAR USA

AUTOMOTIVE ELECTRONICS / POWER TOOLS

Contact us for all your Mitsubishi voltage regulators and rectifiers. Here are some new products available. Visit our website for more information.

mitsubishi



VRH2009-168
Alt No. A3TG1491



RM-203
Alt No. 04801490AA, A2TX0281



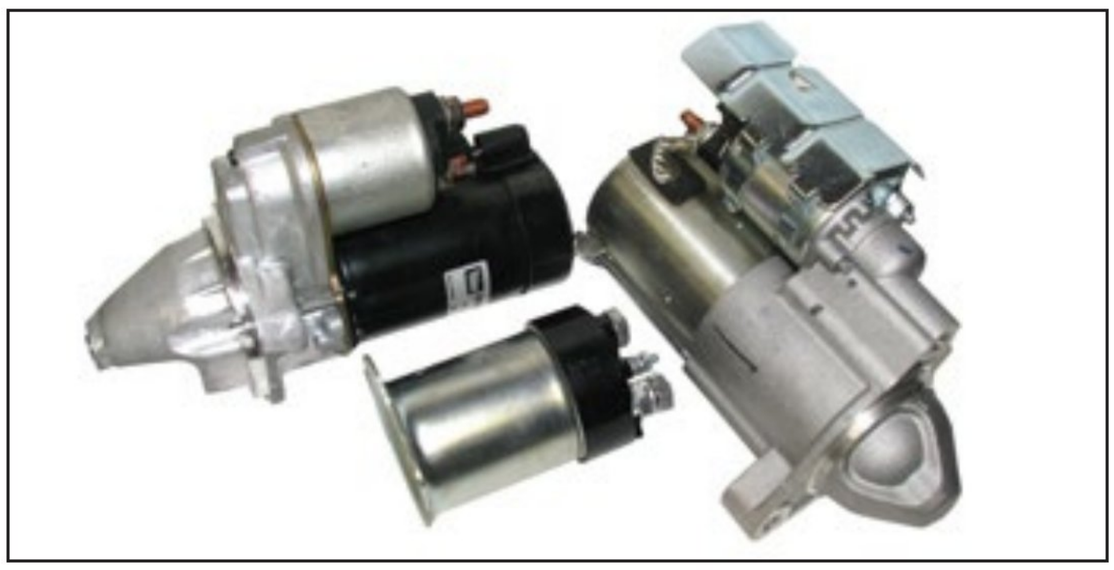
VRH2009-175
Alt No. ME192608



RM-205
Alt No. A3TR0188ZT

2575 Container Drive
Montgomery, AL 36109
Tel: 334.244.1885
Toll Free: 1.877.REGITAR
Fax: 334.244.1901
info@regitar.com

Authorized Distributors:
Arrowhead Electrical Products, MN
Elpar Industries Inc., FL
J & N Auto Electric Inc., OH
R & R Regulators, IN
Wagner Alternators and Supplies, CA
Dayer, Inc., Canada



Modern permanent magnets combined with gear reduction technology result in some amazingly small, yet powerful starter motors. An old-style 10MT Delco solenoid is shown as a size reference.

strontium mixed with lead-iron oxides were developed in 1952 by the Phillips Company. They are made from finely powdered barium ferrite or strontium ferrite that is formed under heat and pressure. Their magnetic strength is enhanced by aligning the individual particles with a strong magnetic field during the forming and curing process. Once cured, ceramic magnets resist demagnetization. Their strength is comparable to Alnico in terms of magnetic force, but they are much more permanent. They also have the advantage of being able to be formed into many different shapes. They are low in cost to manufacture, and because of the composition, they resist corrosion. The only real drawback of ceramic magnets is that they are very brittle and can be easily cracked or broken. Today, rubber-based binders are used in place of ceramics to make magnets that are not only unbreakable but flexible. If you have ever used magnetic business cards, they were probably barium or strontium lead oxide magnets.

In the 1970s, the first of what became known as rare-earth magnets were developed. The name comes from the use of rare elements in the alloy, the first of which was samarium. Researchers developed permanent magnets made from powdered samarium and cobalt fused under heat. These magnets took advantage of the way the atoms bonded (called magnetic domains) into hexagonal crystals that align magnetically on their own. This discovery changed everything. Once made, samarium-cobalt magnets are 50 times stronger than magnetite and are highly resistant to demagnetization.

Then in the 1980s, a company named Magnequench, then a subsidiary of General Motors, developed a magnet using neodymium and boron, which produced magnetic forces nearly 75 times stronger than magnetite. These magnets were used in Delco's first permanent magnet planetary gear starters. Because they are also far less expensive to manufacture than samarium-cobalt magnets, neodymium-boron magnets are now being used in a wide variety of motor applications from small power tools to large traction motors. The majority of starters being manufactured today are using neodymium-boron magnets. Their only real drawback is a low resistance to corrosion. That is usually overcome by coating or covering them to prevent contact with air and moisture.

Using magnets to replace conventional field coils saves a significant amount of energy. This is because amperage is no longer required to power the field, where most of the power is consumed once operating speed is reached. This allows today's starters to produce more torque with less amperage. That equates to fewer cranking amps from the vehicle's battery and allows for the use of smaller battery cables as well. It also means that starters take up less space in the crowded engine compartment of today's cars, trucks and equipment.

Small permanent magnet motors are being used in place of wound field coil motors in virtually all applications because of their power to size ratio They have replaced actuators on vehicles that once used cables or solenoids to do everything from controlling air flow to opening and closing the throttle. Outside the automotive world, permanent magnet DC motors are being used in many applications from conveyor systems to hospital beds. Many of these specialized motors are very expensive new, costing into the thousands of dollars. You may have to look a little harder to find the parts, but they are available. You already have the tools you need to rebuild them. This is an opportunity that many rebuilding shops fail to take advantage of.

As you are aware, the major drawback of permanent magnets is that they are brittle and can be broken quite easily. When this happens, it is usually because the starter or motor has been dropped, or a customer has beat on it with a hard object—like a hammer. The ERA offers its members reasonably priced durable warning labels that can help you to prevent that problem. Look on page 11 for information on how you can order them.

E R A

HOOSIER ELECTRIC CO.

We will rewind your
Import rotors and stators -
EVEN BOSCH ROTORS

We are one of the few remaining
DOMESTIC SOURCES
for rewound products.

- Special windings
- High amp upgrades
- Heavy duty
- Agricultural
- Military
- Off road
- Marine

High-Amp upgrades available on most foreign and domestic stators and rotors

To Order or For More Information Call:
Toll Free 1-800-543-5292
Local (219) 844-8389
Fax (219) 845-0238
7041 W. 21st Avenue • Gary, IN 46406

Hi Torque IMI Performance Products, Inc.®



HiTorque.com

2015 Catalog

MEMBER OF ERA Electrical Rebuilder's Association

MADE IN USA

Toll Free 888-244-8675

NEED HELP?
It's just a phone call away

1-636-584-TECH (8324)



Did you know that as an ERA member you have access to a Technical Help Line?

ERA members always have someone to call when they run into a problem rebuilding an alternator, starter or generator. Questions about charging and starting circuits for specific automotive and light truck applications can be answered, too.

Call the number above to reach ERA Exchange Editor, Bob Thomas. If he cannot answer your question himself, he will refer you to another ERA member who can, or he will search for the answer. If you happen to get the answering machine, please leave a short message, and Bob will call you back as soon as he can.

This help line is free to all ERA members. Supplier members are invited to refer their customer's technical questions to the ERA Tech Help Line, too.

Technical help is just a phone call away for ERA members.

E R A

START HERE
Romaine Electric
EXPERTS IN ROTATING ELECTRICAL SINCE 1921

A ROMAINE EXCLUSIVE!
18940UT
Nippondenso OSGR Conversion
12 VOLT, 10 TOOTH, CW 2.2KW



REPLACES 63280041, MSN8011, 71440231, 714405310, 2873K405, 2873K624

- Designed and Developed by ROMAINE ELECTRIC
- Built on the 2.2KW Nippondenso platform
- Fixed position D.E. Housing
- Replaces the 18940 Marelli unit nicely
- Designed with C.E. ground studs for system grounds
- Used on JCB and Perkins engines

CALL YOUR LOCAL WAREHOUSE!
www.romaineelectric.com

1-800-426-5005
TOMORROW'S VISION ... TODAY

REBUILDER'S MARKETPLACE

WANT TO BUY

CORES, SCRAP AND SHOP-ASSETS: All types of starter, alternator, generator and internal component cores. Also used equipment and new/rewound/rebuilt parts and units. Top dollar. References. 30 years industry experience. Operations in Wisc. and Ind. with focus in Midwest, but can work in other regions. Dane Recycling and Core, LLC. Call Dave 608-630-6132.

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

LEECE-NEVILLE 24-VOLT (40MT size) starter cores. Paying $35.00 each. FOB Miami. Contact Howard at 305-633-1524 or e-mail: hy@cmearma.com

PARTS, SUPPLIES, EQUIPMENT FOR SALE

CRUMBLISS STARTER TESTING EQUIPMENT for sale. Models 2482 & 2495 testers, & 2487 power converter. Less than 10 hours each. Call 360-734-7723 or email james@whatcomelectric.com

VINTAGE STARTER AND GENERATOR FIELD COILS. ACE, Autolite, IPM, Preferred Electric and Vulcan part numbers. Listed in Excel spread sheet to send via e-mail. Call 860-528-8174 or e-mail ken@guyselectric.com

REBUILT OE UNITS ready to install. Mitsubishi 215A alternator (A8TU0091): 200A 31SI alternator (19011105): 24V Iskra starter (11130977). Call Mike at 850-623-5111 CST.

SERVICES

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

DAN MARINUCCI TECHNICAL TRAINING: Are you tired of tech seminars that drone on like a tired starter motor, or theory for theory's sake? Call Dan! His classes are concise and full of practical, take-it-to-the-bank info. Dan makes learning fun. Topics include starting/charging systems, evap emissions and Honda/Nissan/Toyota drivability. Go to danmarinucci.com or call 330-869-5472

AD RATES

Base rate of $25.00 for up to 25 words. Each additional word is 75 cents/word. Please note, a word includes abbreviations, acronyms, street addresses, articles (a, the), e-mail addresses and phone numbers. **ERA members receive the first 25 words free.** Email ad to office@electricalrebuilders.com or call 636-584-7400

ERA Members can place up to 25 words here for free. Just submit your ad the first week of the month prior to the month in which you want to advertise. It is an ERA benefit!

ANYTHING ODDBALL GIVE US A CALL!

C.C. BATTERY CO.

QUALITY AND SERVICE SINCE 1923

YOUR RESOURCE FOR REWOUND & NEW

ARMATURES • ROTORS • STATORS
DE HOUSINGS • COMPLETE UNITS

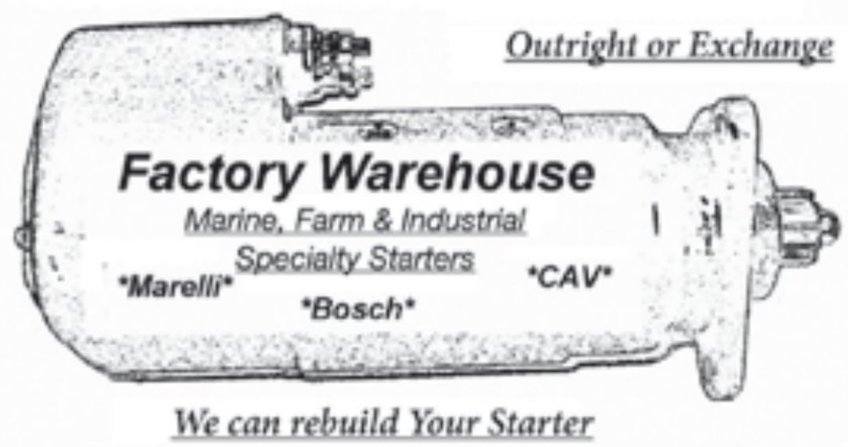
YOUR WAREHOUSE FOR

LOADHANDLER • NIEHOFF • POWERBRIGHT
COLE-HERSEE • UT • JIMCO • C-TEK • DIXIE
LEECE-NEVILLE • PRESTOLITE • LETRIKA
QUICKCABLE • LUCAS CAV • BUSSMANN
KEI • MITSUBISHI • POWERLINE • NIKKO

DRIVES COMPONENTS — R&R — SOLENOIDS CONVERSIONS

800-531-1038 • FAX 361-882-9163 • 361-882-5561
e-mail: ccbattery@aol.com • www.ccbattery.com
3513 AGNES ST. • CORPUS CHRISTI, TX 78405

New or Remanufactured — *Outright or Exchange*



Factory Warehouse
Marine, Farm & Industrial
Specialty Starters
"Marelli" "Bosch" "CAV"

We can rebuild Your Starter

Phone: 360-636-5950 Fax: 360-423-1298
E-mail: csco@comcast.net

Luna — **Luna Industries, Inc.**

There is $$$ in low voltage DC motor repair.

We sell complete rebuilt motors & motor parts for electric golf cars, forklifts, & industrial vehicles. Call or email for prices.

520.792.3080

sales@LunaIndustriesInc.com
www.lunaindustriesinc.com

VENSEL ENTERPRISES

USED EQUIPMENT!

- Test Equipment
- Presses and Press Tooling
- Welding & Soldering Equipment/Supplies
- Winding and Rewinding Equipment
- Cleaning Machines and Accessories
- Lathes and Lathe Tooling
- Undercutting Equipment
- Sanders & Polishers
- Wire Brushing Machines

1-800-662-6099

www.venselenterprises.com sandy@venselenterprises.com

ERA EXCHANGE
PO Box 906
Union, MO 63084
CHANGE SERVICE REQUESTED



The ERA ... We've Got It All Online For You!

Books • Forums • JIMCO Manuals • Wiring Diagrams
DVDs • Technical Library • Training Videos • Supplier Sources
Equipment Manuals • Forms • ERA Exchange

WE'RE HERE FOR YOU 24/7
www.electricalrebuilders.org

MAY ONLY

ORDER 7-1/2 OR 10 HP BENCH TOP TESTER



GET

* FREE upgrade to PREMIUM test lead set

OR

* FREE air tension vise mounting

*You deserve to test with the **best**-----**JIMCO***

JIMCO

800-821-7137
fax 816-331-1971

e-mail JIMCOINC@AOL.COM
web WWW.JIMCOTEST.COM