★ SHOW ISSUE ★

ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

April 2016 $12.95

BOSCH KB 416 & 417 SERIES
Heavy Duty Starter Explained

TECH TIP: DELCO REMY 44G
Battery Post Spacer Fix

2017 ERA SHOW ANNOUNCEMENT!

2016 ERA SHOW PHOTOS!

PLAIN TALK | WE NEED A HAPPY HOUR

Electrical Rebuilder's ERA Association — Founded 2001

A WORD FROM THE PRESIDENT
Value Your Resources



This month I would like to reach out to our membership and talk about the benefits of being an ERA member. To be successful in business, you have to be informed on what is going on in your industry. You have to know what works and what does not.

The way that I operate my business developed over many years and will continue to change in the years to come. The ideas and procedures that I practice in business today were not thought up by me, but obtained by way of a lot of outside information resources. As a business owner it is my job to evaluate what works and implement it into day to day operations.

The ERA is one of my most valuable resources for obtaining ideas, education, problem solving, industry news, product sources and peer networking. The great thing about being a member is when I look at the money I save on website subscription discounts and buying group discounts, it more than pays for my yearly dues. This is real money that I would be spending even if I was not a member. All the other benefits I have access to as an ERA member are basically free.

I get a monthly magazine filled with technical articles, opinion articles and supplier product information. I have access to an industry expert for technical help via the ERA's Tech Help Line. Our website has sent business to me via the Find-a-Rebuilder feature. I have in house technical training for myself and my employees via the Technical and Video Libraries on the website. I have sold product and surplus equipment via the Wanted and For Sale section on the ERA Forums. If I need an opinion or answer to a business or technical question, I can always count on help from my industry peers via the Forums.

There are too many benefits to mention them all here now, but I wanted to bring up a few to remind our membership of the many resources that are available to them. I would encourage you to every now and then go to our website home page and watch the ERA Video Tour. It is a great refresher course on how to navigate and take advantage of the resources that are available to you as a member online, day or night, seven days a week. Browse through the menu bars on the left to access a vast amount of information, tools and products that are available to you. I know of no other single source of information that is available, specific to our industry and your business. When I do the math, it is basically free. Get used to using it!

Mike Dietrich

NEW ERA MEMBERS

Woody's
Labadieville, Louisiana

Vee-Co Generator & Starter
Memphis, Tennessee

Al's Auto Electric
Tunnelton, West Virginia

Ohio Generator
Louisville, Ohio

PLP Battery Supply
Murphysboro, Illinois

HCH Bearing Americas
Jacksonville, Florida

Kayes Auto Parts
Blue Ridge, Georgia

ABOUT THE COVER

The stepped catch on a Bosch KB control relay inhibits contact closure until the pinion is fully engaged in the ring gear.

The May issue will include ERA business news from the Annual meeting, including bylaw amendments, new honor roll members, and an updated list of the Board of Directors and Advisory Board members.

ERA EXCHANGE

Volume 33 Number 8

April 2016

Published monthly by the
Electrical Rebuilder's Association
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Union, MO 63084
Phone 636-584-7400
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Rebuilding *is* Recycling!

PLAIN TALK — We Need A Happy Hour



BY ROB BUKSAR

Back in the day when the offshore parts entered our market, it spread like a raging epidemic. Even though we all saw this occur to other industries, I know many of us thought we had some sort of special immunity. It just couldn't happen to us.

Parts rebuilders were the first to be fed the sulfur. Armatures, rotors, stators, solenoids and starter drives were being marketed as new parts and being sold at rebuilt prices. I still have many of those initial catalogs with that headline plastered all over the cover page, "New at Rebuilt Prices!"

It didn't take long for electrical rebuilders to quit supporting their parts rebuilders. I really can't blame anyone - it made economic sense. From a rewinders' point of view, we understood what was happening. It was similar to going to the doctor for a wellness check and being told that you have a terminal disease with a year to live. Like a disease, proliferation of cheap offshore parts attacked in stages.

Stage One is when the orders really started slowing down. Even long time established customers cut way back. When you called them wondering where the orders were, they usually gave you a "cock and bull story". Yet, we all knew the orders and money were going elsewhere.

Stage Two began when the cores stopped coming in. Most rebuilders were excited about getting cores shipped in and establishing some sort of core bank. Now, those of us who were trying to build parts couldn't find enough cores to rebuild. We couldn't supplement with new because regardless of how many we purchased, the price we paid was the same price available to everyone. In other words, the dollar volume had no bearing on the price structure.

Stage Three is when your former regular customers were willing to sell you their cores rather than sell them to the junkman. I can't tell you how many times I've been told, "I'd rather sell them to you to rebuild than let the Chinese get them and just melt them down." I used to think to myself, why buy the cores? The rebuilder that I'm buying them from will not buy back any of the rewinds. He will continue to buy cheaper offshore and look for someone to sell his scrap to, either me or the junkman. The most insulting angle was this; "I'll sell you my cores and you give me a credit against merchandise that I'll order but never send you any money!" That was my favorite since the customers who proposed this, and there were many, thought they were doing someone a favor!

Stage Four is finally recognizing that everything that you had done in the past and maybe your father's efforts would no longer work. All the positive mental attitude, hard work and loyalty to the cause were not going to save you. Truth of the matter is simply this. The epidemic had plenty of warning signs and most, if not all, paid no attention to them. It's too late to look for a cure if the body has become so weak and beat up that it won't respond to medication. "Game, set, match. Lights out!"

As a footnote to the above, this is worth mentioning. When a big rewinder closed, I was always asked how much of their former business was I able to capture. My answer was always the same. Hardly any! You see, they didn't close because their customers were dissatisfied or mad. The market changed drastically and they were cut right out of it. *Their former customers were having their needs satisfied in some other fashion.* If you remember nothing else about this article, make note of the last statement, it's a biggie!

This article is not about bitter grapes or assigning blame. All that's occurred in this country has happened by design and way out of the control of the average guy or small businessman. One of the great things about America was you didn't need a Harvard business degree to make it or a ton of money to get going in your own business. Passion, dedication and sweat equity would do it. Now, it takes a lot more education and information to increase your odds of success or survival.

So, here's what all of this bloviating is about. Many of you don't realize that the same things that I talked about earlier are now happening to you. Sure, there are some variations but in principle, it's still the same. Am I suggesting that the remaining rebuilders are in the dark? Of course not! Most to one degree or another know what's happening out there. However, the sixty-four dollar question is, "What are you doing in your own business to be pro-active?" Please don't tell me you're waiting for the phone to ring and the weather to change.

We are in an economic slump again. All reports suggest business is slow or soft at the very least. If you are one who is just waiting for the phone and weather, let me tip you to something you may not be aware of. While you're waiting for something to start happening again, the guys who are pro-active are out after your accounts, big and small alike, they are after your little piece of the pie. Why? Because it's a feeding frenzy and there's only a little meat left on the bone and you're fair game.

I've spoken about this many times. The gloves are off. There are no rules or regulations, line of distribution or respected marketing zones are almost not existent so whoever consistently makes the sale in anyone's market wins; period. So, here's what I suggest and you need to take this in principle. We all need a *"Happy Hour"* or some variation of it. Taverns and grills are typically slow between 3-6 so they offer drinks or food at dramatically discounted prices to get people in and spend some cash. Airlines will darn near giveaway those 6 empty middle seats to fill the plane. It's better to get something rather than leave them empty and get nothing. Trucking companies going to and from to their freight hubs will discount the daylights out of freight rates to fill the truck. Why not? They have to go anyway so they might as well pickup a few extra bucks. I could go on and on but I think you got the drift.

I am not suggesting you discount your main stay. Most of us don't get enough for our main stay to begin with. In some markets, in our own way, something has to be promoted to get our phones ringing and customers coming in. Waiting for business to pick up is not the answer. Keep this in mind; just because it's slow does not mean nothing is happening out there. The competition, from all levels, is gnawing at your business and because it's slow, your customers have time to talk to them. Think about it!

Maybe *"Happy Hour"* of some sort isn't as crazy as it sounds! May God bless our little industry!

Rob can be found at IWI 800-323-7521

BOSCH KB 416 & 417 SERIES Heavy Duty Starter Explained



BY BOB THOMAS

The Bosch KB 416 and 417 series heavy duty starters, nicknamed the "Bosch Humpback" by some (*see Figure 1*), have a unique form of soft engagement that can cause problems for those who may not fully understand how it works. Bosch designed and manufactured these direct drive starters to crank large diesel engines up to 10 liters or more.

The major difference between the two series numbers is that 416 starters are case grounded while 417 starters are isolated ground – which makes their internal wiring a little more complicated. While most part numbers are 24 volt units, you may encounter a 12 volt version. The starter used for our photos is a 0001417037. It is isolated ground, 24 volts, CW rotation and rated at 6.6kW.

The KB's applications range from medium to large diesel engines of European origin including Mercedes-Benz, KHD, Deutz, MAN and Volvo. For that reason, they are not very common in North America – found here primarily on specialized farm or industrial equipment, marine engines or large transit vehicles. But given the world-wide marketplace we live in today, any rebuilding shop could see one of these starters. When you encounter one for the first time, it can look pretty intimidating once the two screws holding the rear cover are removed (*see Figure 2*).

Two well produced videos on the ERA website demonstrate the proper dis-assembly and reassembly procedures for these starters. If you find yourself rebuilding one for the first time, you should watch both videos, filmed by Henry Henke at United Starter and Alternator. The KB design is compact and anything but conventional, so be prepared to take notes as you watch them. Common wear and problem areas are pointed out in detail. Each video contains many useful tips that will save you time, not to mention frustration and heartbreak – especially on reassembly.



Figure 1 – Bosch KB starters are unconventional in design. They may be found on large diesel engines of European origin.



BOSCH KB 416 & 417 SERIES

Once you understand how these starters were intended to operate, they are much easier rebuild. The secret to making them function properly is in the soft engagement mechanism that depends upon five key parts – the shunt coils, a motor solenoid, a control relay, a sliding shaft inside the armature and a friction drive clutch. The relay and solenoid are mounted on the commutator end of the starter under the cover. The pinion and clutch are pushed out the drive end by way of a spring loaded armature shaft that runs trough the center of the armature. This unique setup allows for a compact yet powerful cranking motor.

The primary field coils are four pole, series-parallel, similar to the configuration that Delco used in most of their 10MT starters (*see Figure 3*). But within them and out view are four fine-wire shunt coils that are connected in series. Their leads are the small wires in the photo. The shunt coils provide slow rotation during engagement when they are connected is series with the armature and serve to limit the speed of the motor throughout the crank cycle when they are connected in parallel with the armature. The shunt coil circuit is switched by the motor solenoid.

The motor solenoid operates a plunger that pushes the armature shaft (*see Figure 4*) that in turn pushes the drive clutch and pinion into the engaged position. As in nearly all conventional starter solenoids, it has a low resistance "pull-in" coil and a high resistance "hold" coil. But unlike conventional solenoids, it does not close the motor contacts – although, in a way, it does control that function. The motor solenoid does move the double contact switch (*see Figure 5*) that changes the ground path of the shunt field coils - initially to a positive brush making a series motor and then to a ground brush to make it a parallel or shunt motor.

The control relay functions with a single coil and it switches the motor contacts – but not without permission. The motor contacts cannot close until the drive is fully engaged in the ring gear. There is a second smaller set of contacts that power the positive side of the shunt field coils (*see Figure 6*).

The pinion and drive clutch slide longitudinally inside a clutch housing that is part of the armature (*see Figures 7 and 8*). This drive incorporates a friction clutch pack that allows some

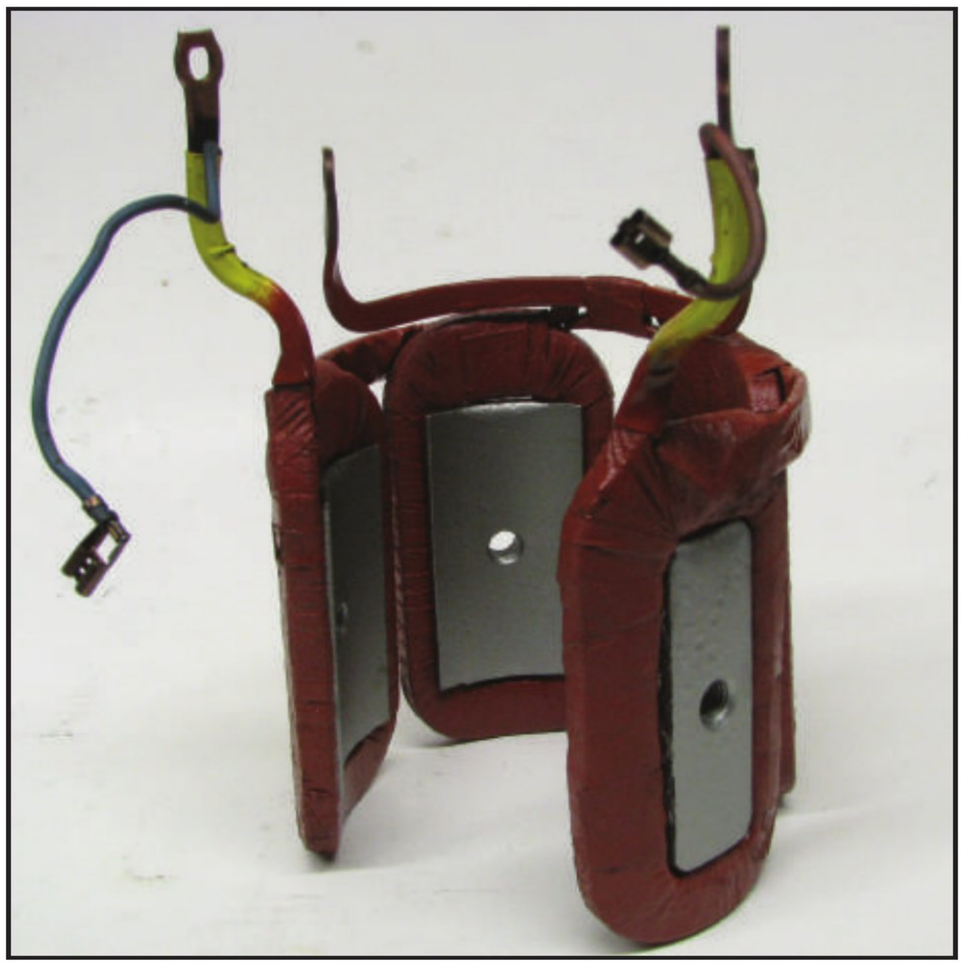

Figure 3 – The field coils are actually two sets of coils in one. The small wires are the four-coil shunt that performs two functions in the crank sequence.



Figure 4 – The armature shaft runs lengthwise through the armature locking to the drive clutch and pinion by the small splines.

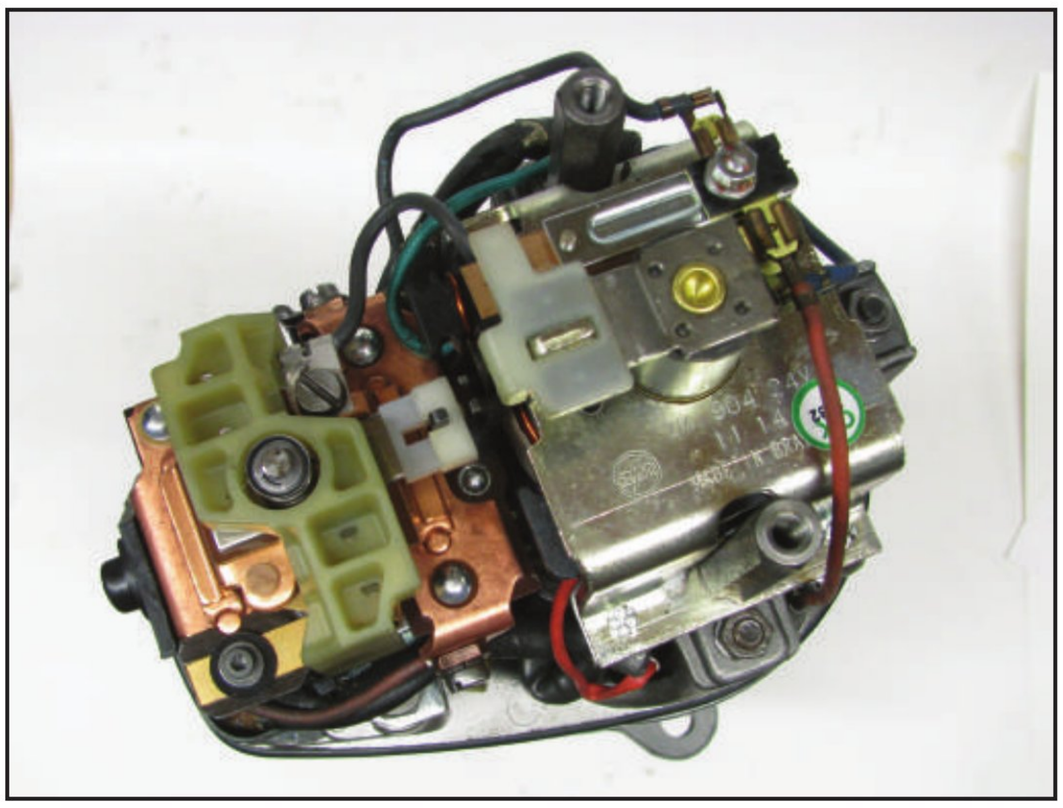

Figure 2 – The control relay (left) and motor solenoid (right) perform together to accomplish one of the softest engagements of any heavy duty starter.

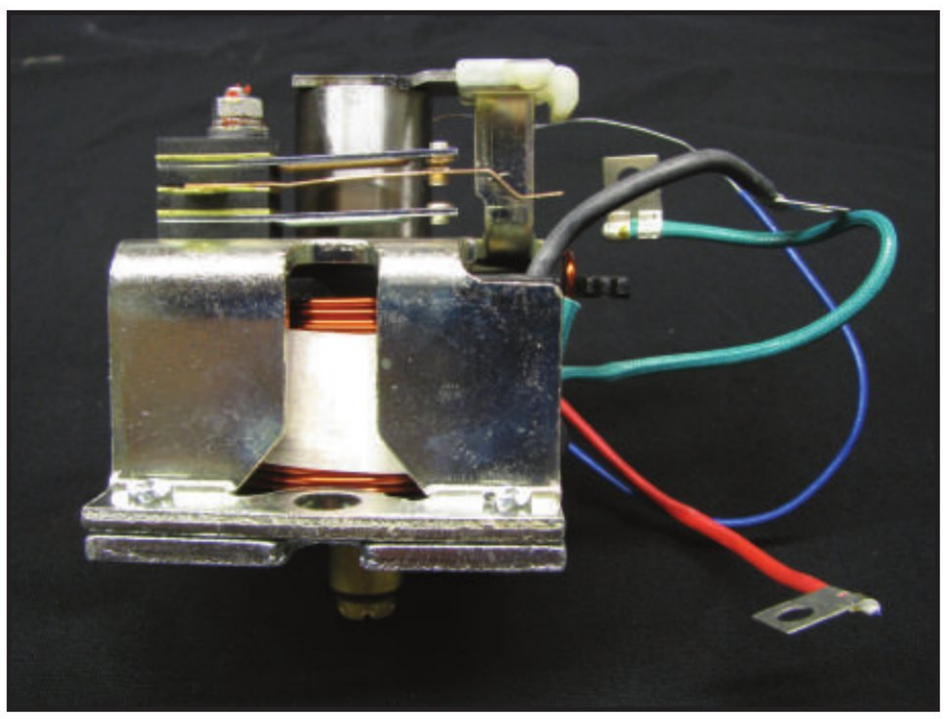

Figure 5 – The KB's motor solenoid engages the drive, switches the shunt coil ground and enables the control relay contacts to close.

minimal slippage when the pinion mates with the ring gear. Friction clutch packs are not new. Prior to WW2, they were commonly used on heavy duty starters – applications that were too demanding for other drive types at the time.

This friction clutch uses a combination of straight and helical splines along with a series of friction plates that will tighten when turned on one direction but loosen and slip when turned in the opposite direction (*see Figure 9*). As shown in an earlier photo, the clutch plates fit into the clutch housing where they can slide longitudinally to engage the pinion but must turn with the armature. When our armature turns clockwise against resistance the helical splines force the clutch pack to tighten, locking the armature to the clutch's shaft. After an engine start, the resistance is removed which loosens the clutch plates – allowing the pinion to spin free during disengagement.

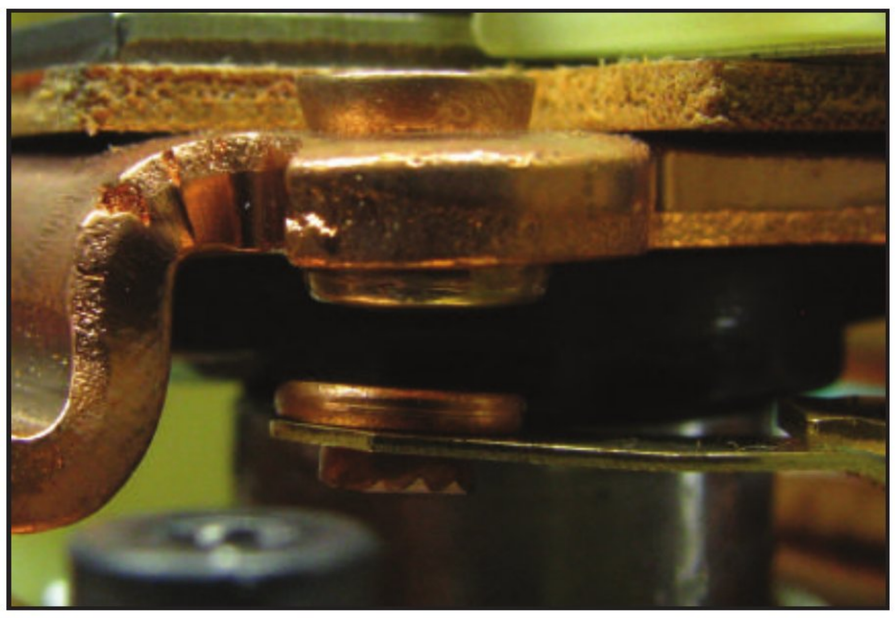

Figure 6 – This less obvious set of contacts on the control relay applies power to the shunt coils.



Figure 7 – The KB armature's drive clutch housing (right side) assures that the drive can move laterally while remaining locked to the axis.

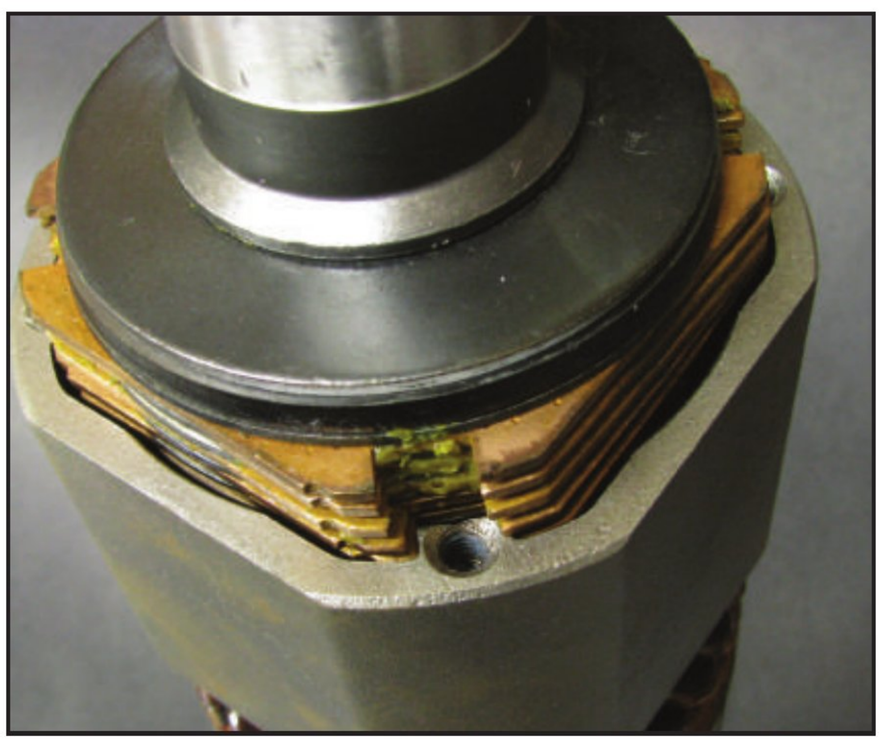

Figure 8 – The square-shaped friction disk drive clutch is locked to the armature's axis by way of a notch in each corner.

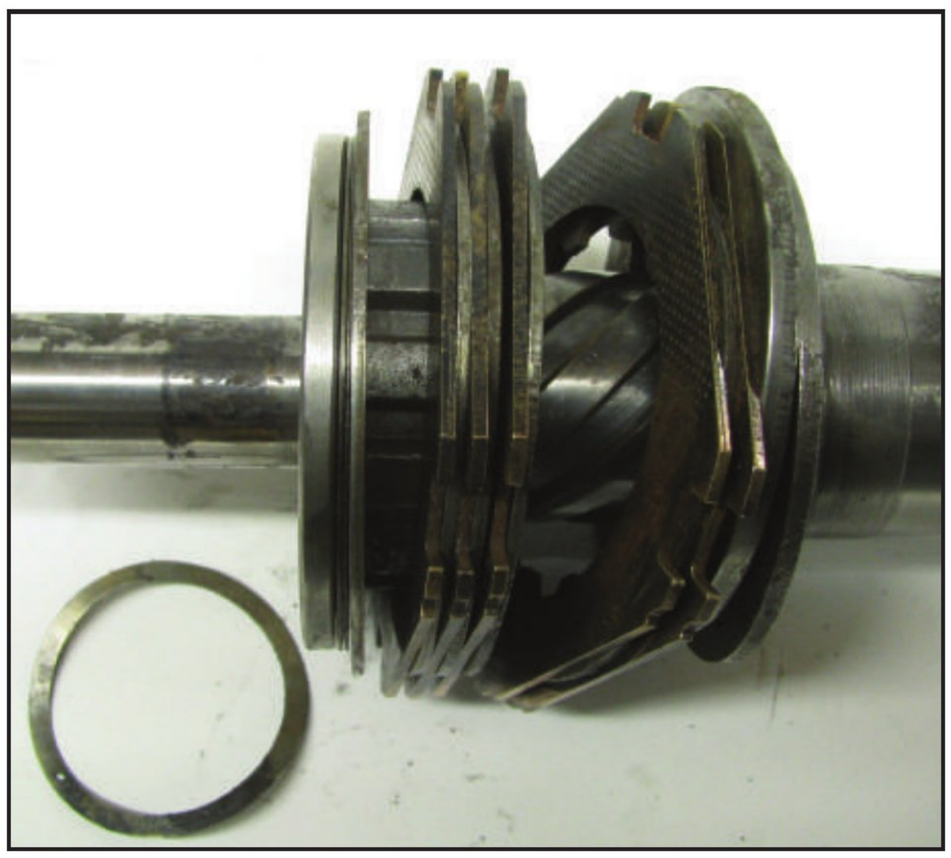

Figure 9 – Helical splines cause the disc pack to tighten for cranking but will loosen in reverse for over-run prevention.



The armature shaft shown earlier has two small sets of straight splines (*see Figures 10 and 11*). They lock into the pinion and the drive clutch shaft. Notice that there is a small bearing on the plunger end of the shaft. The splines and bearing are key wear areas on KB starters. The pinion is keyed (*see Figure 12*) to secure it inside the drive clutch's shaft. It is held in place by a self locking nut that threads onto the end of the armature shaft (*see Figure 13*).

How It All Works

When voltage is applied to the switch terminal, the control relay's coil and the motor solenoid's "hold" coil are powered. At that instant the motor solenoid does nothing, but the control relay closes the contacts that apply voltage to the shunt field coils and the motor solenoid's "pull-in" coil. A stepped catch on the relay (shown on the cover) prevents the main motor contacts from closing all the way. Meanwhile, the shunt coils are grounded through the two-position switch to the positive side of the armature making a series motor - current flows through the shunt coils and then the armature to ground.



Figure 10 – The return spring on the solenoid end of the armature shaft retracts the pinion for disengagement. Note spline wear on this used shaft.



Figure 11 – The threads on the drive end of the shaft locks the pinion to the splines on the shaft.

That causes the starter to rotate slowly. At the same time, the "pull-in" coil in the motor solenoid causes the plunger to push the armature shaft, drive clutch and pinion toward the ring gear with significant pressure. The two work together to achieve a soft engagement. As the pinion begins to mate with the ring gear, the two position switch on the motor solenoid re-configures the

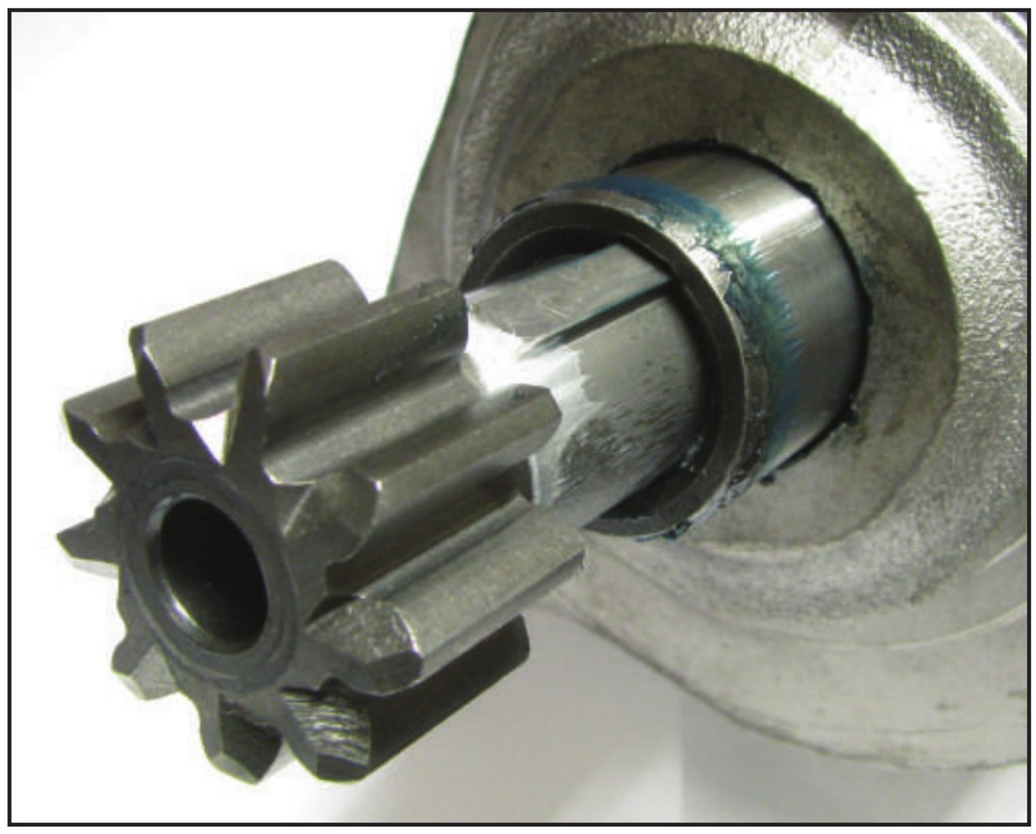

Figure 12 – The pinion slides into and is locked to the drive clutch shaft by a square key.

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shunt coils by switching the ground side to motor ground. That puts them in parallel with the armature which will produce an increase in torque while limiting armature speed during cranking.

Once the pinion is completely engaged in the ring gear, the motor solenoid's plunger bottoms out. A plastic bracket on the top of the plunger comes down to push the stepped catch on the control relay (*see Figures 14 and 15*), which in turn allows the relay's plunger to bottom out. That allows the main motor contacts to close so that the starter can begin cranking the engine. The friction clutch pack absorbs some of the initial impact force between the pinion and the ring gear. All of this takes place – perfectly timed - in less than one second.

When the engine starts and voltage is removed from the switch terminal, the relay's motor contacts open, the shunt contacts open and the solenoid's "pull-in" coil" looses its power causing the plunger to return, away from the armature shaft. The spring on the shaft applies the force necessary to retract the now free-spinning pinion from the ring gear, allowing the starter to come to a complete stop.

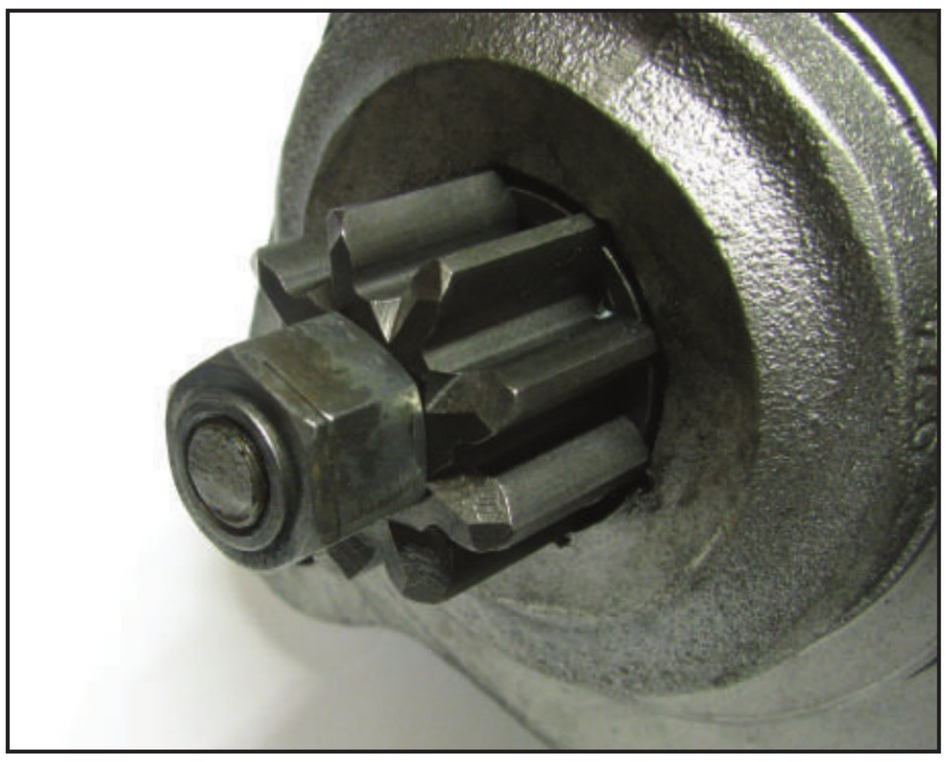

Figure 13 – This self locking nut fastens the pinion to the shaft.



Figure 14 – The stepped catch on the control relay (center) momentarily prevents the motor contacts (lower left) from closing.

In addition to the splines on the armature shaft, the other most common wear areas are the plastic parts of the control relay's stepped catch and the motor solenoid's release bracket. There are bearings in some strange places too. All of this is well covered in the videos.

You should also be aware that Bosch offered a start-locking and start-repeating relay that could be used with these starters. If a customer has a starting problem – that relay could play a part in it.

Special thanks to Henry Henke of United Starter and Alternator for his help in making this article possible.



Figure 15 – Once the pinion is fully engaged, the nylon bracket on the solenoid (upper right) releases the relay's catch, allowing the contacts to close.

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TECH TIP: DELCO REMY 44G Battery Post Spacer Fix



BY LARRY HAGEMEISTER

We have run into problems on some 8201 Delco 44G alternators when trying to remove the pressed on battery post spacer. That spacer has to come off to replace the voltage regulator. The spacers on the early 8201 alternator, Delphi's AD series, rarely cause problems. The 44G, which will interchange with the AD, uses a slip ring end frame that serves as the heat sink for the negative diodes. They both use the same regulator, D3587 for the RVC charging system. But the spacers do not interchange between the 44G and AD alternators. Nobody, as of this writing, offers a replacement spacer for the 44G.

Our solution was to use a grinder on the old spacer to get a better grip on it. After pulling it off, we replaced it with a modified 5/16ths coupler nut, available at most hardware stores. We found a coupler nut that was the same length as the spacer. I drilled out one end of the nut about 5mm to go over the serration at the base of the B+ stud. This is very important to insure you get a good crush on the regulator's battery connection under the new spacer.

I'm not sure what others are doing with this alternator, but as you know, we rebuilders find a way and here it is. Let me know if you have any questions.

Larry Hagemeister is the owner of Hagemeister Enterprises, Inc in Lebanon, OR and Redmond, OR. You can reach him at 541-259-2262.

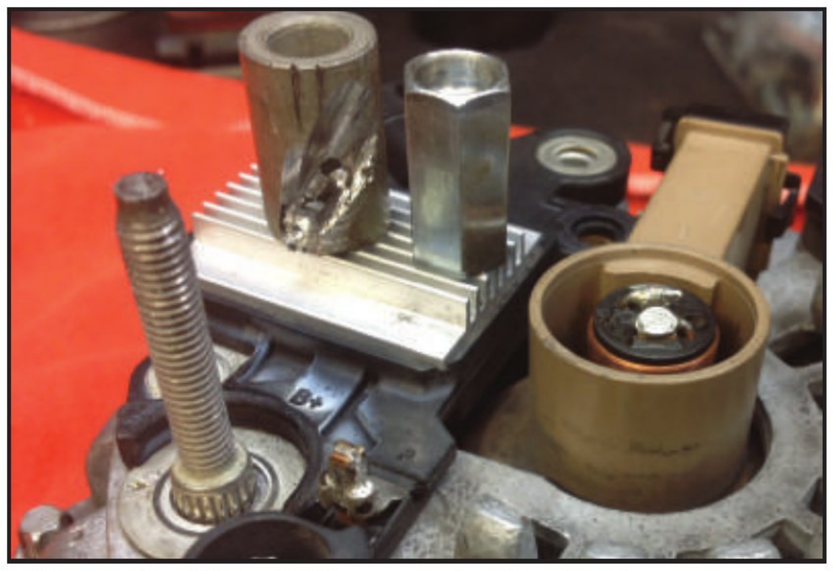


Figure 1 – This 44G spacer had to be damaged to remove it in order to change the regulator. The coupler nut space we made is on the right.

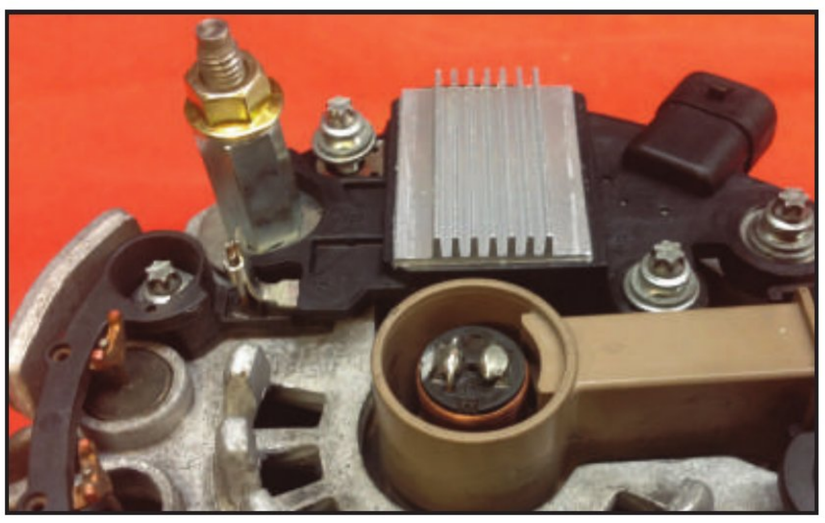


Figure 2 – Here you can see the finished product with coupler nut spacer installed.



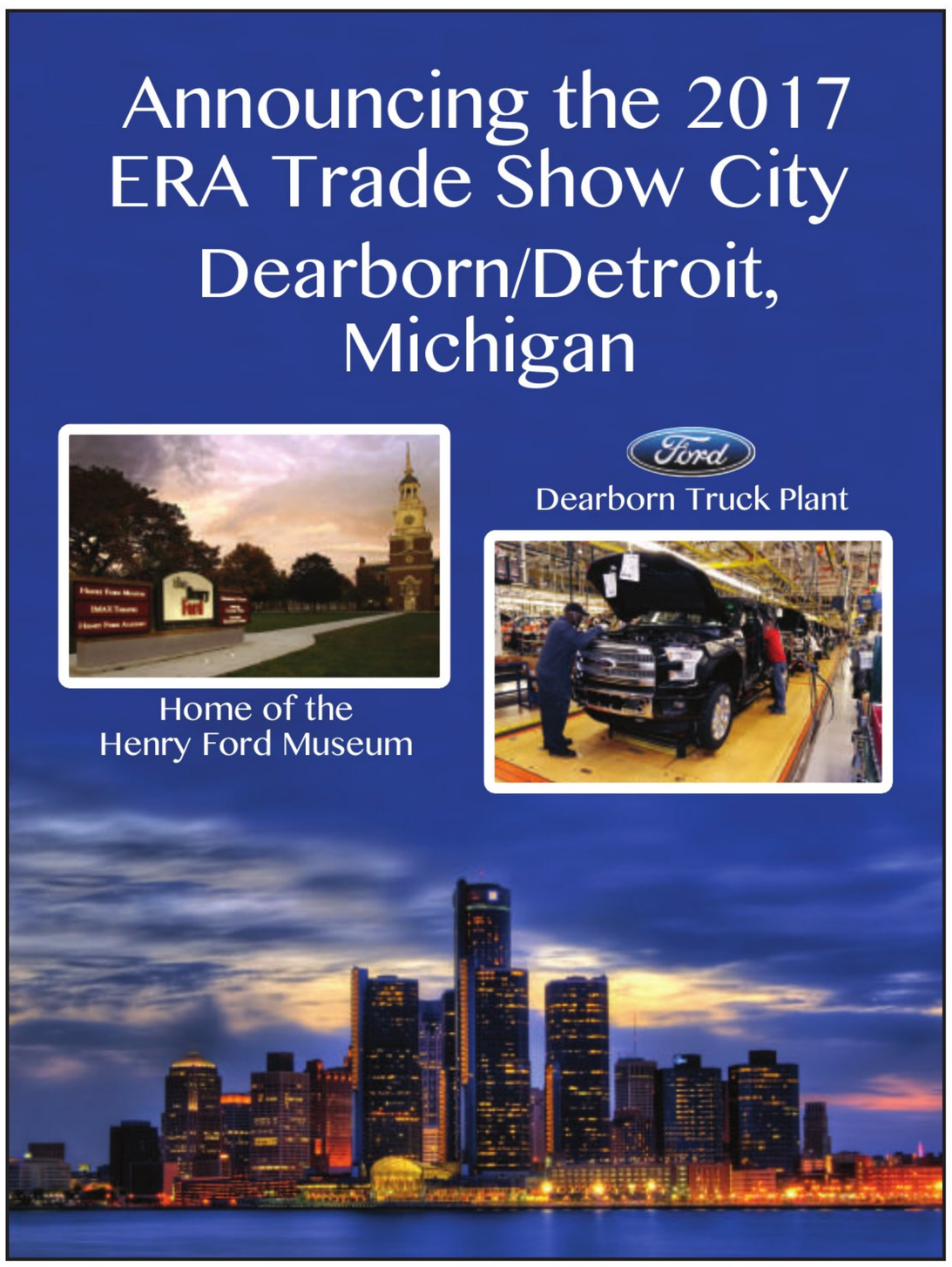
ERA EXPO 2016

The 2016 Electrical Rebuilder's Association trade show in Memphis, Tennessee was a huge success. A total of 135 rebuilders from 73 companies and 61 exhibitors from 27 companies were in attendance.

For the first time ever, the ERA was able to announce the location of next year's show at the current show. The destination for the 2017 trade show will be in the Dearborn, Michigan area. Look for more information in upcoming issues.



Mike Dietrich announced the upcoming trade show during the luncheon. Mike Schroeder & Stephanie Schroeder unveiled the sign featured below.

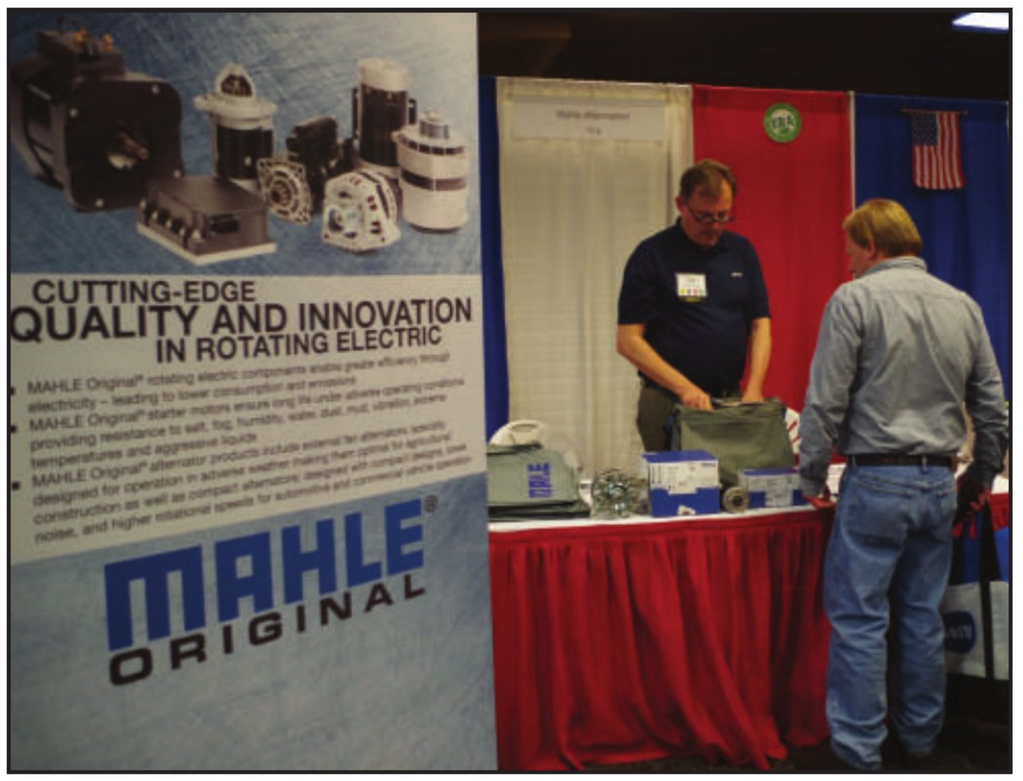




ERA EXPO 2016



Many exhibitors, like J&N Electric, had demonstrations of their products for members to view and test.



Bob Hopko from Mahle Aftermarket



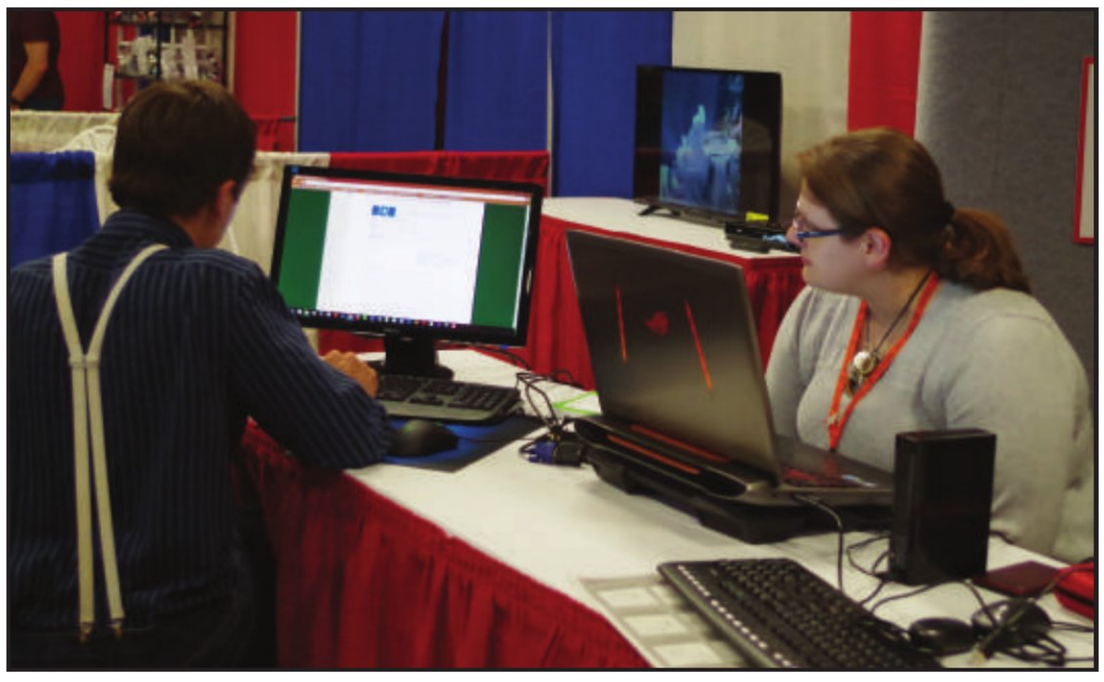
Colin Freed spoke with Kenny Turner on what products Litens has to offer.



Rick Gerrits from Dubois Marketing



Bob Wagner from Wagner Alternators chatted with members about products.



The ERA webmaster, Jessica Myers, was at the ERA booth to help any members with questions about the website.



Dennis Jacinto from YouTech helps a member learn how to use his new online catalog, Partref.

2016 Expo Ratings & Reviews

"The whole trade show is run very perfect and professional. Everything was on time and we stuck to the times. The introduction of the next show was also very professional."
— Mike Harder, Finicki Auto Electric

"The best show in several years. It's great to see all my friends."
— Daren Roggentien, Roggentien Electric

"Pleasantly surprised by the attendance level and the enthusiasm of those in attendance."
— Mike Tweed, Standard Starter Drive

"A real diverse set of seminars this year."
— Tom Barrett, Dakota Battery

"A successful first experience and great seminar turnout."
— Murl Reiman, PLP Battery

"The greatest roundtable ever."
— Alan Melton, Am for Electronics

"Thank you to the ERA for the opportunity to exhibit at this year's ERA show in Memphis. Litens is pleased to continue to support the rebuilding community by having a booth at this great show. The relationships that are built and the market feedback we receive is priceless. Litens looks forward to seeing all of you at next year's show in Detroit!"
— Allen Steadman, Litens Aftermarket

"The 2016 ERA show was a big success for both WAI and the electrical rebuilding industry as a whole. It's great to see so many accomplished folks with so many years of experience come together to share ideas and trade secrets. As a supplier, the ERA show provides a great opportunity to better understand the needs of our customers through various forums. From the open discussions at the lunch table to the one-on-one meetings in the booth, all of this information is valuable and helps WAI adapt our business to better support the rebuilding industry. We are looking forward to heading to Michigan for the 2017 ERA show."
— Seth Moul, WAI Global

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Mohammad Samii of Sammy's Auto Electric spoke about testing, rebuilding, and case-studies of new starters and alternators.



Juan Grube of JIMCO explains small engine AC charging systems.



Murl Reiman, a first time ERA trade show presenter, gave a presentation on battery chargers.



Many members attended and participated in this year's roundtable discussion, led by Alan Melton.



Members had a chance to ask questions and voice opinions during the roundtable discussion



Nick Staub of Romaine Electric participated in roundtable



Dan Marinucci gave a presentation on scope testing alternators

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Buses lined up outside the Holiday Inn hotel to take members to the WAI Global distribution center tour. Over 100 people attended the tour.

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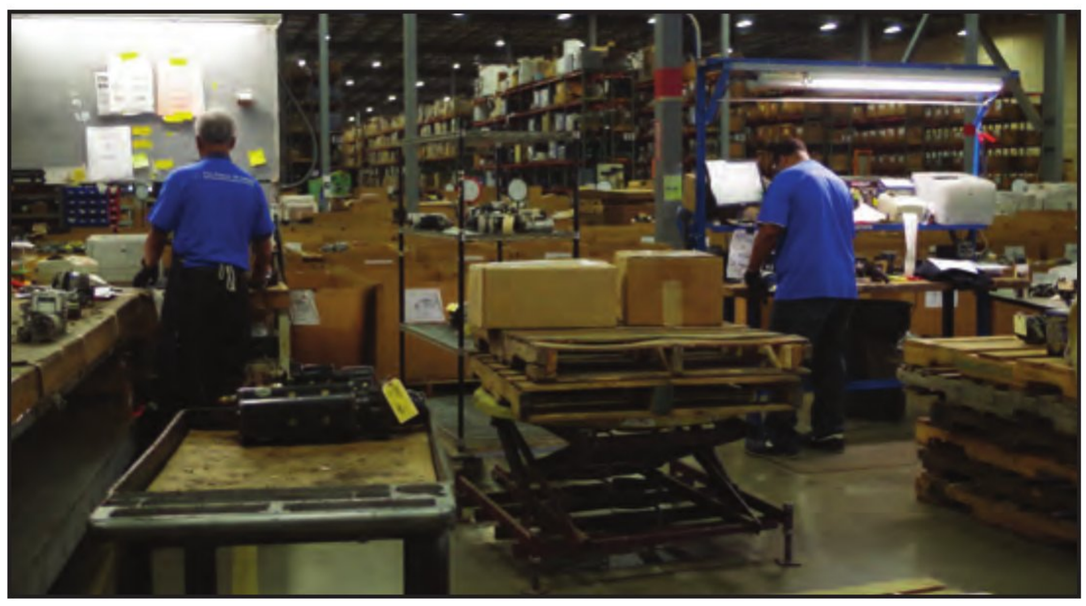
Rodney Newsom, Operations Manager



WAI's 270,000 sq. ft. distribution center



Troy Light, Technical Service Manager, answers questions from ERA members



WAI's warranty returns area



Seth Moul, Director of Sales and Marketing, accepted an award on behalf of WAI from the ERA as a thank you for their generous contributions



WAI provided lunch after the tours

RAFFLE WINNERS



Jeff Sensenig of Jeff's Starter Shop won
Jimco's $150.00 Kansas City Steak certificate



Joe Mazzone of Buckeye Auto Electric
won IMI's 6670 starter



Mike Mackey of Mackey Auto Electric
won WAI's $50.00 Home Depot giftcard



Michele Schroeder of Central Automotive Electric
won WAI's $50.00 Home Depot giftcard



Rodney Sensenig of Jeff's Starter Shop
won WAI's Lester Pic Book



Mike Vernon of Vee-Co Generator & Starter
won WAI's Lester Pic Book



Dan Kelly of George J. Hust Co.
won Wagner's $125.00 merchandise credit



Ron Davis of B&M Starter & Alternator
won Wagner's $125.00 merchandise credit

ERA EXPO 2016



Addisyn Roggentien of Roggentien Electric
won PLP Battery's battery charger



Casey Barrett of Dakota Battery
won Regitar's Regulator Tester



Jason Kiser of JK's Starter & Alternator
won Romaine Electric's 10SI Chrome Alternator



Ron Mitchler of Ron's Alternator & Starter
won Dixie Electric's $25.00 Visa giftcard



Tom Barrett of Datoka Battery
won WAI's Lester Pic Book



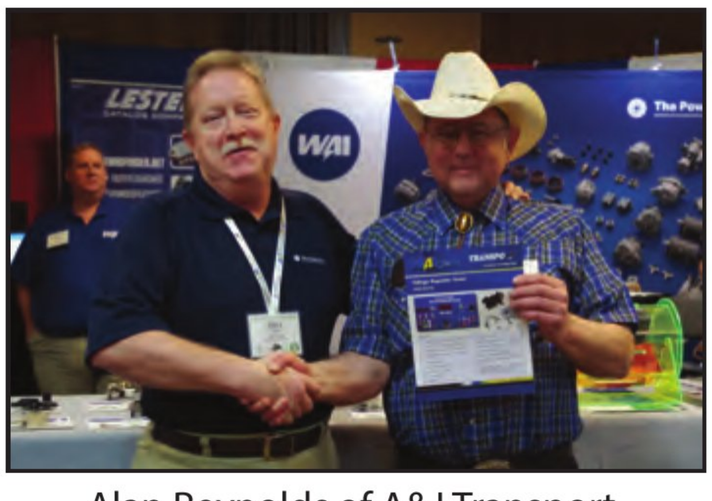
Addisyn Roggentien of Roggentien Electric
won Dixie Electric's $50.00 Visa giftcard



Jason Kiser of JK's Starter & Alternator
won WAI's Lester Pic Book



Tommy Mertens of Jim's Alternator Service
won Dixie Electric's $25.00 Visa giftcard



Alan Reynolds of A&J Transport
won WAI's Regulator Tester



Jim Burnett of Hite Parts Exchange
won the ERA's 40" flat screen tv

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"I believe I'll be able to help any caller." he explained when he took over the job. "I rely on other ERA members who know more than I do about some subjects." The ERA's Tech Help Line has always been a team effort. The same group of industry veterans are at Scott's disposal.

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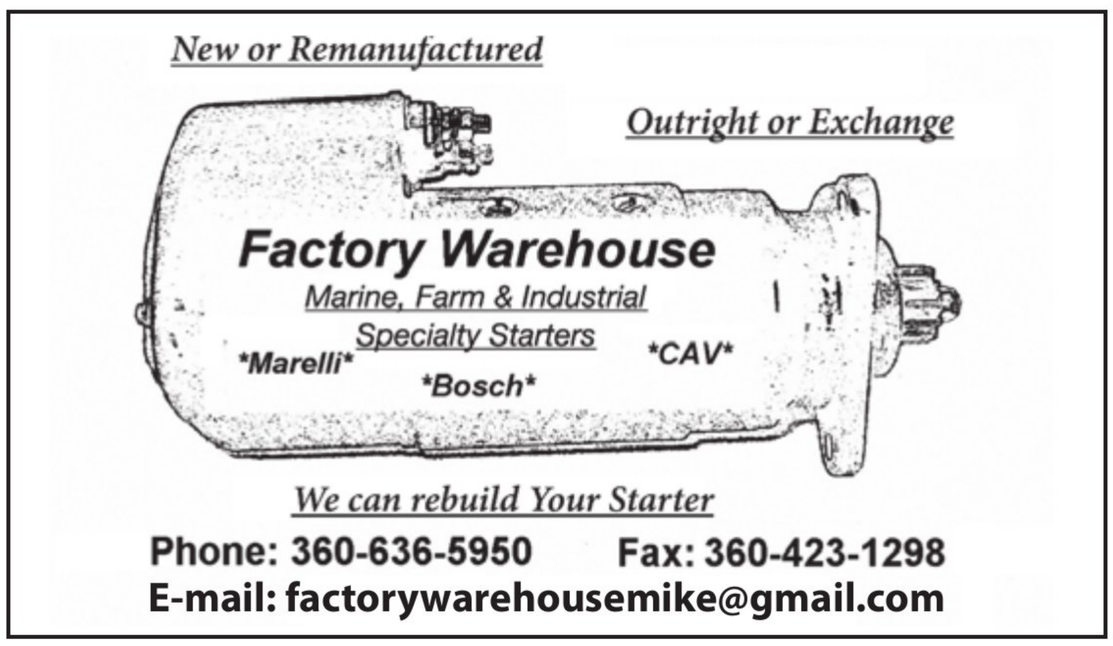







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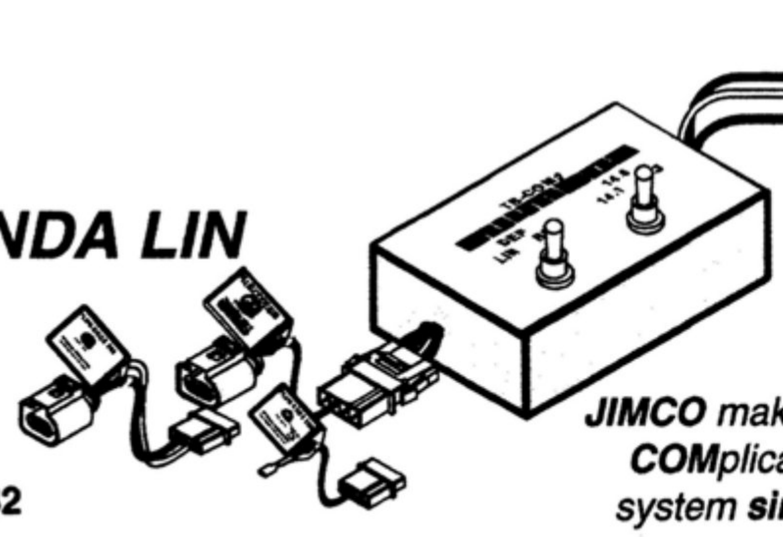

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