ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

JUNE 2015 $12.95

DELCO-REMY 39MT
A Rebuilder's Friend or Foe?

CONRAD'S CONUNDRUM
Ford F450 Intermittent Starting

PLAIN TALK | BEARINGS, BUSHINGS and BRUSH SPRINGS

Delco-Remy's workhorse 39MT starter

A WORD FROM THE PRESIDENT
Inventory management



Have you ever taken a call from a customer who was looking for a starter or an alternator which you did not stock, and your turnaround time was not good enough to make the sale? What if there were a way to grow your inventory without making a big investment in parts and labor? This can be accomplished with a database system that is designed to do just that. I know that this idea is not new, but I would ask you, "How much effort do you put forth to utilize and turn what inventory you do have?" Whether you are a one-man shop or a thirty-man shop, a properly built inventory management system can pay big dividends.



I know this to be true, because I started developing my system several years ago. Something to remember is this—that a management system is a process that is ongoing and ever changing. I hope that by sharing some of my experience on this subject, that it might help some of our members. How many times have you purchased a $20.00-plus part and later found out that you had one hidden away on a shelf or inside a unit that you had in stock for years? What is more important is—how many times has that happened and you were not aware of it? With an inventory management system, that question will be answered. Once you know what you have in stock, you can then apply knowledge and skills to expand that inventory by changing a regulator, drive, pulley, clocking, housing and so on. This is a competitive edge that is unique to our industry. I know that almost all of us have practiced this to some extent, but with the part number proliferation explosion that has been occurring in our industry, I believe that I need a system that helps me practice it to the **fullest** extent!

You do not need expensive software packages to develop a good management system. Having a computer is definitely a big plus. To start with, take a look at your major suppliers' Web pages. Most of them are ERA members, and they have Web-page links in the sources guide on the ERA website's home page. You need to really explore these sites and see how many tools they have for finding what you need. If it is your first time using their site you may have to call and ask for sign-in privileges. The days of cataloging are all but gone. The websites are usually real-time, which show current inventory levels. Cataloging sites such as Lester, Apptrak and AIM are great sites for product data showing application, component where used and parts interchange. Having a computer at your point of sale, with these sites opened, is a great start to building an effective inventory management and sales tool.

Next month is "Building Your Own Database."

Mike Dietrich

NEW ERA MEMBERS

Challenger Battery, Inc.
Laredo, Texas

Gold Seal Alternator & Starter Service
Barrie, Ontario, Canada

Bear Hill Auto Electric
Bethany, Conn.

E World
Scarborough, Ontario, Canada

East Orlando Remanufacturing Corp.
Orlando, Fla.

Standard Motor Products, Inc.
Long Island, N.J.

ABOUT THE COVER
A fourth generation Delco-Remy 39MT starter showing the solenoid with Integrated Magnetic Switch (IMS) Relay above it.

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PLAIN TALK
Bearings, bushings and brush springs



BY ROB BUKSAR

This may seem like old news to many of you, but I'm still sorting out a lot of what I saw and experienced at the Davenport ERA Expo. It was a great regional show that was well-supported by vendors and rebuilders alike. Yet, we judge things much differently than we used to, because so much has changed. I'd like to do a short review so we can all be on the same page.

Back in the day when we were still a manufacturing country, the only trade organization we had at the time was the APRA. The annual APRA shows were events that you just didn't want to miss. They were supported by what seemed to be unlimited suppliers, all displaying products, parts and components that they manufactured themselves. Rebuilding was the platform that this was all built around, simply because that's what the industry was all about—rebuilding and fixing starters, alternators and generators and returning them to the marketplace. There were ample training sessions, seminars, round-table discussions and stand-up presentations. They were necessary and important, because the starting and charging technology was evolving, and we all had to stay current to stay functional. Rebuilders spent the lion's share of their time focusing on bushings, bearings, brush springs and all of the tech stuff, because in those days it was necessary. The business end was important but not vital, because the market available to rebuilders was unlimited. Hang out a shingle over your door that you were a rebuilding shop, and customers just started lining up!

We rolled into the nineties, and a bunch of manufacturing had already relocated overseas. It began with all of the component parts. At first, it was just a little of this and a little that, but it grew quickly. Nevertheless, the major domestic manufacturers of component parts had already begun falling by the wayside. Competing with overseas prices just wasn't possible, so without a food chain, they disappeared.

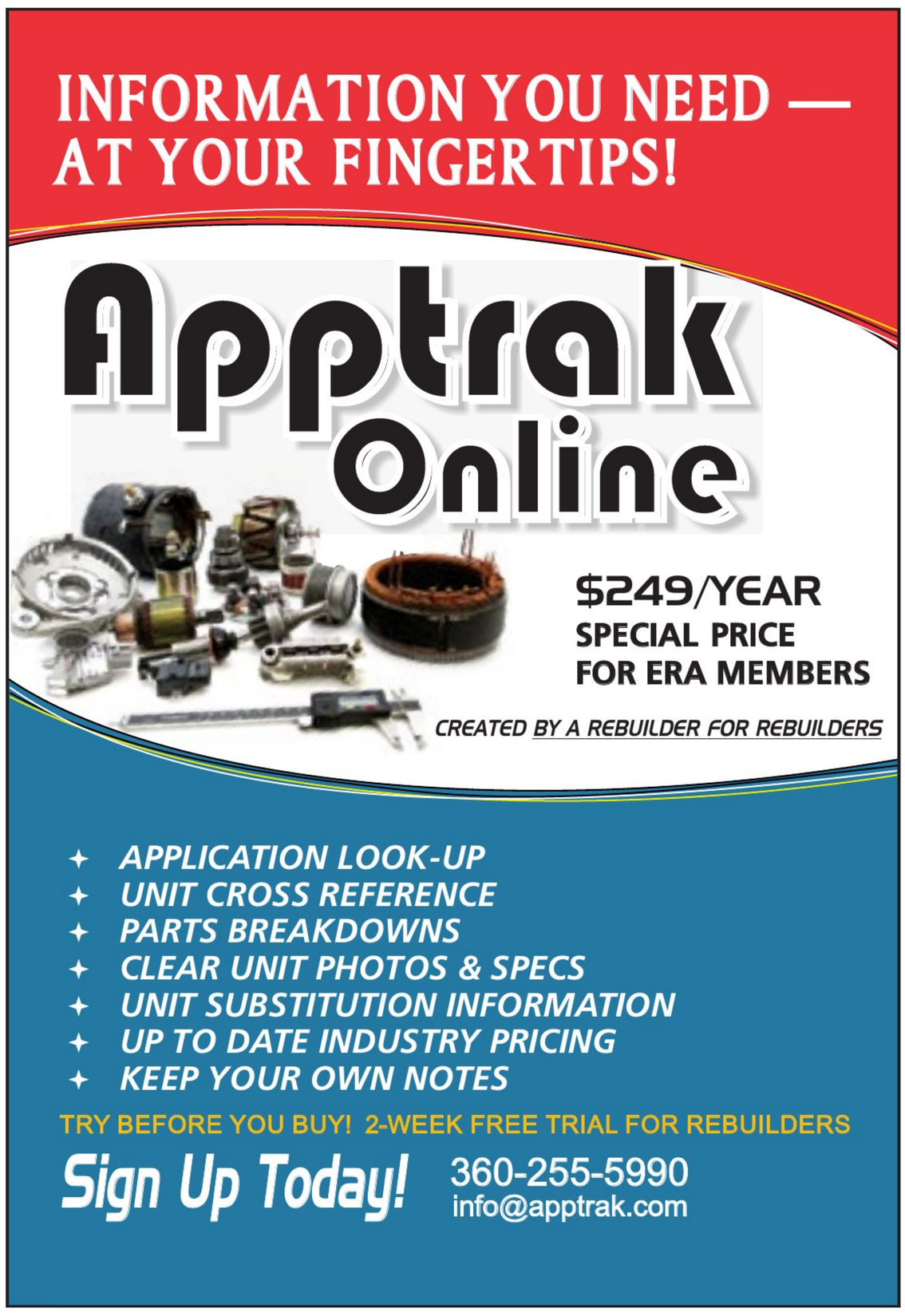
The trade shows continued without a number of domestic manufacturers who just disappeared off the grid. Somewhere in the midst of all of this, the ERA started and grew, attempting to be more sensitive to the needs of rebuilders. The ERA shows had lots of support, training and vendors displaying their parts and some new units—yet there was a very noticeable difference, at least, to me. The parts on display by many of the vendors were all made offshore. They actually looked like they all came from the same place, just packaged differently. In those days, because the industry was still sizable, the ERA was able to support traveling road shows presented by Joe Davis. These presentations were excellent, timely, and for the larger part, well-received. Joe helped us all understand the up and coming technology and how to fix it. Joe deserves a big thank you for all of the hard research and good presentations he developed. It helped us all. It gave rebuilders more bearings, bushings and brush springs to talk about, too!

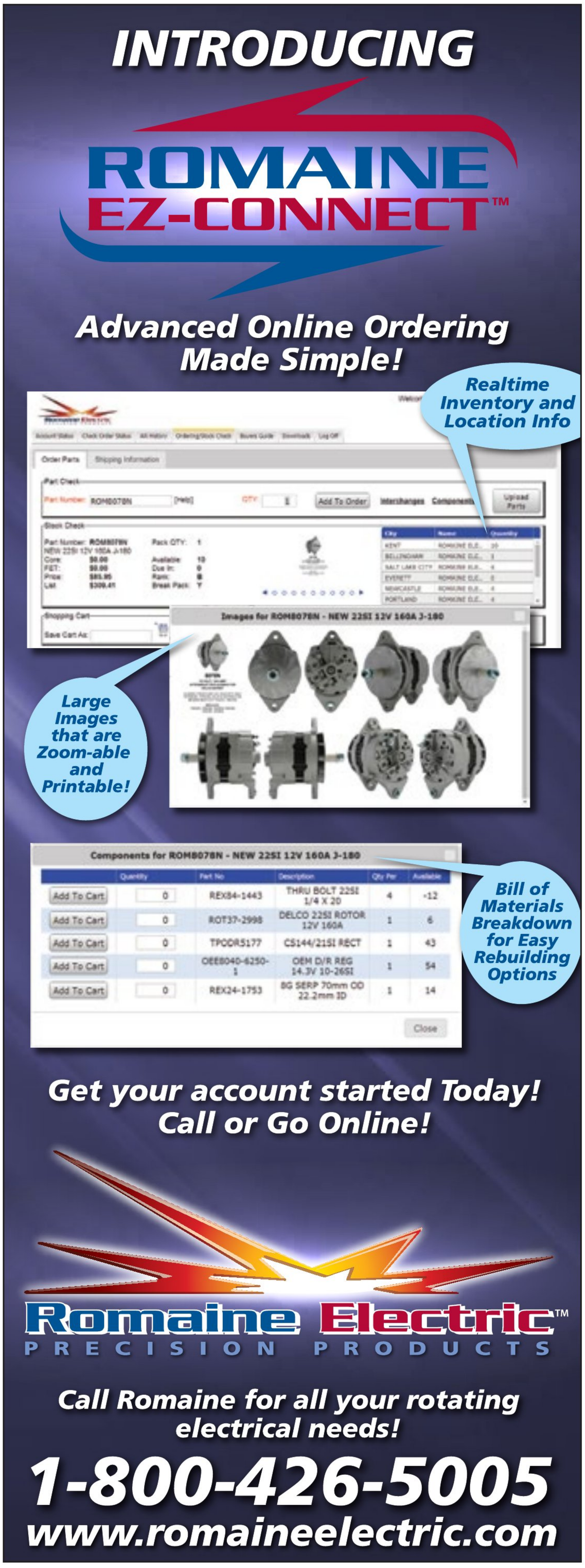
Now, I'm going to take a big jump up to the latest regional ERA show in Davenport, Iowa. I hadn't attended many trade shows over the last few years because of personal issues and most recently, a health calamity. I couldn't have been happier to attend this one.

As I mentioned earlier, I thought it was a great show for all the right reasons. What grabbed my attention almost immediately, was how few parts were on display. Most of what occupied the space on the tables were replacement units. Most of them, I can safely say, were made offshore somewhere. Where? Who knows, and who cares at this point?

We are "a long way from Kansas" my friends, and "clicking our heels together" won't return us to where we were. My intent today is not to pine over the past, but to ask, "How are we approaching the future?" Aside from a few exceptions, the main topic of conversation at the show was still bearings, bushings and brush springs.

What's left of our little industry is in a very different place from where it was years ago, along with what remains of the other surviving independently-owned small domestic businesses. Putting myself at the top of this list, most of us are old dogs in need of learning some new tricks.





PLAIN TALK

I think that many of us are like a scratched record, where the needle just can't get past the groove without a push.

Immediate change is necessary. There is no time to waste. Your market is no longer unlimited because of far better starting and charging technology and overall better vehicles. During a conversation with my friend, Wes Grueninger, (Exchange production designer and ERA webmaster) he mentioned an auto salvage yard that he was formerly involved with. He said that there were rows of complete engines with the starters and alternators still attached. The auto bodies were either wrecked or rotted off the motors. The interesting thing was that all of the engines, along with their attached starters and alternators, still worked! Better longer-lasting power trains have shrunk the daylights out of what once was a maintenance-heavy industry. Stupid trade agreements and a lopsided global supply chain have whacked the rebuilding market even more!

So, what's the point? Let me suggest this. These days, there's a whole lot more to talk about besides bearings, bushings and brush springs! I kind of think that many of us are stuck in a groove like a scratched record, and we won't get out without help.

Now, don't feel beat up or feel like the Lone Ranger. Steve Jobs, the former horsepower behind Apple Computers and probably the greatest innovator of our time, had the same problem at the beginning. His mantra became "change-change-change." That, along with the affiliation of others, propelled him into building one of the world's greatest companies. Do a little reading about Steve. You may discover that he struggled with many of the same demons that we do and see what he did to overcome his problems.

This I can tell you. Steve Jobs, along with the others who have successfully adjusted to the new global economy, good or bad, did not get hung up with bearings, bushings and brush springs in their own world. Neither should we. What are we going to fix or sell in the future? Where's the market and for what?

Change is the order of the day—along with the people, companies or new affiliations to push us out of the "groove" and thrust us all into new successful endeavors! The clock is ticking, and time is not on our side. We all need to either move on or be prepared to move out. There's still money to be made, just not exactly how we used to do it!

P.S. If you know how to cost-average your rebuilding, and you still have rebuilders on the payroll, you will make more money trying to rebuild most units, rather than just blowing them off and buying NEW ones. The more units that your rebuilder can fix per week, will bring your cost per unit down, not up.

God Bless America and our little industry!

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

ERA

39MT DELCO-REMY STARTER
A rebuilder's friend or foe?



BY BOB THOMAS

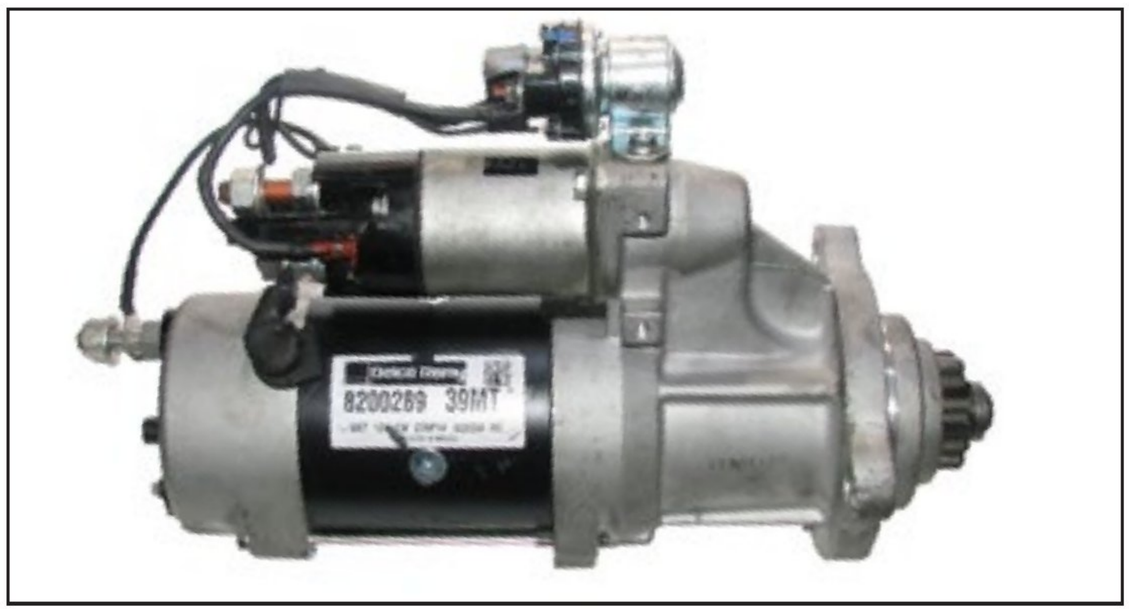


Figure 1—The 39MT, Delco-Remy's primary heavy duty starter, has been in use for 15 years.

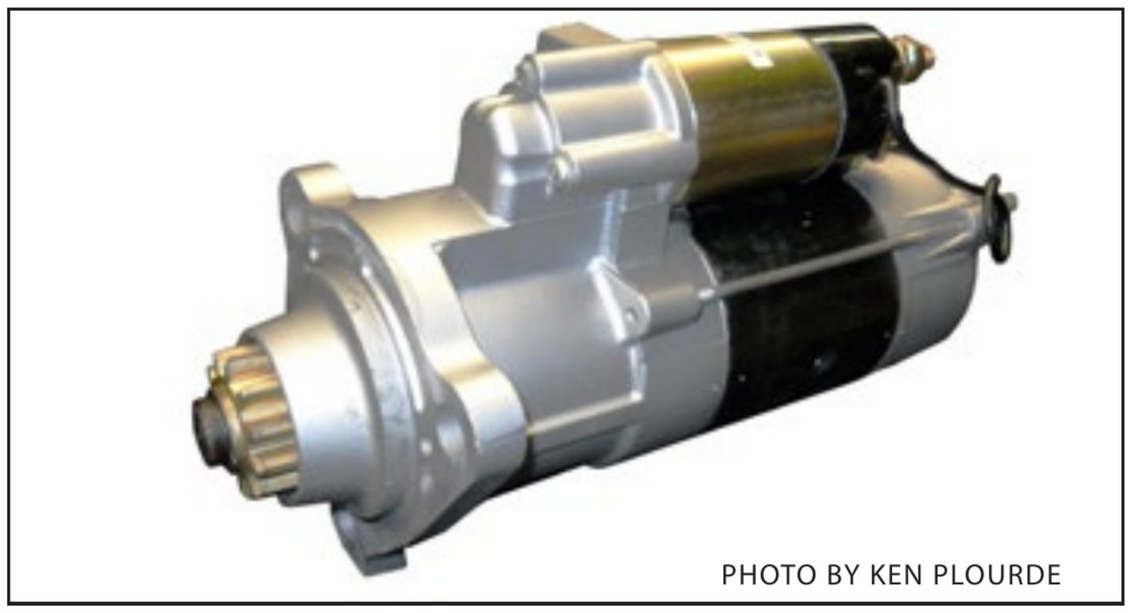


PHOTO BY KEN PLOURDE

Figure 2—The first generation 39MT looks very similar to a Mitsubishi heavy duty starter. Note solenoid mounting screws.

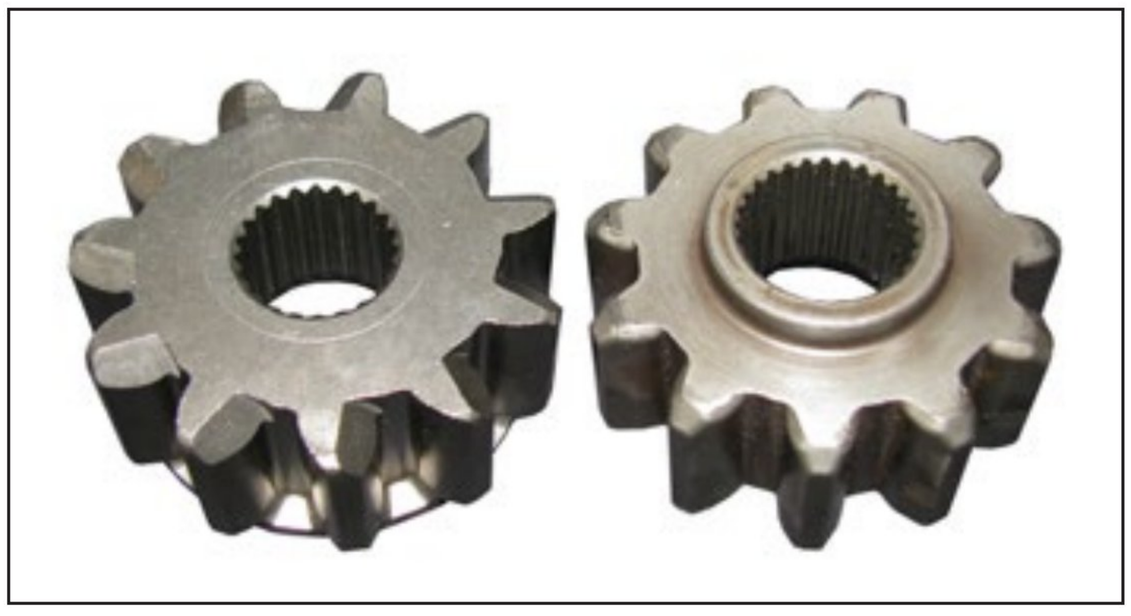


Figure 3—The Generation II pinion is on the left,. The Generation III and IV pinion is on the right. Note that the inside diameters are different, as well as the faces of the gears.



Figure 4—Generation II, III and IV starters use the same solenoid. Mounting screws thread into the DE housing.

The Delco-Remy 39MT has been around since the beginning of the new millennium, but some rebuilders still admit to feeling uncomfortable working on it. Delco-Remy has made a number of changes to this starter since it first appeared, and these changes have caused much of the confusion and problems that have been associated with the 39MT (*see Figure 1*).

This planetary gear starter was designed to replace the straight drive 42MT. It provides better torque and cranking speeds than a 42MT along with a considerable reduction in size and weight. The 39MT and 42MT share nothing in common, other than the fact that the complete unit can be interchanged on many applications. Delco-Remy has made a continuing series of modifications and improvements to the 39MT since it was introduced. Consequently, 39MT service parts do not interchange like they did with the 42MT. It is of the utmost importance to know exactly which 39MT you are working on, whether you are rebuilding one or a batch of these starters.

Having the OE starter part number before you do anything is highly recommended. Identification without it can be a problem with all the changes that have been made. There have been many aftermarket replacement units, too, and they may or may not be exact copies. Delco-Remy identifies their 39MT starters as being from a particular generation. Up to now there have been four generations.

GENERATION I—The first 39MT starters were made in Japan and shared many similarities with Mitsubishi heavy duty planetary gear starters (*see Figure 2*). The easiest way to identify this starter is the three solenoid mounting bolts that go in through the drive end (DE) housing to the solenoid. All later generations use a different solenoid with two mounting bolts pointing in the opposite direction. No parts from a Generation I will fit any of the later starters. These units were all made in Japan. Some service parts are still available for them, but they are limited.

GENERATION II—There was a complete redesign of the 39MT when production was moved to Korea for 2003. All 39MT starters after that move look very similar. Generation II starters can be identified by the flat face of the pinion gear on the left in the photo (*see Figure 3*). The pinion on the right was used only in Generation III and IV starters. If you are rebuilding a 39MT Generation II, you cannot use parts from the DE housing assembly of any other generation. The housing, pinion, pinion hardware, drive clutch and shaft are all different from later versions. The drive clutch shaft is 18mm in diameter. The solenoid for all Generation II, III and

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IV starters is the same and mounts differently as described earlier (*see Figure 4*).

GENERATION III AND IV—Production was later moved to Mexico, and significant modifications were made to the Korean 39MT, which included a larger diameter drive clutch shaft. Most of the DE housing assembly was changed. These starters can be differentiated from their Generation II counterparts by the visibly different pinion gear as described above. The pinion hardware, clutch, shaft and DE housings are all different from Generation II. However, they may appear similar enough to get them mixed up or confused.

An over crank protection (OCP) thermal switch similar to that used with the 42MT was originally added as an option, but it is now being included on all new 39MT starters (*see Figure 5*). Note that the self-resetting OCP switch is located on the brush holder right above a ground brush (*see Figure 6*).

Perhaps the most popular feature to be added to the 39MT since its inception was the addition of rotatable DE housings (*see Figure 7*). This allows dealers and installers to achieve wider coverage with fewer part numbers. It also makes it possible to replace almost any aging 42MT with a 39MT.

Soft Engagement Solenoid

All versions of the 39MT incorporate a soft engagement feature that was designed to eliminate flywheel milling. The 39MT solenoid accomplishes this in a way that is different from past starters. The pull-in coil of this solenoid in 12 volt applications is wound with 10 gauge wire that requires about 230 amps. The hold-in coil draws an additional 40 amps. Combined, this solenoid needs 270 amps to work properly. The amperage draw of this solenoid during free-run bench testing, initially caused much concern in the rebuilding community.

Current flows the same as it does in most other starter solenoids. All of the pull-in coil's amperage flows through the starter's motor as it travels to ground. This high current causes the 39MT's motor to turn slowly, but with a significant amount of force, until the pinion is fully engaged into the ring gear. At

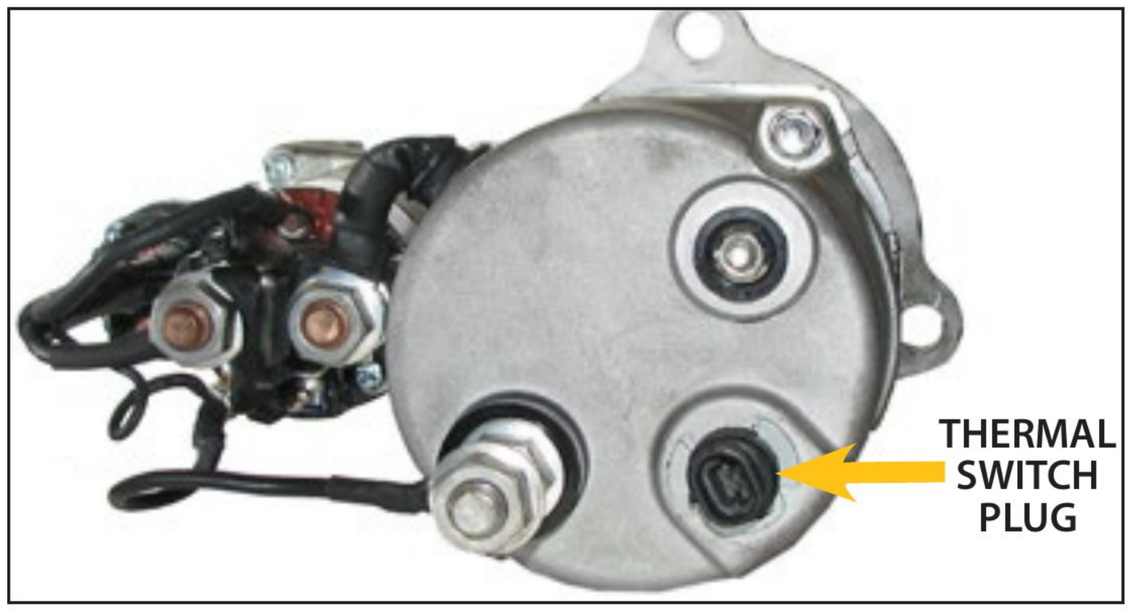


Figure 5—The plug on the CE Housing is for the OCP thermal switch.

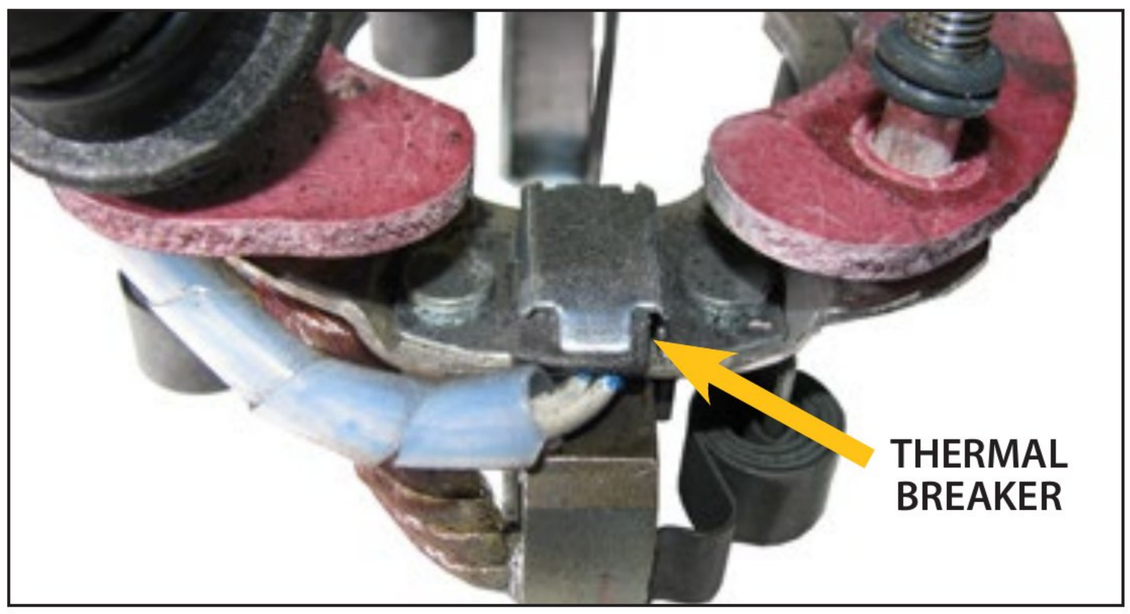


Figure 6—The OCP thermal breaker is mounted on the brush holder, just above a ground brush. Once an option, it is now standard on all 39MT starters.

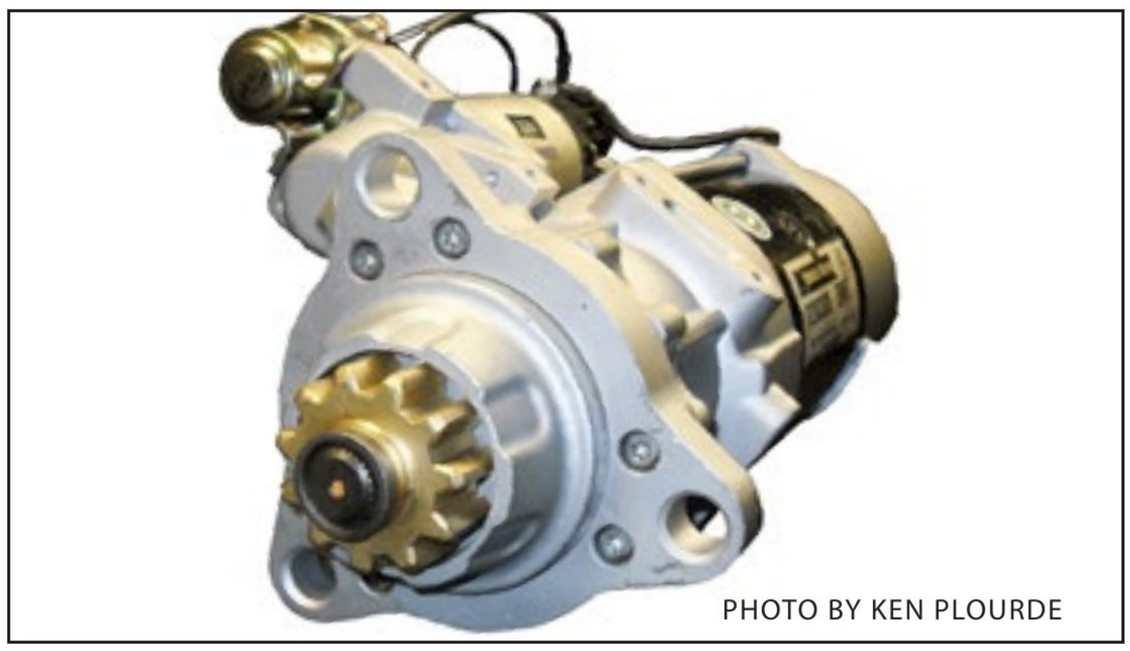

PHOTO BY KEN PLOURDE

Figure 7—The rotatable DE housing was introduced more recently and can be purchased as a component part to retrofit any Generation III or IV starter.

that point the solenoid's contacts close, the pull-in coil's ground is lost, and the hold-in coil keeps the solenoid contacts and drive pinion in place during cranking. The ability to rotate a pinion at a controlled speed while it is pressed tightly against a ring gear, is what makes the 39MT's soft engagement different. Extended cranking can easily overheat this solenoid, because it consumes over 3,000 watts during pull-in and 400 watts during cranking.

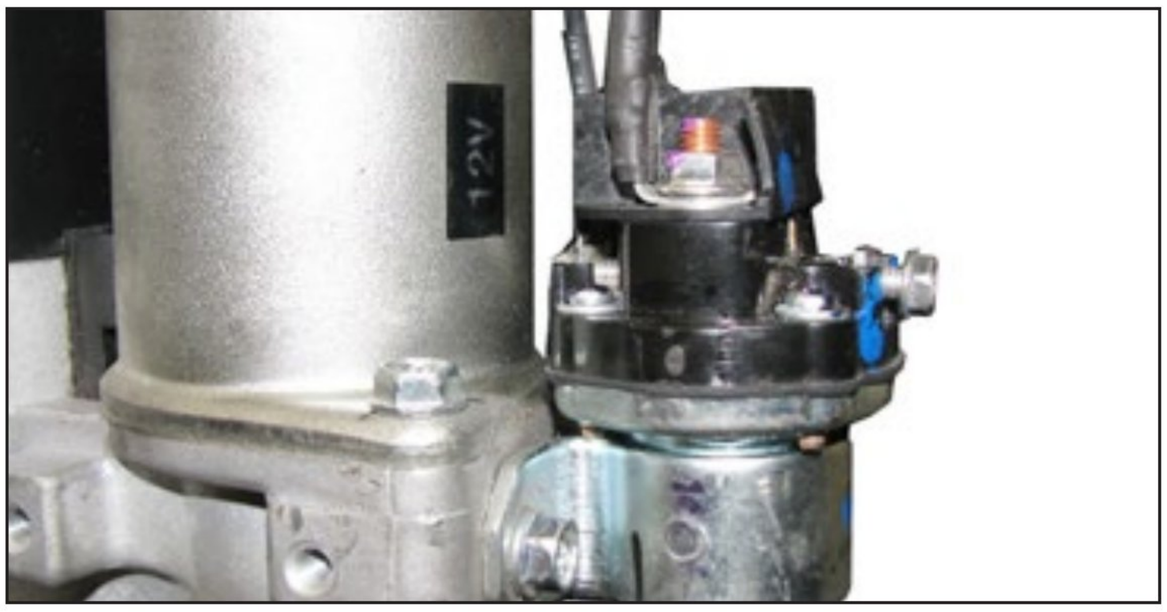


Figure 8—Once considered an option by Delco, the Integrated Magnetic Switch (IMS) Relay should be used in all applications.



Figure 9—Permanent thread-locking compound must be heated prior to removal of the through bolts during disassembly.

IMS Relay

All generations of 39MT DE housings provide for the mounting of Delco-Remy's Integrated Magnetic Switch (IMS) Relay (*see Figure 8*). However, this relay was initially considered an option by Delco-Remy. That decision was probably based on the many applications that already had a heavy duty start relay, hence thinking it not really essential. While many of the heavy duty start relays commonly used with 42MT may have been rated to handle 300 amps intermittently, the wiring circuit was another matter. In most cases it was not. The rebuilding community figured this out pretty quickly when customers began showing up with 39MT start problems. More than one 39MT application was retrofitted to a 42MT, because it came without the IMS relay. Delco-Remy responded with recommendations to install the relays in all applications and now includes the relay as a standard part on every new 39MT.

Through Bolts

The external through bolts on all Delco-Remy 39MT starters are installed at the factory with a permanent thread-locking compound. We strongly advise that you apply heat to the housing before attempting to remove these bolts (*see Figure 9*). Loose through bolts have been a common problem with this starter, and we strongly advise using a good thread locker when you reassemble one.

While on this subject, there is another tip that we would like to share for those who missed the 39MT seminar that was presented by John Kaiser of the Ryder Rebuild Center at the 2014 ERA EXPO in Atlanta. As mentioned above, loose

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through bolts have been causing an ongoing problem with the 39MT. At Ryder, they tightly seat the commutator end (CE) frame and field housing onto the DE housing assembly before the final tightening of the through bolts (*see Figure 10*). Other rebuilders who are doing this have confirmed that it is an important step. Delco-Remy's torque specification for the through bolts is 7.7-9.8 Nm or 68-87 in-lb.

Brushes

Initially Delco-Remy used different brush formulas for 12 volt and 24 volt starters, and the aftermarket followed suit. Since then, Delco-Remy changed this to use the same brush compound for both voltages. We are aware of some production rebuilders who were using the 24 volt brush in 12 volt starters before Delco-Remy made that change, because of overheating problems with the 12 volt brushes. Based on this, we recommend that the new 12-24 volt brushes be used in all applications.

Pinion Removal

One rebuilding problem that the 39MT posed was finding an easy way to remove the pinion gear. Something or someone is required to hold the drive in the extended position to remove the



Figure 10—We recommend seating the CE housing tightly against the field case and DE housing prior to final tightening of the through bolts during re-assembly.

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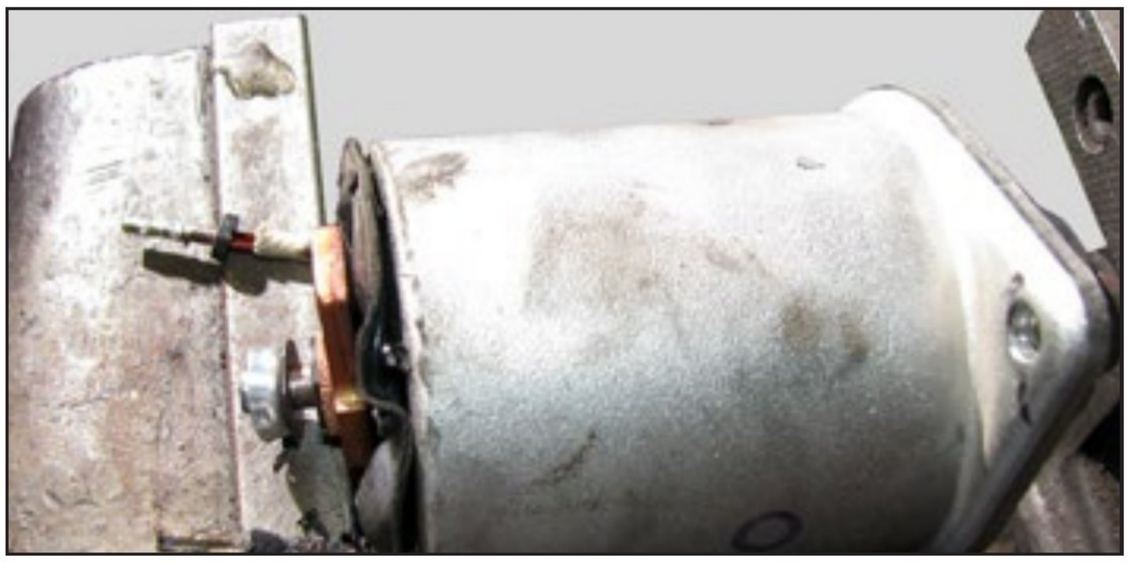


Figure 11—Compress the moving contact spring in a vise to remove the collar and the clip holding the contact.



Figure 12—Remove the clip, collar, insulators and moving contact from the contact rod. This will release the plunger from the solenoid.

snap ring and collar holding the pinion. Two hands simply are not enough. Dean and Mike Conner of Conner's Repair Service in Morgan City, La., came up with a simple tool that can be made in 10 minutes using a 39MT solenoid core and a tap.

Simply remove the solenoid's cap and use your vise to compress the plunger while holding the moving contact (*see Figure 11*). Remove the clip, collar, insulators and moving contact from the contact rod (*see Figure 12*). Remove the plunger and discard the springs. Lock the plunger in your vice with the contact rod facing up, and use the tap to cut threads on the rod (*see Figure 13*). We used a 6mm tap, but a 1/4-28 will also work. A large flat washer and nut are all that is needed to complete this inexpensive tool (*see Figure 14*). When this device is mounted on the starter, you can

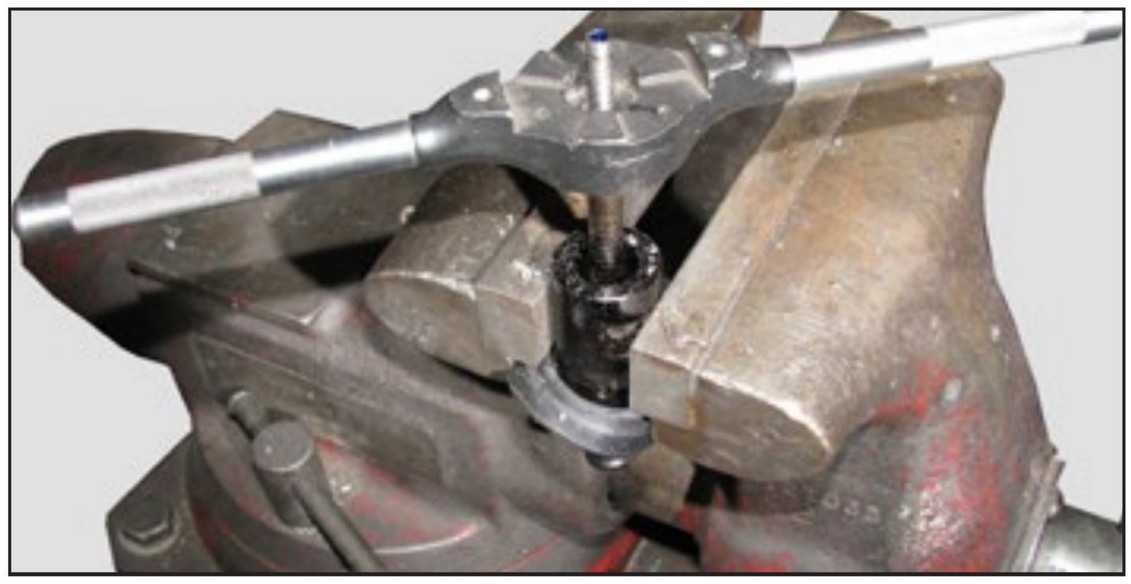


Figure 13—Hold the plunger in a vise and cut threads down the rod until the shaft steps to a larger diameter.

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simply tighten the nut to extend the drive. You will find a video on the ERA's website which shows how to make and use this tool.

Like many planetary gear starters we have seen in the past, the 39MT utilizes blind splines on the drive shaft to limit drive travel (*see Figure 15*). Note that the splines on the shaft alternate between open and blind (closed). To remove the drive clutch from the shaft, you must first remove the C-clip behind the drive clutch (*see Figure 16*). This will permit the drive to slide back off the splines and be rotated to an open spline for removal. When re-installing a drive clutch, it is imperative that you ensure that it is on a blind spline before replacing the C-clip. If a starter is assembled with the clutch on an open spline, it will perform normally on your bench. However, it will fail within a short time once it is installed on an engine. The likely result will be a broken drive end housing and a bell housing full of drive and starter parts.

Special thanks to Ken Plourde, owner of Guy's Electric Service in South Windsor, CT for providing some of the photos and information we have assembled here. There are two videos on the ERA website about 39MT starters which were filmed in his shop.

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Figure 14—The large flat washer and nut complete the tool. You can now install it on a starter and tighten the nut to extend the drive for pinion removal.

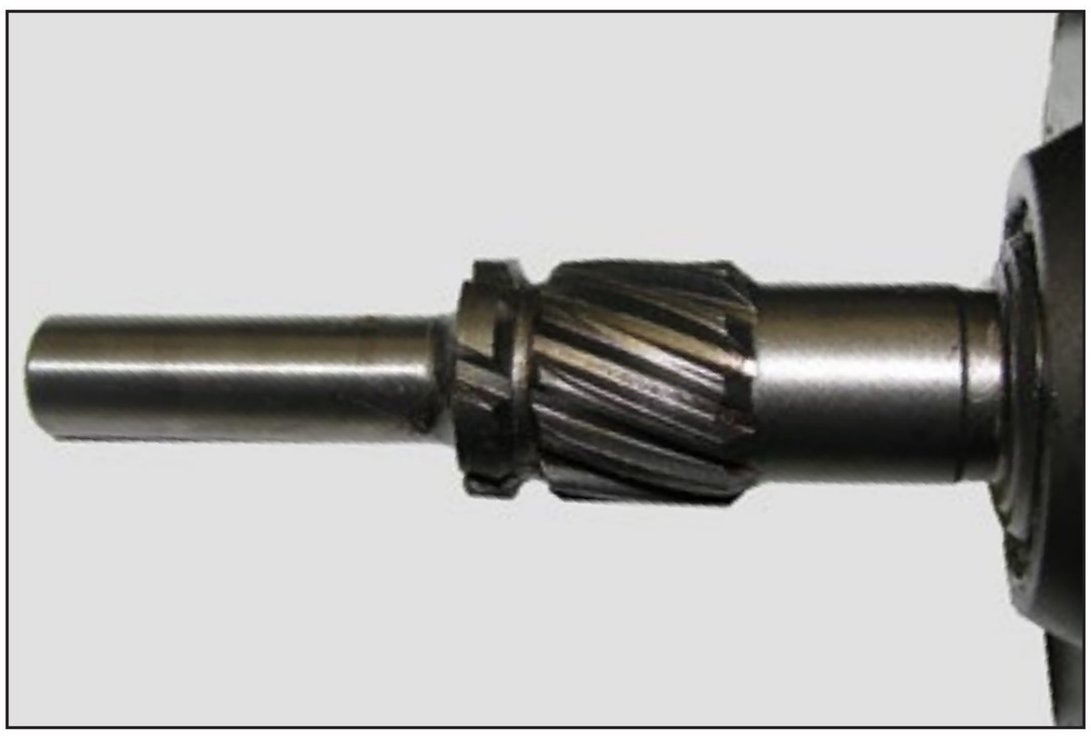


Figure 15—Note that every other spline on the 39MT shaft is blind. The drive must be on a blind spline when it is reassembled.

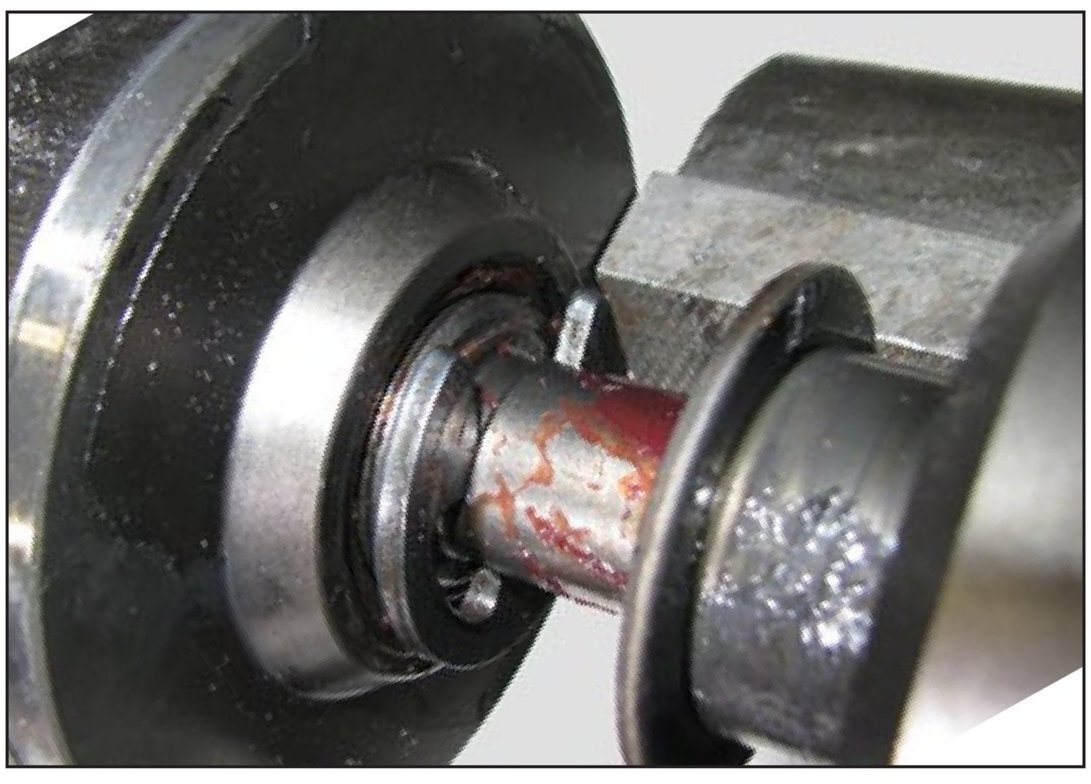


Figure 16—Note the C-clip behind the drive. It must be removed before you can rotate the drive clutch to an open spline for removal during dis-assembly.

CONRAD'S CONUNDRUM
Ford F450 with intermittent start



BY CONRAD KOBER

Detailed here is an actual repair incident encountered, along with the solution that solved the problem. My intent is to share this information so that together we can learn and improve our diagnostic skills. Hey, have a great day!!

VEHICLE: 2005 F-450 Super Duty 6.0L

PROBLEM CLASSIFICATION: Battery, Instrument Cluster

OBSERVATION: Intermittently the vehicle will crank but not start. When this happens, it has been observed that the engine appears to be cranking with sufficient speed. Also, when this happens, the instrument cluster gauges do not function. Furthermore, when the ignition key is cycled and the instrument cluster gauges do sweep, the engine will start. The vehicle has just arrived for repair after several weeks of this problem occurring at the most inopportune times. The first start this morning was fine, but the vehicle stalled while leaving the yard. Then the vehicle cranked and would not fire. In attempting to start the vehicle, the batteries were run down. The vehicle was boosted, and it started fine. The customer charged the batteries for one hour and drove the vehicle to our service facility.

TEST RESULTS:

- Vehicle starts fine
- Ignition switch inspected. Okay
- Both AGM batteries tested. Passenger side battery does not pass the Midtronics conductance battery test. It indicates to be low but not faulty
- Charge battery and test. Okay
- Check charging system. Scope alternator output. Phase problem indicated
- Replace alternator. Okay

continued on next page ...

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DISCUSSION: The observation that the engine would crank with sufficient speed suggested that the battery voltage should be okay. Checking the system voltage when the vehicle arrived confirmed this. It was not until the batteries were tested that the problem showed itself. An inspection of the alternator revealed a rectification issue. In this case, the batteries tested fine after being recharged. However, checking Identifix has indicated similar issues requiring battery replacements. What is the relevance of the instrument cluster function observation? The instrument cluster gauges observation was not quite as indicated. These gauges do not sweep on start up as was suggested. However, the gauges will sweep if the instrument cluster is being reset. A reset will occur if the battery voltage to the cluster has dropped too low.

CONCLUSION: Intermittent engine starting issues can be an indication of a variety of problems. Test the batteries and charging system before proceeding with further tests. Even if the engine appears to be cranking initially with sufficient speed, this is not enough of an indication that sufficient voltage is present to fire the diesel engine. This vehicle has been back in service for several weeks now. The problem has been solved.

Conrad Kober is an auto-electrician at Roko Service Ltd., Vernon, British Columbia, Canada.





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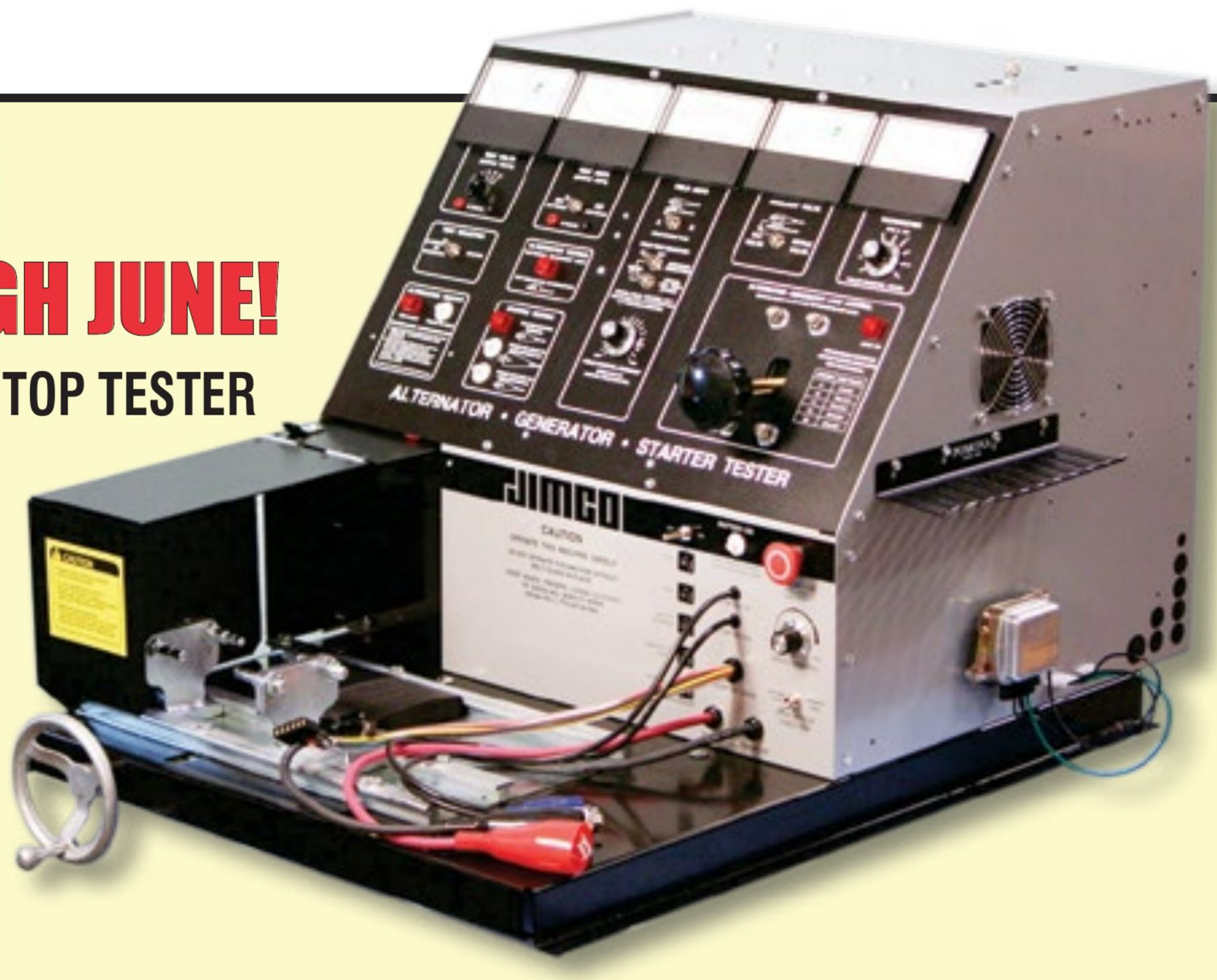
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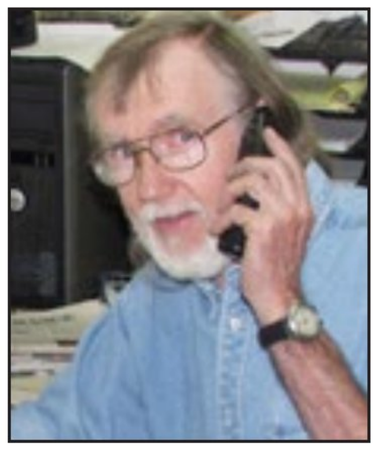
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