ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

September 2020 $12.95

AUTO ELECTRIC CORNER
Bcm Brake Light, Pulling Denso Bearings & Scarce Mahle Starter Parts

WHEN IT HAPPENS TO YOU
A “Brush” With Danger

TECH TIP — PM ENHANCED ROTORS
Polarity Matters

ONE REGULATOR – TWO PLUG CODES
Accidental or OEM Curve Ball?

TECH TIP — TRANSIENT VOLTAGE SPIKES
Unique Problems Solved

Electrical Rebuilder's ERA FOUNDED 2001 ASSOCIATION

A WORD FROM THE PRESIDENT
We Need You!



This month, I am requesting your help with my goal of upgrading our current ERA website. Many of you who use this resource already may have noticed or used some of what has been upgraded already. Currently we are working diligently on bringing back the "search" feature that we had lost due to a transition process. This feature unfortunately slipped by us three years ago. And we, the Board of Directors, are working to bring it back.

The vast amount of technical information on our website is useless if you or I cannot find what we are looking for with a minimal amount of effort and time. Our goal is to have this project up-to-date by the beginning of 2021. Our other current project is upgrading the website's 30-day trial guest member web pages to allow a guest to see more of what the ERA has to offer than what is currently available for them to view now. I, along with the Board of Directors, felt that we needed to provide more of a look at what we have available, rather than a page saying, "To see this, you need to join the ERA".

I, along with the Board of Directors, have noticed that membership growth has become stagnant. We all agree that for our association to survive and be successful, we need to be proactive in bringing new members in and retaining our current membership. Now is the time for you to help us with our website upgrade project.

Here is your homework assignment to all members: Log into the ERA website home page and on the top tool bar, click on "My Account." This will bring you to a page where you will need to enter your username and password then click on "log in." That will take you to a page that has the current information that we have for you and your business.

Please review it, add or correct all of the requested information boxes on these two pages. If you make any changes or corrections, please remember to hit the "save" button when you finish. This will ensure that the information on your account is up to date. This is very important for you and your businesses because this page is what steers business your way by either one of your fellow members or someone visiting the ERA homepage through the "Find an ERA Member" feature. It will also notify the ERA office of any changes so that they can correct their records. You will receive an email by the end of this month to remind you to complete this task.

Next month, I will give you another assignment to review and make corrections or adjustments to the ERA Forums Member Control Panel page. This instructor does not tolerate any excuses for not performing your homework. "My dog peed on my laptop" or "my spouse smashed my desktop PC with a hammer because I was spending too much time on the computer" doesn't cut it with me. Believe me, I have heard them all. Your help with this simple and non-time consuming task will greatly help with our ongoing project.

Ken Plourde

NEW ERA MEMBERS

Roy Supply Co., Inc.
Belle Chasse, Louisiana
Recruited by Jimco 2.0

M&M Staffing
Stockbridge, Georgia

ABOUT THE COVER

Popular Denso regulator plug with a proliferation of Plug Codes

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Rebuilding *is* Recycling!

INDUSTRY NEWS

& ANNOUNCEMENTS

Romaine Electric Opens Northeast Warehouse

Romaine Electric has opened a full service warehouse in Winchester, Virginia to better service customers in the Eastern US. Northeastern Sales Rep Steve Saine has been visiting rebuilding shops throughout the area since they opened the warehouse. If he has missed your shop, give the warehouse a call at 833-994-1251 to invite him to stop by.

The Winchester location is fully stocked (*see Figure 1*) and orders can be placed online using Romaine Electric's website, romaineelectric.com or by calling them.



Figure 1 – Romaine has it in Winchester.

CORRECTION

In last month's issue, *A Tale of Two Armatures* contained several errors. The first was misnaming one of the armatures as 1989 throughout the article. As some readers pointed out, the correct Lester number is 1889.

The second error was using the same D&V test data for both armatures in Figures 3 and 4. While the power consumed kW numbers in Figure 3 were correct for the 1898 armature, the rest of those test results were actually from the 2204 armature. Below we have reprinted both charts (*Figures 3 and 4*) with the correct data and Lester numbers.

In addition, as one member noted, these armatures fit 20MT, 22MT, 25MT and 27MT starters, not just the latter two.

We apologize for the confusion that this caused readers. Although not really an error, it is worth explaining how a D&V tester operates to get this information, which is backwards of how the starter cranks an engine. The tester powers the starter with no load until it reaches its free spin shaft speed. At that point it begins to apply load which is increased until the shaft speed gets close to a stall. Thanks to Mohammad Samii for being the first to notice the errors and for explaining how the tester operates.

Test **1998**	Speed [RPM]	Current [Amps]		Voltage [Volts]	Torque [Nm]	Power [Watts]	Efficiency [%]	Trq. Const. [Nm/A]	Voltage Drop [Volts]
1	2501	454	**2482**	8.38	7.62	1994	52.3	0.0167	0.01
2	2001	523	**2870**	7.81	9.83	2058	50.3	0.0187	0.01
3	1499	611	**3361**	7.11	12.68	1990	45.7	0.0207	0.02
4	999	707	**3929**	6.35	15.83	1655	36.8	0.0223	0.02
5	749	759	**4162**	5.94	17.70	1387	30.7	0.0233	0.02
6	599	787	**4292**	5.70	18.65	1169	26.0	0.0236	0.02

Figure 3 – D&V test results using the 1898 armature.

Test **2204**	Speed [RPM]	Current [Amps]		Voltage [Volts]	Torque [Nm]	Power [Watts]	Efficiency [%]	Trq. Const. [Nm/A]	Voltage Drop [Volts]
1	2501	454	**3804**	8.38	7.62	1994	52.3	0.0167	0.01
2	2001	523	**4084**	7.81	9.83	2058	50.3	0.0187	0.01
3	1499	611	**4344**	7.11	12.68	1990	45.7	0.0207	0.02
4	999	707	**4445**	6.35	15.83	1655	36.8	0.0223	0.02
5	749	759	**4508**	5.94	17.70	1387	30.7	0.0233	0.02
6	599	787	**4485**	5.70	18.65	1169	26.0	0.0236	0.02

Figure 4 – D&V test results using the 2204 armature.

ERA Heroes

ERA members who generously contributed to the financial well-being of the Electrical Rebuilders Association during the Covid-19 Pandemic of 2020.

Thank You

A-1 Base
A&J Transport
ACC Rebuilders Inc.
Action Alternator & Starter Inc.
Adema Alternator & Starter Service
Allstart Auto Electric, Inc.
Alternator Specialist
Alternator-Starter Service
Apptrak Computer Software
ASI Rebuilders
Battery Exchange
Big Moe Rebuilders
BPS Cores
Buckeye Auto Electric
Bud's Starter & Alternator Shop
C.C. Battery
CAE Pullers
Central Automotive Electric
Chic Armature
Churubusco Auto Electric
Clay's Repair Shop
Dakota Battery
Del-Ray Electrical Rebuilding
East Orlando Remanufacture Corp.
EK Auto Electric
Foxon Alternator & Starter Rebuilders
George J. Hust Co.
Guy's Electric Service
Hagemeister Enterprises
IMI Performance Products
J&E Automotive
Joe's Electric
John's Automotive Electrical
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Just Parts
Kaestner Auto Electric
Karam Auto Ltd.
Linn County Machine
Mackey Auto Electric
Mahle Aftermarket
Martin Rebuilders
Martin Repair
Maysville Repair
Nightingale Auto Electric
Northern Mobile Electric
Phillip Hulsey
Piedmont Auto Electric
PLP Battery Supply
Regitar USA
Roggentien Electric
Roko Service
Romaine Electric
Ron's Alternator & Starter Repair
Sailon Auto Electric
Sammy's Auto Electric Service
Standard Starter Drive
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Stephanie Schroeder (ERA Exchange)
Taylor Auto Electric
The Auto Clinic of Mansfield
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White Springs Repair
Witmer's Electric & Automotive
YouTech Group

AUTO ELECTRIC CORNER — BCM Brake Light, Pulling Denso Bearings & Scarce Mahle Starter Parts



BY MOHAMMAD SAMII

Caught in the Hi-Tech World

A 2012 Chevy belonging to a local business (a sewer service company) was brought in for rear right turn signal and brake light (same filament) not working. We were tasked to repair it. This simple problem turned out to be a good learning experience and a valuable case-study, thus the reason sharing it with my readers here. The problem turned out to be not so simple at all and relatively expensive (about $800) to fix, indicating the proliferation of the electronics and chassis control in the newer generation vehicles (even a simple work van). We have moved into a new era, with literally with no end in sight.

A study of the expansive wiring diagram spread out in 3 pages (just for the exterior lights) showed the power to the affected circuit is not from any switch but from the Body Control Module or BCM (*see Figure 1*). All the other functions of the module were working fine. It was just not powering up the right brake and turn signal. Once the related pin on the BCM was located and powered up, we saw the lights coming on, indicating the lack of any wiring problem in between.

A BCM was ordered through the dealer which incidentally they had one on the shelf, but the story does not end there. This BCM is on the list of modules that require programming after installation, and that is simply a process to configure a new blank module for the options that were installed on that very particular vehicle as identified by the Vehicle Identification Number (VIN) and the RPO. Needless to say the programming and installation were competed and the van was fixed.

The company who owns a fleet of 8 of such vans called and told us they have a 2008 model of the same van (this one a GMC Savanna) which has the same exact problem, and possibly another van with the same issue…! A very odd coincidence but when we inquired what these three vehicles have in common, they said they haul the same trailer that is equipped with a hi-pressure power washer and pump used in their service work. It became clear the problem with the vans was most likely caused but some sort of wiring problems or short on this particular service trailer.

So the trailer was brought in and we located and repaired the wiring that had rotted out insulation which were bare and touching the frame as it went over bumps in the road. The second van was brought in and it too needed a BCM that again needed diagnostics, replacement, and programming. We are waiting for the third van to show up for the same problem, and I doubt if it will be any different than the other two (*see Figure 2*).

This seems to be the nature of the work these days as the old switches and relays are no longer the source of power and ground. The body electronics have taken over the function of powering accessories. We have no choice but to learn the realities of the work and the intricacies of the new systems these days, and try to keep up with it if we intend to stay in our Auto Electric business.

Denso Bearing Puller

Pulling Denso SRE bearings off of the SC-type alternator rotors, especially the newer ones where the bearing is surrounded by a ring, can be challenging. There are ways that it can be done with a little effort as I have shown at some ERA Trade Shows a few years ago. Of course each has his own way of doing it, but to make the operation go a little quicker and smoother, I came up with an alternative method that you might find interesting.

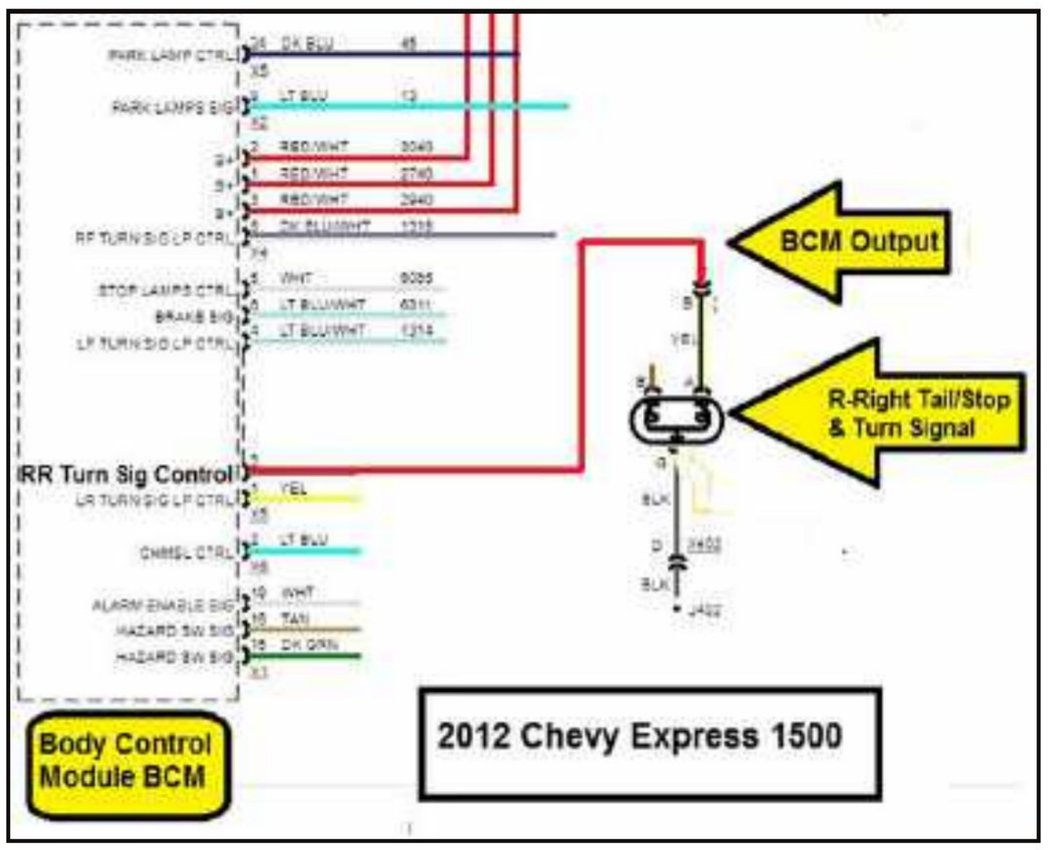

Figure 1 – 2012 Chevy Express tail light wiring (Abbreviated)



Figure 2 – The replaced BCM's for the lighting problem

I found this puller on Amazon for a mere $20 price (*see Figure 3*). It it is no longer available but exact type pullers are, at slightly higher prices. Their intended use is for pulling a harmonic balancer from the crankshaft. I used two 35mm OD bearings (Denso SRE) to make a symmetrical shape arrangement of sort (*see Figure 4*). Then I started grinding out the tapered end of the puller from 44mm down to about 41.5mm, and then ground out the tip (the grabbing part) a little to make it to fit in the



Figure 3 – Shankly puller on Amazon. Similar ones are available



Figure 4 – Using bearings to align the legs & making measurements



space between the rotor's bearing and built-in ring around it (*see Figure 5*). With a little support of the puller's legs, either by a C- clamp or the vise, it pulls the bearings out very easily. (*see Figure 6*)

If I had a 4-jaw chuck for my larger lathe and owned a vertical mill, and the skill to run it, the work could have been done a lot more professionally, but since I do not have either of those two items, the bench grinder with a new grinding wheel was my only available option. With a little caution and support, this thing is pulling out all kind of bearings with a 35mm OD, even a 24-SI rotor's bearing very easily and successfully.



Figure 5 – Ground out legs and jaws to fit around the bearing

I would like to mention that by no means is this a substitute for the professionally designed pullers, especially the ones made by CAE Pullers. A short video of it can be seen at their website (caepullers.com). Their



Figure 6 – Pulling out hard-to-grab Denso bearing



Romaine Electric
PRECISION PRODUCTS

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Connect to Original Wiring Harness and Penntex External Regulator

ROMAINE REPLACEMENT PennTex UNITS



Radial Mount

PX2RHP-240A
12 Volt, 240 Amp, CW
Denso Conversion
(Replaces: PX-2R SERIES)



Modular Mount

PX4VHP-240A
12 Volt, 240 Amp, CW
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Radial Mount

PX5RHP-240A
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Denso Conversion
(Replaces: PX-5R SERIES)

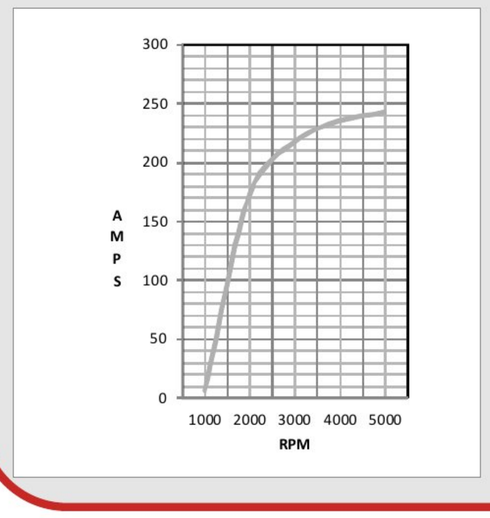


Modular Mount

PX520GHP-240A
12 Volt, 240 Amp, CW
Denso Conversion
(Replaces: PX-5GD SERIES)

170 Amps at Idle

RPM	1000	2000	3000	4000	5000
AMPS	6	173	217	235	242





All Models Have Moveable Battery Post



T-Mount

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Denso Conversion
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Leece Neville Design
(Replaces: PX-1300)

37-5032N
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Ford Design
(Replaces: PX-1055)



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1-800-426-5005

actual puller can perhaps be seen in the 2021 ERA Show at the CAE booth, along with their other fine pullers.

Hatz Engine/Mahle Starter…!

Hatz engines are small and efficient diesel engines that have been used on many industrial and construction applications worldwide. The Hatz Engine Company (Motorenfabrik Hatz), a German firm, has been building small diesel engines since the earlyn 1900's. In 1978 they opened a subsidiary as Hatz Engine North America which is located in Waukesha, Wisconsin. From there they oversee all distribution, service, parts, training, as well as some engineering and product testing for all of North America.

Recently we ran into a succession of requests for the Mahle MS140 (Lester 30253) starter that are used on some Hatz engines for various applications. For whatever reason, the issues with these starters are the drive assembly and worn out forks. While the OE drives are available, the shift levers are not, and neither is the brush assembly. Out of 4 units, we could only save and reuse one fork!



Figure 7 – Mahle MS140 starter for Hatz engine applications



Figure 8 – Worn out MSX-512 drive, new ones are available

This starter is available in aftermarket at about 1/3 the price of an OE one, but scarcity of the common OE parts and the price for what little is available moves rebuilders toward the cheaper aftermarket version when rebuilding it is not economically feasible.

Replacing the starter drive is a cumbersome process but can be done with a little patience and ingenuity. It is one of those with the hollowed gear that the snap ring and retaining cup are almost hidden inside the gear barrel. The complete OE starter from some equipment dealers is nearly $600, depending on what line of machinery it is used on. Thus an aftermarket version with a healthy markup may make for a very profitable sale.

Out of our many cores, with one drive replacement, we managed to make one complete unit to keep on the shelf, and if the recent trend is any indication, it will move very shortly. If you have calls for this starter, keeping one on the shelf can pay off well due to high dealer prices and the immediate needs of most equipment owners.

Well, that's all for this issue. Until I see you again, keep up the good work.

You can contact Mohammad Samii by email at: sammyselectric@sbcglobal.net, or by calling the ERA Tech Help Line at 636-584-8324



WHEN IT HAPPENS TO YOU —
A "Brush" With Danger



BY MOHAMMAD SAMII

I suppose it does not make much of a difference if a rebuilt unit of yours fails on a customer's vehicle or on one of your own vehicles. The results are nearly the same. Depending upon when and where the failure happens and if there are additional expenses such a towing, lodging, reimbursement - it is always an unpleasant ordeal and seldom are the results anything to be happy about.

Now if the failure has nothing to do with the quality of your work, and has occurred because your trusted supplier has changed its source, and the new batch of parts have not been field-tested and were sold as they arrived, then the problem takes a different twist and the frustration level jumps sky high. The incurred losses or resulted inconvenience makes you feel differently toward the same supplier and your trust in them goes out of the proverbial window.

Now here goes my story. In our rebuilding process in my business we replace brushes on Denso alternators, relying on the quality of the OE's brush-holder, and install aftermarket replacement brushes. This has worked well for us for many years right from the beginning and on literally many hundreds (if not well over a thousand) Denso alternators successfully. Then one day the problem showed its ugly head. We started getting back our recently rebuilt Denso alternators with brushes that were worn out in a very short period of time, like a few weeks or just a very few thousand miles.

A thread of discussion on the ERA Forums showed that we were not the only ones who had this problem and best as anyone who tried, there was no acceptable response from the well-known supplier. We realized that we had used a pack of fifty of such brushes, thus had 25 units either sent out, installed by ourselves, or still sitting among the finished stock on the shelf…!

I believe in total, we could account for about 10 of them that failed shortly during our one-year warranty. Luckily only two required full reimbursement as they failed when the customers were traveling. The rest were local cases that replacing the alternator (or putting better brushes in them) solved the problem without losing much face or creating irate customers. Then the last one showed up unexpectedly in our own 2006 Chrysler Town & Country, using a 13870 alternator!

I had bought this van in 2015 from the widow of a deceased friend of mine who no longer needed it as her own new Camry was all she could use. It was and still is a well maintained clean vehicle with only 80K miles and new tires. When I bought it we found issues with slightly leaking water pump that was replaced, and we also replaced the OE starter and alternator to make it more reliable as the fear of clutch pulley failing at that vintage was a serious issue then. It was and still is a spare vehicle, mostly kept in storage but occasionally used by my family if there are more than two or three adults (and children) traveling or bigger items needed to be hauled that do not easily fit in any of our other cars. The seats are easily removable which makes for a good size cargo space.

One Friday evening in late Fall of 2018, my wife and our two grown daughters (one 7 months pregnant) were going to Chicago to drop some stuff off to our son in Batavia, IL, then stay in a hotel that was hosting some sort of workshop/ conference that they were going to attend for the weekend. So driving the van was a logical choice.

Around 8 PM I got the dreaded call that the battery light is coming on and going off sporadically. They were about 50 miles away from our town on I-57 heading toward Chicago, another 85 miles away. I could only guess (correctly as I determined later) what had happened as those pesky brushes were wearing out and disabling the alternator. I told the family to pull off at the next exit and stop at a first convenient place then call me to investigate the options. The van completely died a short distance from the Exit…!

There were not many options that late on a Friday night, so I decided to take a new battery, flashlights, tools, and testers, in another car (my wife's 2014 Toyota RAV-4), head on toward where they were, swap the cars and send them on their way. I planned to change the battery, and return home, hoping to make it back with the new battery, and that is exactly what I did!

I jump-started the van to make sure would start. It did. We swapped the cars, put all of their stuff tightly in the RAV-4 and sent them on their way. I walked back to the van to make my battery replacement, secure the hold-downs temporarily and get it ready for the trip back home.

As I tried to finish up the battery installation and get going, I could not help the thoughts that were raging through my head. Here I am, a 75-year old man (then, 77 now) with a known heart problem, changing a battery on the side of an Interstate highway at 10:30 on a cold Friday night, while the wind generated by the cars and semi's passing by pushed my body almost to the point of falling over. It was late November and we live in Illinois...! I was lucky there was not blizzard that night. It was cold enough and certainly unpleasant changing a battery on the ramp of Exit 283 (Gilman, IL) on I-57. In my mind, I was thanking my supplier for the quality brush they had sold me, ironically to improve the reliability of the van, knowing that my family would be using it occasionally.

Tailgating some trucks on the way back home and sporadically turning the headlights off to save battery power (totally illegal), I made it home and parked it in the shop to be repaired the following Monday. Teardown of the alternator showed; you guessed it, no surprise…worn out brushes. I hoped that this would be the last of the batch of 25 that I will ever see, and I admit now almost 2 years later, we have not had another one of our Denso alternators returned with worn brushes.

Anytime I go toward Chicago and pass that Exit, it reminds me of that dreadful night struggling to change a battery and make it home because of a failed alternator that I had replaced to make the van more reliable and trip-worthy! Go Figure.

ONE REGULATOR – TWO PLUG CODES
Accidental or OEM Curve Ball?



BY BOB THOMAS

When I received a call from ERA member Merlyn Martin about a Denso alternator (101211-1100), it was difficult to accept what he was telling me. He claimed that there were two different voltage regulators for this alternator. To add another twist, he said that both of them have the same part number – 126000-2490. Martin is the owner of Martin Repair LLC in Goshen, IN. The machine that he was working on was a Bobcat walk-behind mini loader, model MT-55.

The difference between the two versions as he described them was their plug codes. The current aftermarket alternator (Lester 12337) and regulator are plug code 318, which is D-IG-L. But the current OE Denso alternator and regulator seem to have a sense terminal in place of the lamp terminal, which makes it a D-IG-S. Bobcat's walk-behind loaders have a voltmeter on the panel (*see Figure 1*) and do not have a charge lamp.

This same alternator was used on other Bobcat equipment with Kubota engines that do use the L terminal. All references on supplier websites, and various application databases describe this alternator as having an L terminal. But there was some strong evidence that the same alternator had an S terminal on Bobcat's walk-behind loader applications. Martin's diligent documentation seemed to confirm his story, as bizarre as it seemed. He sent me a charging system diagram from Bobcat's MT-55 service manual (*see Figure 2*) along with a page showing a photo that explained each connection in the harness going to the alternator, including a reference that the third terminal was "sense" He also confirmed first hand that the MT-55 and MT-52 both have B+ going to their third plug terminal.

Martin had worked on several of these machines and discovered that the aftermarket alternator could not be used unless he cut the B+ sense wire. If not, the IG terminal turned the alternator on and it charged. But the B+ sense wire prevented it from turning off when the machine was shut down. Then overnight, it drained the battery. Aftermarket 12337 alternators (with 318 plug code) could not be used on the walk-behind loaders.

Martin found that new OE Denso alternators functioned properly on these machines. His call to me was in frustration of trying to find an aftermarket regulator to rebuild a core. The cost of the OE regulator was nearly as much as the complete Denso unit.

Upon hearing his story, I contacted Gene Kaiser at



ONE REGULATOR – TWO PLUG CODES



Figure 1 – Instrument panel with voltmeter on a Bobcat M-55 walk-behind loader.

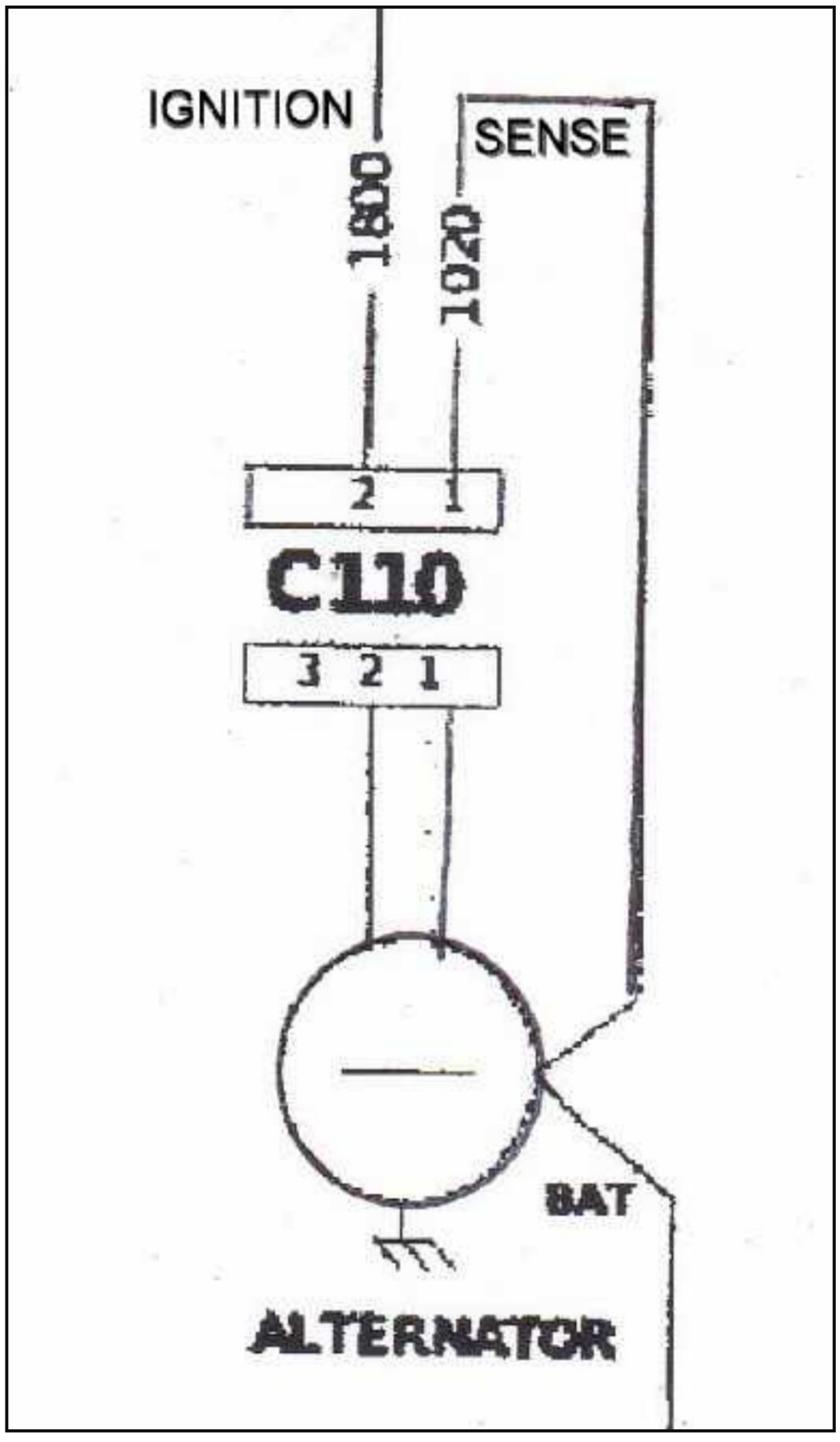

Figure 2 – Charging system diagram for Bobcat MY-55 walk-behind loader.

at Regitar USA to see if they had a regulator that might work in this application. I learned that up until that point, Regitar had no knowledge or record of any such regulator of this size and plug type. But Kaiser was less skeptical of Martin's story and told me that he had seen OE suppliers do similar things before.

Without a new part number to tip them off, it was nearly impossible for the aftermarket to know that a different regulator was being used. Kaiser offered to custom build what Martin needed.

Within a week, Martin had a prototype regulator and the following weekend his son Nelson put it inside their rebuilt alternator and installed it on his customer's machine. It functioned normally, just like the new OE unit had and it did not drain the battery. I shared that news with Kaiser who began the process of assigning it a Regitar part number, which is VRH2005-2490.

I asked Nelson to get me the number on the regulator inside the new OE unit he had just removed. I wanted to know if perhaps it might have a different part number. But his answer was "no". It was 26000-2490 – which appeared to have two different plug codes, depending upon the application.

Since the D-IG-S plug code did not yet exist either, we contacted Dan Bell at Whatcom Electric, in Bellingham, WA. They created Apptrak and share their plug code database with ERA members on our website. Tony Snyder, who oversees the plug codes assigned it a tentative alternate plug code 571 (*see Figure 3*) and entered it into their system with an explanation to warn rebuilders of potential problems.

Whatcom Electric buys direct from Denso, so Snyder called their rep for an explanation. What he received was a confirmation that this alternator and voltage regulator is now and always had been an L terminal unit. They denied the existence of this regulator ever having an S terminal.

The known facts were: Denso was insisting that their alternator was L terminal. The machines in question have a sense wire in the plug. Martin's only problem

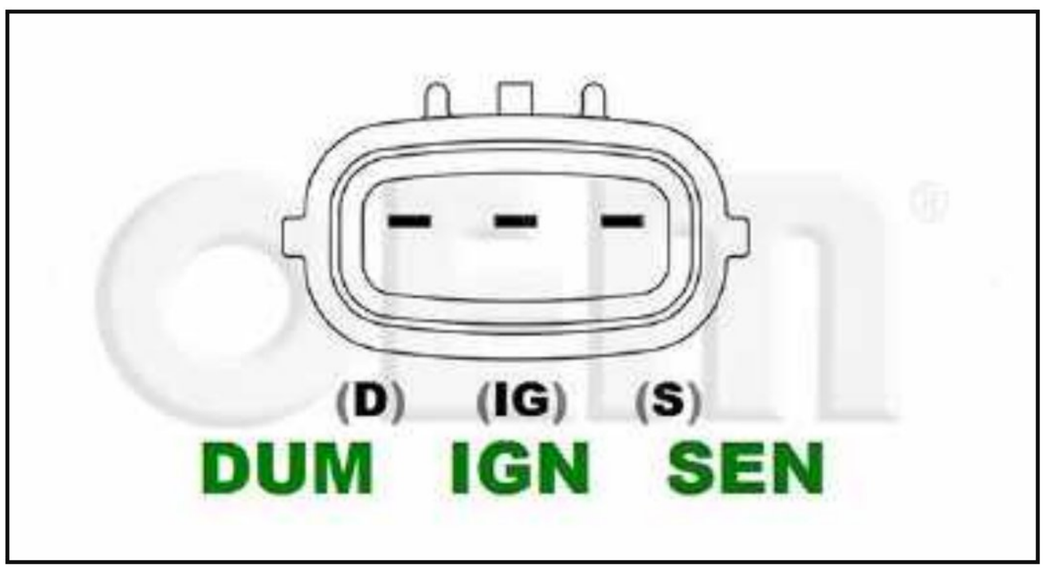

Figure 3 – New plug code for alternators on Bobcat equipment with voltmeters in lieu of a charge warning lamp.

with the aftermarket alternator was that it failed to turn off when the engine was shut down. Yet few problems were being reported by other customers.

I purchased an OE alternator to test, seeing that as the only way to explain the anomaly. Upon opening the box I noticed something that seemed peculiar (*see Figure 4*). The label on the unit lacked a plug code, something that we expect to see on Denso alternators.

I tested it using a charge lamp connected to the third terminal and it performed normally, turning the lamp off and charging at 14.3 volts. I tested it again with no connection to the third terminal and it charged at exactly the same voltage. Then I put four 100 ohm resistors in series, connecting one end to the third terminal and the other end to B+ with a DVM in parallel to read voltage drop. The 400 ohms of resistance dropped the sense voltage by 1.48 volts. This should cause an S terminal regulator to compensate by about 1.5 volts, but instead it held steady at 14.3 volts. I also disconnected power from IG after stopping the alternator and there was no battery drain with power on the third terminal. As a final test, I rechecked the alternator using a charge lamp. It charged at the same voltage and the lamp went out.

Denso was telling the truth about their regulator. It is an L terminal, not an S. Bobcat has one alternator that can be installed on either machine, with a charge lamp or a voltmeter. The sense wire in their harness serves no purpose that I can explain. Martin's initial fix, cutting the sense wire at the plug, turned out to be an appropriate solution after all.

Very special thanks to Merlyn and Nelson Martin for discovering this anomaly, conducting an investigation and sharing their results, especially Nelson who did all of the R&R work of swapping and testing the alternators on his own time over a weekend. Thanks also to Regitar USA and Gene Kaiser for once again coming through with a regulator to solve Martin's immediate need. And thanks to Dan Bell and Tony Snyder at Whatcom Electric for posting a warning and explanation in their plug code data.



Figure 4 – No plug code on the Denso label.

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TECH TIP — PM ENHANCED ROTORS
Polarity Matters



BY DARIO AGUILAR

I learned a valuable lesson recently and would like to share it with my fellow ERA members. The alternator was a 180 amp Valeo unit, quite common on some Mercedes Benz models with diesel engines, as well as Sprinter/Dodge/Freightliner vans and Jeep Grand Cherokees – all using 3.0L V-6 turbo diesels. Model years ranged from 2007 to 2015. Valeo's part number is FG18S056 or Lester 11306. My alternator had been removed from a 2010 Mercedes 350. It came in not charging and soaked with engine oil, something that I had seen previously on the same unit removed from other Mercedes cars.

As you might probably guess, the brushes and slip rings were damaged beyond repair (*see Figure 1*), but everything else checked fine once we cleaned it thoroughly to remove all of the oil. I changed the sip ring assembly and installed a new voltage regulator. But when I tested it on the bench, I could only get about 120 amps out of it. Normally I had been seeing close to 200 amps on one of these units, so I knew that something was wrong.

I called a rebuilder friend to seek some advice, feeling that the permanent magnets built into this rotor may have something to do with the problem. Normally, polarity does not matter when changing slip rings on a rotor, meaning that you can connect either end of the coil to either side of the slip rings. But when you have permanent magnets in the rotor to enhance output, I learned that you have to insure that the coil and magnets are working together, not against one another.

My friend suggested using a compass to check my problem rotor (*see Figure 2*). I placed the compass on the rotor to check the direction of the magnets. Then I applied 12 volts to the slip rings in the same polarity as the regular used. When I did this, the compass needle swung around almost 180 degrees. This proved that the leads were connected backwards. I had replaced slip rings twice before with this same unit number, and never had any problems. But as my friend pointed out, if you don't check polarity you still have a 50-50 chance of getting it right anyway. I guess that my luck ran out on the third one!

The solution for me was to remove the slip ring assembly and rotate it 180 degrees to make it right again. But what about the next time? The solution to prevent this from happening again is simple. Whenever you have to change slip rings on a rotor with permanent magnets, remove one coil lead first and then check to see which slip ring is still connected to the coil using a simple continuity test. Mark the rotor coil lead and the slip ring that is still connected. I simply used + and – to represent the corresponding brushes on the voltage regulator (*see Figure 3*).

I hope that you will remember this when you run into a rotor with magnets built in. I know that I will.

Dario Aguilar is the owner of East Orlando Remanufacturing Corp. in Orlando, FL.



Figure 1 – Damage to slip rings from leaking oil.

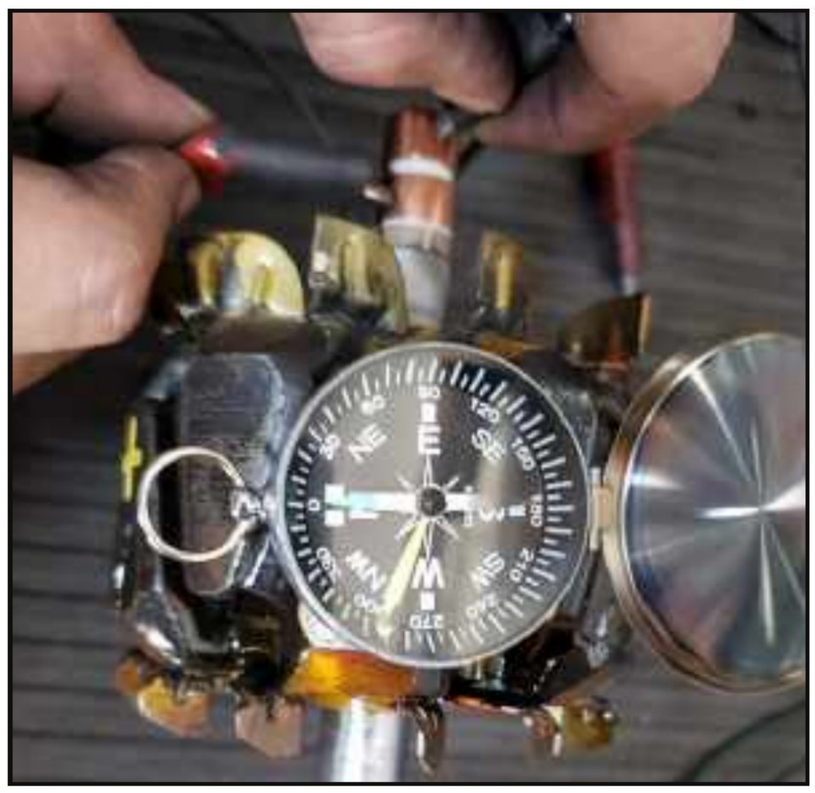


Figure 2 – Testing the alignment of permanent magnets in the rotor using a compass.



Figure 3 – Mark the slip rings and the rotor to insure correct orientation.

TECH TIP — TRANSIENT VOLTAGE SPIKES
Unique Problem Solved



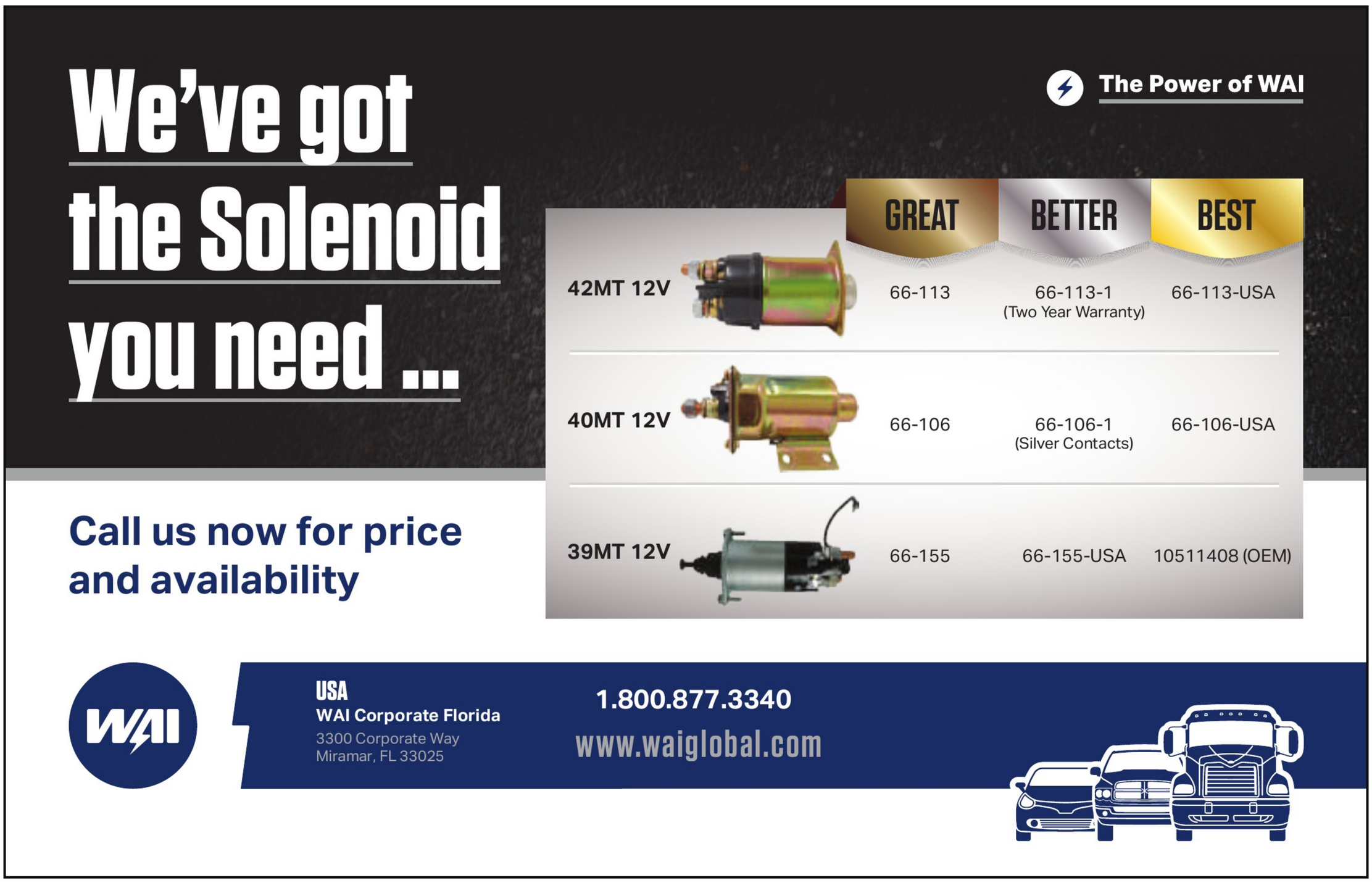
BY DWIGHT DERSTINE

A few months ago I got a cll about a 10DN alternator that the customer uses to charge batteries. Picture a 10DN mounted to the floor with positive and negatives leads coming from the alternator. These leads are 10 gauge insulated wire with alligator clamps on the ends to clip onto the battery posts. The batteries are usually a lead acid deep cycle type of some kind (Interstate Battery part# SRM-24 or something similar) but they are using lithium ion batteries more and more.

The batteries are used to power their LED lights and blinkers on the customer's horse-drawn buggies after dark. So they don't have a huge load but they do need to be recharged after a weekend when they are on the roads going to church. This 10DN is belt driven from their diesel powered line shaft that also powers their shop equipment. They start working in the shop at 5:30-6:00 AM, so the line shaft is spinning for 9 to10 hours per day. After they take turns charging five or six batteries, the alternator has nothing to do. So they either unhook the belt that powers the 10DN or more often they just let the leads lie on the floor - where they may get kicked, stepped upon or even touch together.

I should also mention that this alternator is set up with a rheostat so it can either charge in manual mode (which is adjustable by turning the dial to vary field current) or in automatic mode using the self-exciting regulator attached to the outside. The customer said that automatic is what they normally use and the regulator on the alternator was bad when it arrived.

I installed a new regulator (J&N 230-12071), tested it and returned it to the customer. Three months later he returned with another blown voltage regulator. I believed that their habit of leaving unused "live" charging cables on the floor was destroying their regulators, but the customer was hesitant to believe me. So I consulted a friend, Bob Thomas, who has been writing for the Exchange since I joined the ERA. I wanted to know if he thought I was on the right track and if not, what could be done to improve the reliability of this setup.



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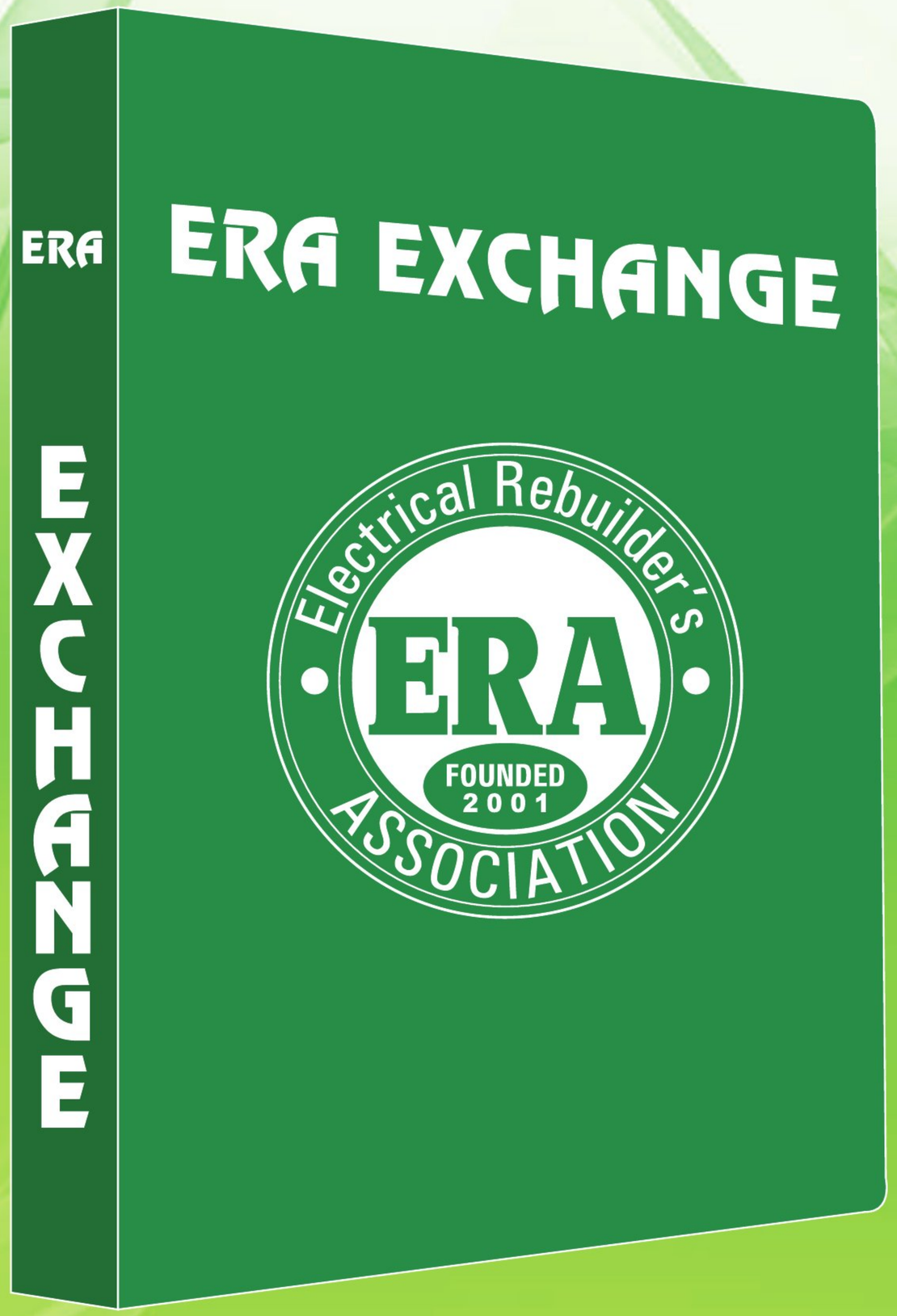

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Bob explained to me what he believed was damaging the regulators. It was disconnecting a battery while the alternator was still charging it. He emailed me a copy of an article on transient voltage spikes and he told me that my customer must have a way to turn the alternator off before disconnecting a battery. The main problem was the customer and the question of whether or not they would do it.

Working together, we came up with a solution. I set up common household light switch in a box and wired it between the regulator's field wire and the alternator's field terminal (*see Figure 1*). Bob suggested that I install a resistor across the switch terminals to allow a tiny bit of field current to flow continuously. This would prevent any unwanted voltage spikes from occurring when the switch was opened, as switching the field circuit abruptly might damage the new regulator. I ended up using a 310 ohm resistor for that (*see Figure 2*), because I already had one of those on the shelf.

The true test will be an on-the-job test and will they always remember to turn the alternator off before disconnecting a battery?

Dwight Derstine is the owner of Maysville Repair in Apple Creek, Ohio.

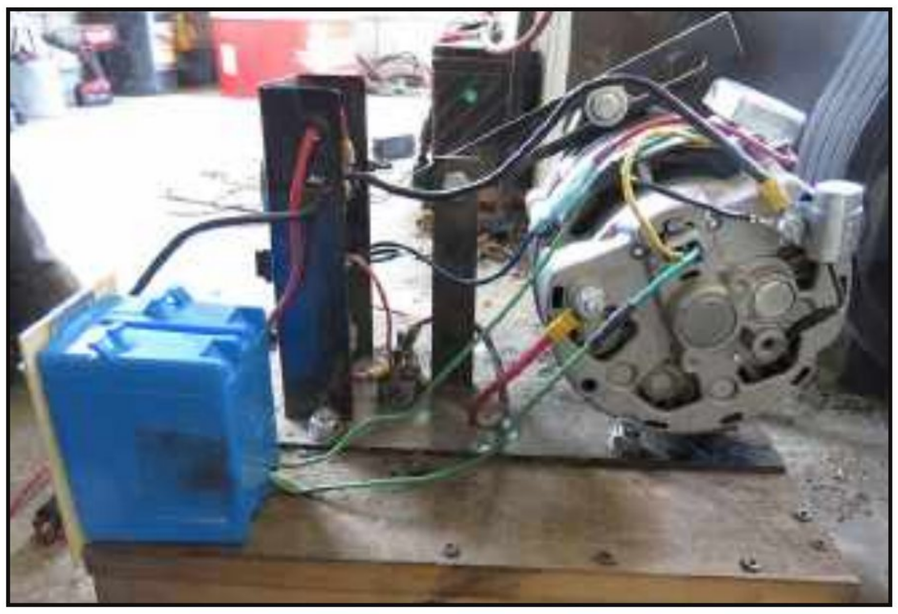

Figure 1 – This is the 10DN set up with light switch installed to turn the field circuit of and on when changing batteries.



Figure 2 – This is the 310 ohm resistor that I installed across the field switch.

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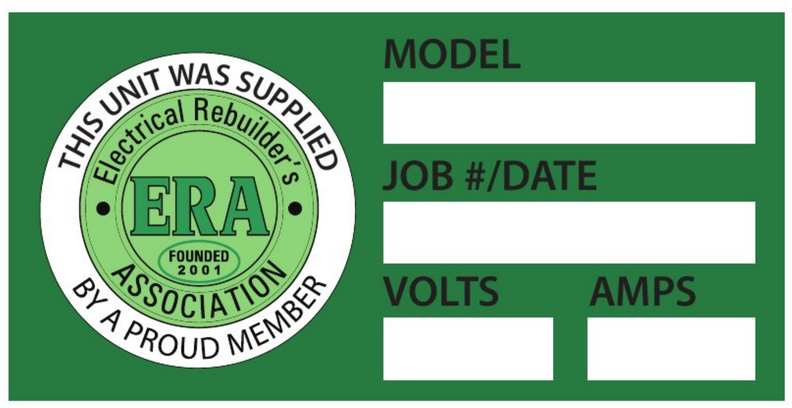





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