

ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

February 2017 \$12.95

DENSO'S PMGR STARTER
Unique Flat Commutator

ONBOARD VSAT TESTING

ABOUT THE HENRY FORD

2017 Trade Show Registration!

See Page 15

PLAIN TALK | **IT'S TOO LATE TO QUIT**
So Let's Play to Win



A WORD FROM THE PRESIDENT

How Do You Value Cores?



How to deal with cores is a question that every rebuilder has been asking since the day that they first started their business. By that I mean, what do you keep and how do you organize them?

The first part of the answer to that question has never changed. First you must determine their value. This is not the easiest job in the world, but the more effort you put into it the more profitable you will be when it comes to managing your cores.

Number one, you must have an inventory list that tells you exactly what you actually have. Not a barrel of mixed this and a half barrel of that. You need a complete inventory of all cores based on unit numbers before you can ever begin to manage them.

Once this is done, you can start with the easy decisions first. For example let's say that I notice that I have 12 Chrysler alternators, Lester number 7002. After checking my sales history, I discover that I have only sold 3 of these in the last ten years. I also find out that I stock a stator, rotor, rectifier and some small parts for this unit. It took me five minutes to put 10 of these at 15 pounds apiece into the alternator scrap barrel at a value of \$32 at today's scrap price. This is one way that I determine a cores real value. I probably could have put them all in the barrel and come out money ahead, but after all, I am a rebuilder. I can always scrap the other two at a later date. I

also found out that I have 2 of the 14789 Bosch interchange cores in stock.

The point I am trying to make is once you have determined real value, you can now begin to manage your core inventory. That example was simple and easy, but the best place to start is by grabbing the low hanging fruit first. The hard work was doing the actual inventory. I recommend that you begin by using a visual tag system. You will probably discover that you can fill a barrel or two without filling out the first tag or begin compiling your inventory.

As you work back on your older units, more factors will come into play, such as parts availability and potential market. The value of some of those cores can be a hell of a lot more than scrap value when service and small parts for them are no longer available. Therefore it makes it easier to justify shelf space based on a core's potential value. Just make sure that you know what you have and that you are saving salvageable cores.

Late model cores are the easiest cores to manage as far as determining what to keep and what to scrap. They are also my most valuable cores once they are inventoried and component breakdowns are determined. As for what your real core value is, will be determined by your potential markets and how much effort you put into managing those cores.

I will try to share more ideas on this subject in future articles.

Mike Dietrich

"There is no man living that can not do more than he thinks he can."
— Henry Ford



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CONTENTS

- 2 A WORD FROM THE PRESIDENT
- 2 NEW ERA MEMBERS
- 3 PLAIN TALK— IT'S TOO LATE TO QUIT
So Let's Play to Win
- 4 DENSO'S PMGR STARTER
Unique Flat Commutator
- 8 ONBOARD VSAT TESTING
- 11 ABOUT THE HENRY FORD
- 12 MEET THE SEMINAR PRESENTERS
- 14 Tentative 2017 Trade Show Schedule
- 15 2017 Trade Show Registration Form
- 18 NEED HELP?—It's just a phone call
away
- 19 CLASSIFIED ADS

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ABOUT THE COVER

Flat spiral commutator bars on a Denso
228000-9900 PMGR starter.



Rebuilding is Recycling!

PLAIN TALK — IT'S TOO LATE TO QUIT

So Let's Play to Win



BY ROB BUKSAR

I need to lay in a little background before I get started, just to make the dots easier to connect. I'm a big student of natural laws. These are incontestable bits of nature like gravity, sowing and reaping, where the head goes, the body follows, etc. There are many of them and I suppose, if we could all get in line with them we would all have an easier and more bountiful life. Sadly, we think we know better or maybe don't think at all and burn ourselves up trying to work against gravity.

Today, I want to focus on two of these laws; "sowing and reaping" and "where the head goes, the body follows".

I have been in business most of my life. Most of my nearest and dearest friends are or have been in business also (birds of a feather). I recently had a very serious chat with a long-time owner operator of a sizable business. He has been successful by anyone's definition for decades! Never before have we strayed off the matter at hand but this day was different. Once we transacted our business, the conversation quickly digressed. He wanted to discuss the condition of the industry and how difficult it has become to "find enough", moreover, whether it was even worthwhile to pursue it any longer.

If I was reading him right, I sensed some real doubt in the tone of his voice. I could have been wrong, yet if I was correct, in light of current conditions, his doubt was perfectly understandable. I have to fight off negative vibes daily as all of us do. We are all aware of just how fatiguing that is! Driving home at the end of the day can be really painful and discouraging after the snot has been beat out of you for "chump change".

Rotating electoral will never be what it once was for lots of reasons that we all ought to be aware of. Yet, to one degree or another, too many of us pursue the same thing in the same way, like dogs in heat! Maybe, it's just a habit we can't break? Whatever the reason, either through our own efforts or instructing our inside sales folks to continue pounding on doors where there's no one home.

Sound business thinking would suggest that investing more money trying to capture a larger portion of a declining market is not such a good idea. Further, when we instruct our sales people to pound louder and harder, it becomes self-defeating when they end their day with little to show for their efforts. Why? Because we sent them back into the fray with nothing special to offer or worse yet, into a hole that's already been mined out. Whose fault is that?

Now here's where we begin shooting ourselves in the foot. At the end of the day, when we're measuring results and they're not good, maybe we get negative, condescending and possibly a little threatening about the future, especially theirs! This tends to make a bad situation worse. Why? Your crew is already discouraged due to their lack of success. The reply that they have been getting for what they have to offer is, "I'm good". We all know that means no sales order.

In my mind, here's where we begin joining the land of the living. Getting together with the crew on a weekly basis is vital! Believe it or not, they have fantastic insights but are seldom asked because they're "just employees". Through everyone's best efforts

it's here where we can determine where the money is at and quit focusing on where it isn't. The meeting is on paid time and everyone is required to attend and bring an idea. Understand that there is no such thing as a bad idea! Everyone's contribution will be listened to and respected.

As the top guy, you can never display doubt, weakness or defeat, even if you feel that way! Bad leadership and negativism are crushing and desperately contagious. If the shop even hears the boss spouting off negative superlatives or overhears a "woe is me" conversation with a customer, it will spread through the shop like a raging firestorm. This chatter will destroy your team's will to win. Then, if you're paying attention, you will hear from every corner of your shop the statement, "I just don't give a damn." Well guess what. It's your fault. You are now reaping what you've sown.

Now you tell me; what president, CEO, manager, quarterback or leader of any sort could move his team downfield and across the goal line when his team has been inspired not to give a damn! Yet, we wonder why our country's institutions and many businesses are in such bad shape to include our own. Our businesses are not leaving the country just for lower wages, taxes and regulations. Bad commercial environments have come and gone yet business has always managed to adjust. We have an epidemic of defeatism and frankly, far too many just don't give a damn anymore!

If you want winning results and a crew who is excited and committed to doing it right then lead to win and never threaten. Never ever proclaim to anyone on your team that if conditions don't improve, the folks that you see this week won't be there the next. It's just too easy to destroy folks' will to win. Make sure you are not the author of your own demise via your soiled outspoken attitude.

It's no cakewalk being a dad, boss, coach or leader of any sort. If it were, everyone would be doing it. You are the energy and power source that fuels your environment. Everyone looks to you for inspiration and horsepower whether you're aware of it or not. If you want great results, inspire them starting with yourself. As the head goes, the body follows, always. If you want great results, you must always sow the seeds of great results and not failure.

Follow the money and do it with all the enthusiasm you can muster. If you don't have enough of your own, recruit someone to help you.

It's high-time to speak smart to stupid and reply with positive enthusiasm to someone trying to dump a load of negative refuse in your lap. It's not the end of the world, our country or your business. We have to start behaving like we want to win! Participation trophies are for losers. Your employees want to win also so lead them to do so.

Vince Lombardi was the legendary Hall of Fame coach of the Green Bay Packers. He has been the consummate example of a winner. In his day, he was interviewed about his coaching and attitude regarding success. Vince simply said, "Winning isn't everything, there just isn't anything else!"

God help us all and sustain our little industry.

*Rob Buksar can be reached at International Winding, Inc
800-323-7521*

DENSO'S PMGR STARTER Unique Flat Commutator



BY BOB THOMAS

Back in 2003 Denso introduced a different automotive starter for gasoline engines up to 3.5 liters. Utilizing rare-earth permanent magnets and a planetary gear reduction arrangement, these starters were a departure from the series motor, off-set gear reduction design that had defined the Japanese manufacturer since the 1980's (see Figure 1).

This new PMGR starter produced 1.6 kW of power in a smaller and lighter package than anyone had ever done before. In the field now for over ten years, these starters are reaching their normal end of life, requiring a need to be serviced or replaced.

There are five known Lester numbers that cover this series of starters. The 17825, 17956 and 17955 starters are all CCW rotation. Their applications include Toyota Camry, Lexus ES300, Scion tC, Subaru Imprenza, Legacy, Outback and Tribeca. The 17841 and 17842 starters turn CW. Their applications include Toyota's Corolla, Matrix, Echo and Yarus, Pontiac's Vibe and Scion's xA and xB. The two starters that you are most likely to see are those fitting the popular Camry and Corolla models. Those are the starters that we used for our photos.

All of these starters can be easily identified once disassembled by their armatures, which have a unique type of commutator (see Figure 2). As you can see in the photo, it is flat and the curved bars spiral out from the center. The starter's rotation determines the direction that the bars twist as they move away from the center. The bars on the commutator on the left in the photo slant in a CW direction. The right side commutator slants in a CCW direction. These armatures are very small when compared to most other automotive armatures (see Figure 3). Our photo shows one of the Denso armatures next to a Delco PG260M armature.

You can identify these starters prior to disassembly by the three brush holder screws on the commutator end (CE) frame and the black rubber plug that covers the CE bearing (see Figure 4). Two of the screws are side by side, serving to hold the brush holder in place while grounding the negative brushes. The opposite side screw secures a steel clip that holds the positive side of the brush holder.

The brushes are trapezoid-shaped. Along with the brush holder they slant in the direction of rotation to match the pitch of the armature's commutator bars (see Figure 5). Hence, the CW and CCW brush holders and brushes are different too. You must use the correct brush holder when assembling one of these starters. The easiest way to insure that is to simply hold the two parts together and observe that the brushes align with the bars (see Figure 6).

You may also notice that the positive and negative brushes are not positioned 90 degrees from one another as in most other starters. The positive brushes are located side by side with the motor lead coming out between them. The negative brushes are next to one another across from the positive brushes. While this arrangement is not totally unique, it is a departure from what we normally see.

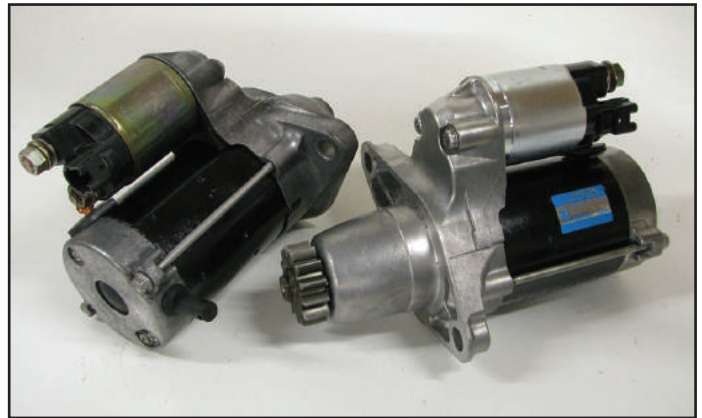


Figure 1 – Denso's Toyota Corolla (left) and Camry (right) starters are a departure from the OSGR Denso starters of previous years.

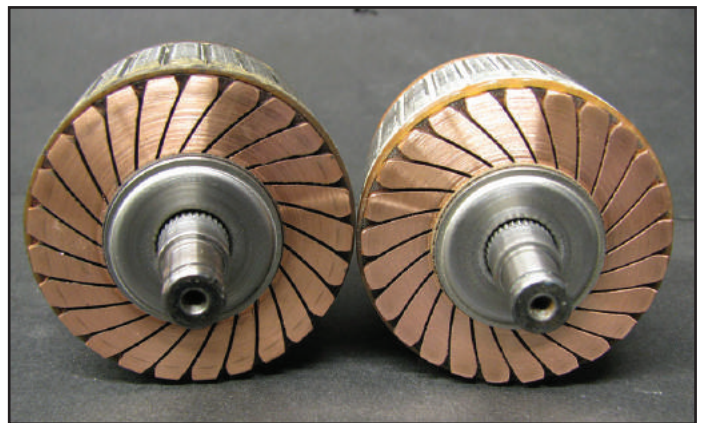


Figure 2 – Here you can see the CW (left) and CCW (right) armatures.

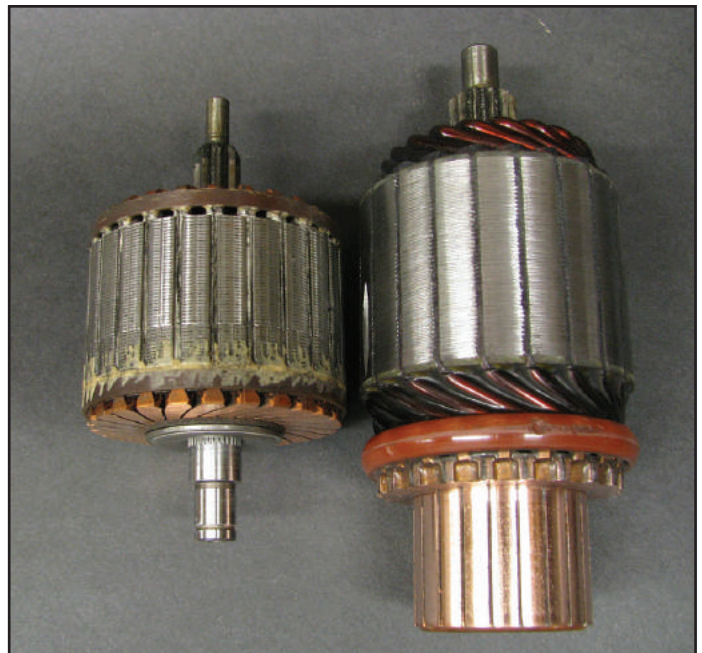


Figure 3 – You can see exactly how small the Denso armature is when next to a Delco PG260M armature.

DENSO'S PMGR STARTER

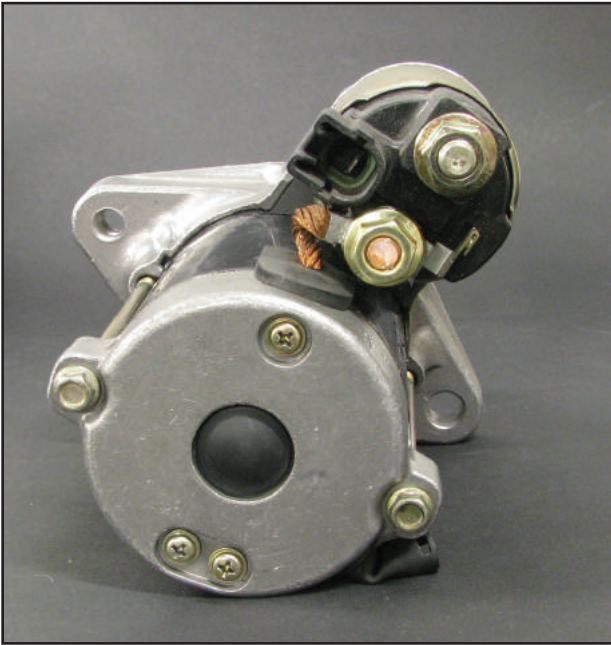


Figure 4 – You can identify a flat commutator starter by the three brush holder screws on the CE frame and the rubber bearing cover.



Figure 5 – The brushes are trapezoid-shaped and slanted to match the spiral commutator bars.

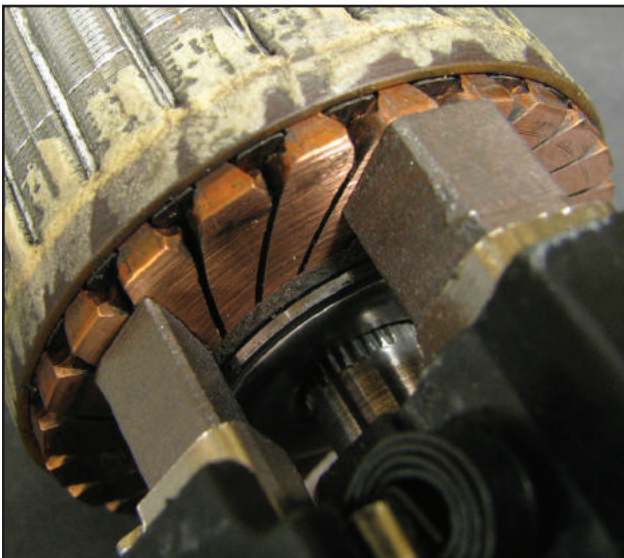


Figure 6 – Insure that you do not mismatch armature with brush holder. Make sure that the brushes align with the bars.



Figure 7 – This small snap ring and spacer washer are both tiny and important parts.



Figure 8 – Denso offers the snap ring as a service part. I highly recommend that you keep them on hand.



Figure 9 – The drive end components prior to assembly.

DENSO'S PMGR STARTER

During disassembly you will no doubt notice that a tiny snap ring holds the armature in place against a 608 bearing in the CE Frame. You will need to use your smallest pair of snap ring pliers to remove it. It is so tiny that it can be easily deformed during removal, dropped on the floor or become lost. This snap ring and the small washer behind it are critical parts (see Figure 7). The good news is that Denso offers the snap ring in a pack of 10 for less than a dollar (see Figure 8). When you order parts for one of these starters, do yourself a big favor and buy some.

When assembling one of these starters, there are some common mistakes that can cost you a lot of extra time. Once all parts are prepared and ready, follow this procedure for the quickest results:

1. Assemble the drive, drive shaft, stationary gear track, backing plate and planet gears (see Figure 9). Take care when fitting the plastic stationary gear to its backing plate.

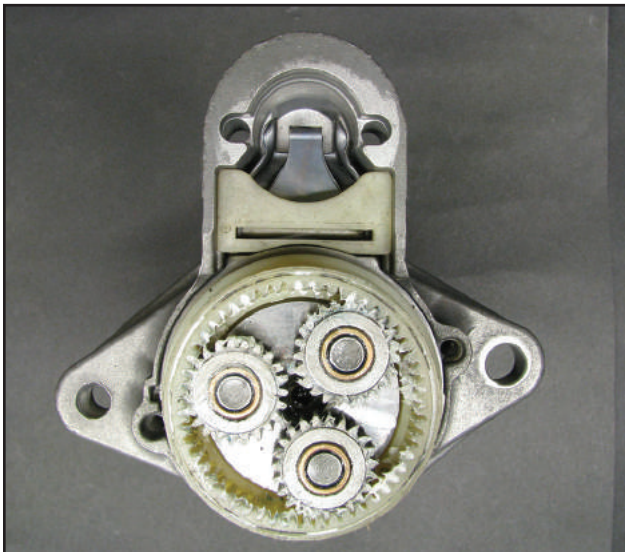


Figure 10 – The DE housing with components fully assembled.



Figure 11 – The 608 ball bearing must be fully seated in the CE frame to insure proper armature positioning.

2. Press the needle bearing into drive end (DE) housing. Then install the drive and gear assembly in the DE housing along with the shift lever (see Figure 10). Do not attach the solenoid just yet.

3. Press the 608 bearing into the CE frame, making sure that it is completely seated (see Figure 11).

4. Install the brush holder into the CE and tighten the three screws that secure it in place.

5. I found that using a C clamp is the best way to install the snap ring on the armature's shaft (see Figure 12). Push the CE frame assembly against the armature's commutator while rotating it slowly until the brush springs are compressed and then gently clamp them together. Tighten the clamp just enough for the plastic brush holder to touch the face of the commutator. This will allow you to use both hands when installing the washer and snap ring (see Figure 13).

6. Inspect the snap ring closely to insure it is tight and inside the groove all the way around the shaft (see Figure 14).

7. Make certain that the planetary gear cover plate is in the correct position inside the field case (see Figure 15) before mating it to the DE assembly. In doing so, insure that the locator on the field case is inside the indent on the DE housing (see Figure 16).

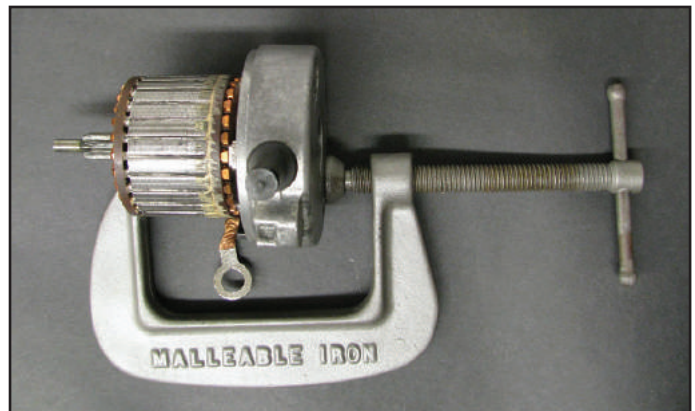


Figure 12 – A clamp like this one is the best tool to hold the armature in place while installing the snap ring.



Figure 13 – The clamp allows two hands free to install the washer and snap ring.

DENSO'S PMGR STARTER

8. Carefully install the armature and CE assembly into the field case. Once the armature's shaft splines align with the planet gears, the magnets will pull in into place. Do not try to force it if it is not aligned.

9. Install the through bolts, shift lever cover, solenoid and CE bearing cover (see Figure 17). Test the starter and confirm that the direction of rotation is correct.

These starters were used as late as 2009 on some models. They were replaced on many applications by a similar looking PMGR starter (see Figure 18) that has a more conventional armature and commutator. The obvious differences are the number of brush hold screws on the CE frame, the lack of a cover for a CE bearing and the solenoid's attaching hardware – studs instead of machine screws. Some of the later starters will interchange with their predecessor on some applications, most notably on the Toyota Camry.

These are easy starters to rebuild and cores are readily available. Most of the vehicle models on which they were used have a reputation for longevity. Drives, solenoids and complete brush holds are available from multiple sources.

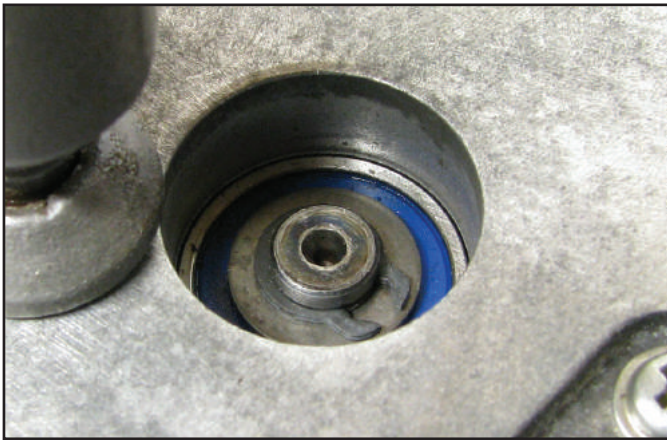


Figure 14 – Take a close look at the snap ring to make sure it is securely in place. A common error is over-stretching this ring which will result in a warranty return.

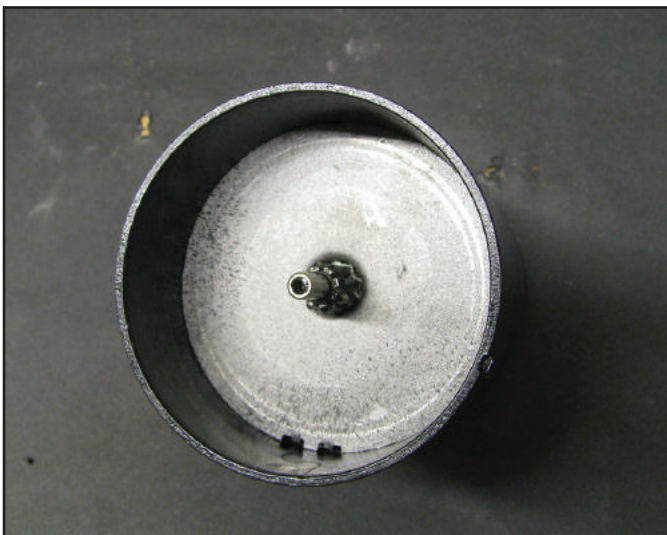


Figure 15 – The planet gear cover must be properly seated in place prior to mating the field case assembly to the DE assembly.



Figure 16 – Make sure that the locator bump on the field case is aligned and seated into the DE housing's indent.

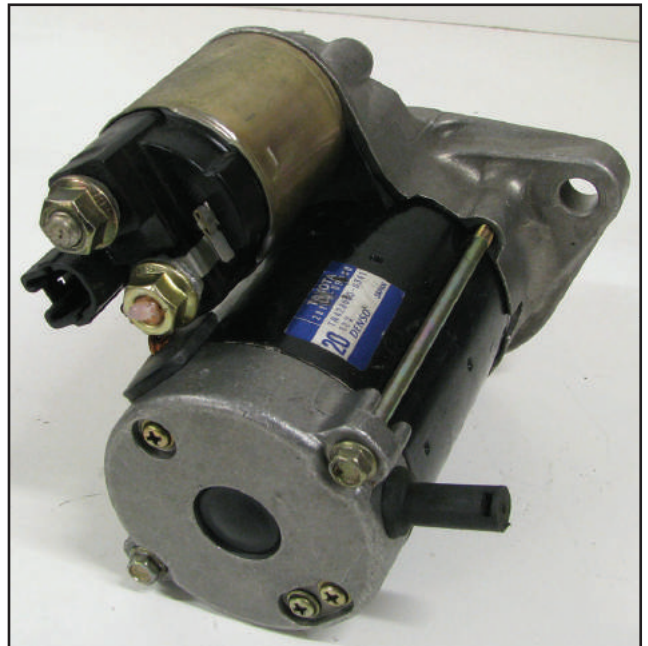


Figure 17 – When testing, double check rotation to insure that parts have not been mismatched.



Figure 18 – Denso replaced the flat commutator starters with a newer version using a more conventional armature.

ONBOARD VSAT TESTING



BY GENE KAISER

In the December issue I explained how **saturation voltage**, commonly referred to as **Vsat**, affects a regulator's life expectancy. To refresh your memory, Vsat is the drop or loss of voltage across a regulator's power transistor. It is that lost electrical energy, converted to thermal energy, that heats up a regulator's power transistor.

In that article I demonstrated how you can test any electronic regulator's Vsat using a constant current DC power supply and your regulator tester. I also mentioned that you can test the Vsat of some regulators as they operate on a functioning alternator -

so long as you can access the brush connections to the regulator. Not only is this method fairly easy - all you need to do it is an accurate voltmeter.

Many of today's alternators have removable back covers and most of those have accessible brushes (see Figure 1). A few alternators expose those connections outside of the alternator (see Figure 2) like this 3G Ford. You do not need to a constant amperage DC power supply like we used in the previous article because the rotor provides the load for this test.

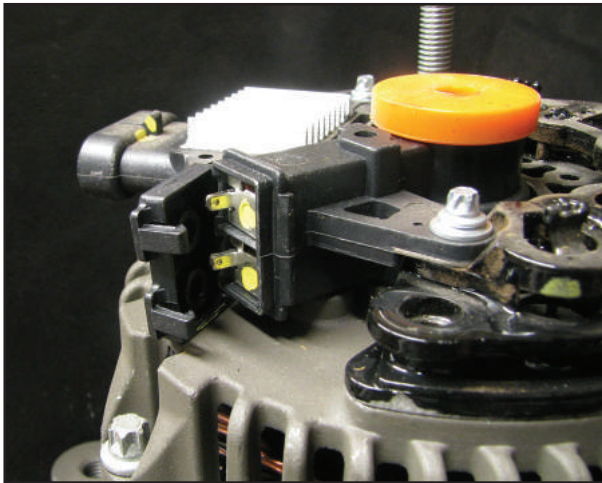


Figure 1 - The brush connections of this 11SI are easily accessible for testing the regulator's Vsat.

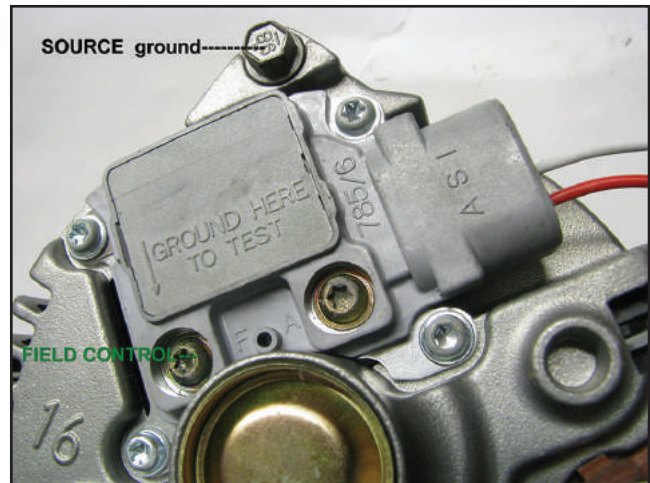


Figure 2 - Ford 2G and 3G alternators are very easy to test Vsat, even on the vehicle in many applications.

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Simply follow these steps to test the Vsat of any regulator with accessible brush connections:

1. Determine if the regulator being tested is A-circuit or B-circuit. One brush will be grounded if it is B-circuit with the control side of field being positive. An A-circuit regulator will have one brush connected to positive voltage source while the controlled brush is negative.

2. Connect one of your voltmeter leads to the controlled brush connection and the other to the source of the controlled voltage. That will be ground if it is A circuit or B+ if it is B circuit. Place your meter's leads as close to the regulator as possible as we have done in our test photos. You do not need to become too concerned about the polarity of your voltmeter leads.



Figure 3 – The Vsat on this aftermarket 3G regulator is well within limits at 0.38 volts.



Figure 4 – The Vsat of this new GM/Valeo regulator is 0.46 volts, about what you would expect from a healthy regulator.

If you connect them backwards the reading will show negative but the numbers will remain the same.

3. Run the alternator at a medium to high speed and apply enough load to insure that the alternator is full fielded. You will see a high reading near battery voltage until the transistor is fully-on. While the alternator is charging at that point enough to maintain 14 volts, the field is actually off most of the time.

4. As the load nears the capacity of the alternator, the voltage on the meter will begin to drop rapidly. At this point, watch your battery voltage and output amperage. On most modern alternators, you will need a load that exceeds the unit's rated output before the alternator becomes full-fielded. Output voltage should be kept above 12.6 volts but in most cases you will need to get near or below 13 volts to insure that the power transistor is fully-on.

So what number are you looking for? That depends upon the type of power transistor that is inside that particular regulator. I refer you back to the December issue where that was explained in detail.

We tested a 3G Ford (see Figure 3) and a GM Valeo alternator (see Figure 4). Both were new regulators with Vsat readings below 0.50 volts. Most late model alternators should not go above one volt when heated up to operating temperature. However, I will reiterate that there is no better test than this to establish the reliability of any electronic regulator. I highly advise that use this test when reclaiming a regulator.

Gene Kaiser is Quality Control and Technical Manager for Regitar-USA in Montgomery, AL.

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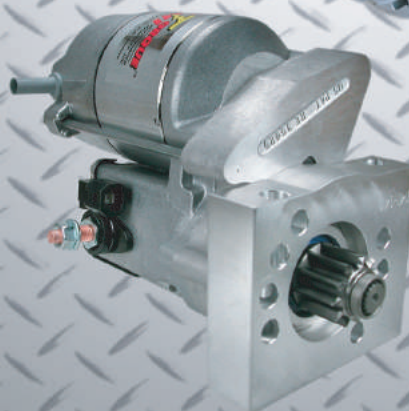
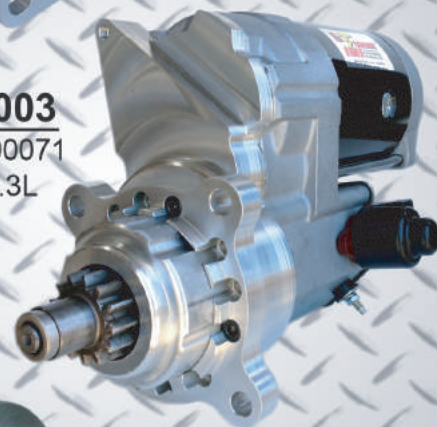
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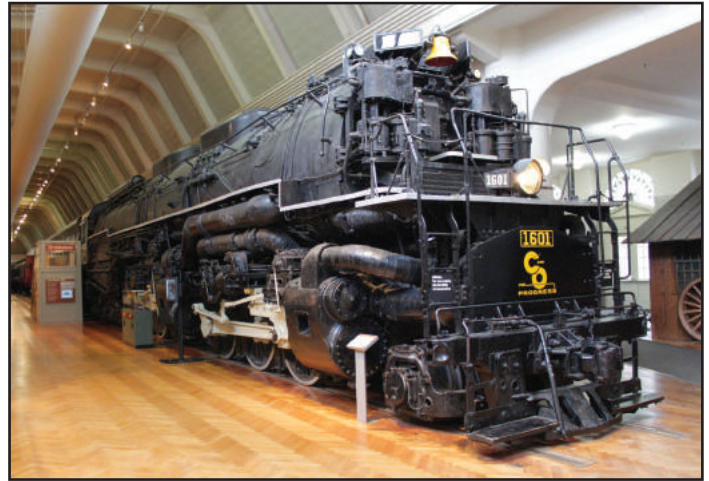


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Catalog



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While the American landscape is dotted with transportation museums of all sorts and sizes, the uncrowned king of them all is the Henry Ford Museum in Dearborn, MI.

Coincidentally, that museum is less than 3 miles from the DoubleTree by Hilton in Dearborn, site of ERA Expo 2017 April 7-9. Unfortunately, incorporating a museum tour in the show schedule was not feasible because of the Ford Museum's massive size – 12 acres. It takes nearly a full day just to go through it.

Alan Melton of AMFOR Electronics suggested making the Ford Museum an extra-day option for the show. The host hotel has offered to extend their discount pricing for anyone wishing to arrive a day or two early or stay later to visit the museum on Thursday before the show or on Monday afterwards. They also provide free shuttle service between the hotel and the museum. Tickets are available at the door: \$22 per person for ages 12-61, and \$20 for seniors over the age of 62.

"I have been there three times and will be going again," Melton stated. "I took Dick Vensel there for his 70th birthday. We arrived when they opened at 9 am and rented a wheel chair. They told us we should be done in about three hours. At 5 pm they politely asked us to leave. We weren't done yet."

This is a golden opportunity to see one of the world's premiere transportation museums, covering not just historic automobiles, but engines of all kinds dating back to the 1600's, unique railroad locomotives, antique bicycles and one-of-a-kind airplanes.

For more information go to their website: www.thehenryford.org.

Henry Ford proclaimed that this museum, which opened in 1929, would show how the inventions of a few had forever changed America.



Meet the Seminar Presenters



Tim Weyandt

Tim Weyandt & Sam Fox with Allegiant Power

Friday, April 7th 1:00-2:30 p.m.

Topic: AGM Batteries Explained

With over 36 years in the battery industry, Tim brings a wealth of knowledge to the Allegiant team. He was self-employed for 16 years as a battery specialist. Tim worked with a large tire chain where he managed the battery division for 10 years. He has worked for two battery specialists while sitting on manufacturer/dealer council, and has even taught at a vocational school. His strength is his ability to understand the business side of the battery industry and apply his marketing background.



Sam Fox

Sam Fox has an extensive knowledge of the battery industry that spans over four decades. He has successfully operated his own battery specialist company. His work history includes Southern Battery, Chloride/Conrex, Chloride, Battery Associates, Co-Founder of Battery Alliance with Art Wilson, and now the current Vice President of Allegiant Power. His expertise in dealing with supplier partners as well as sharing his knowledge with battery specialists across North America has earned him a reputation for sound business ethics.

Bill Bowman – Retired from Delco Remy

Friday, April 7th 2:30-4:00 p.m.

Topic: Alternator Electronics

Bill has extensive experience in both the aftermarket and OE. In the early 80's while working for Delco Electronics, he designed and patented the CS130 voltage regulator (411). The features and functions (Load Response Control, High Side Drive, Active Fault Indication, etc) are now standard on modern voltage regulators.

He worked for WAI and Renard Manufacturing in the 90's. His latest "real job" was the Director of Global Electronics Engineering for Delco Remy (Remy International) from 2010-2015.

For 3 years he wrote the "Driving Quality" column of the APRA Global Connection. In those articles, he discussed ideas of how to improve product quality primarily in the alternator field. In August 2006, he wrote "The MOSFETs are Coming" which predicted the diodes being replaced by transistors in the rectifier. Ten years later, active rectification (with MOSFETs) is a reality.

Bill will present a 90-minute seminar called, "Alternator Electronics." It starts with Ohm's law and goes through regulators, rectifiers, and finally communication protocols (LIN, CAN, COM, etc). To keep the presentation interesting and to engage the audience, Bill uses stories more than boring technical facts to teach. It will feel more like a conversation than a lecture.



MEET THE SEMINAR PRESENTERS



Dan Marinucci – Automotive Technical Training

Saturday, April 8th 8:00-10:15 a.m.

Topic: Vital On-Vehicle Tests That Minimize Starter/Alternator Returns

Dan is an ERA member who has presented a variety of seminars for the association over the years. He's also a member of the North American Council of Automotive Teachers (NACAT).

He has been reporting on the automotive service industry since 1976, writing for **MOTOR/AGE, UNDERCAR DIGEST, IMPORT SERVICE and ELECTRICAL REBUILDERS EXCHANGE**.

What's more, he has written **MOTOR Magazine's** monthly "Foreign Service" column for 27 years. (**MOTOR Magazine** is a Hearst publication that has served the professional auto repair market since the 1920's.

Dan has written the twice-monthly "Automotive Management" column in **TIRE BUSINESS** for 27 years. (**TIRE BUSINESS** is a Crain journal serving the tire dealer market since 1983.)

Dan has been presenting tech training seminars for installer-technicians nationwide since 1993. He has taught these classes in 38 states and across Canada. Dan gathers data for his seminars by investing countless hours in hands-on testing. As just one example, he has captured more than **4000** oscilloscope patterns during his research.

His depth of knowledge and ongoing data-gathering give Dan a unique perspective on the automotive service business.

Mohammad Samii with Sammy's Auto Electric

Sunday, April 9th 9:00-11:30 a.m.

Topic: Newer Starter and Alternator, Testing, Rebuilding, and Case-Studies

Mohammad Samii or "Sammy" as he is often called has been involved with electrical rebuilding since 1972 and currently is president and owner of Sammy's Auto Electric Service, Inc., in Champaign, Illinois which he established in 1979.

His company does custom electrical rebuilding, electrical/electronic diagnostics and installation on various vehicles, and modifications and customizing of charging starting systems for higher power and torque. He is a member of the Society of Automotive Engineers (SAE), an ASE certified technician. Sammy serves on the board of governors of the Electrical Division of the Automotive Parts Remanufacturers Association (APRA). His monthly column, "Auto Electric Corner" appears in the Global Connection (APRA's monthly newspaper) which he has been sharing his experience with his peers since 1992.

He teaches various courses in installation, rebuilding, and diagnostics throughout the U.S. and Canada for rebuilders as well as technicians and mechanics. He has been involved with teaching APRA's Electrical Clinics as well as conducting many training sessions for ERA during their annual ERA Show in the past several years.

Mohammad is a graduate of the Iranian Air Force Academy as well as USAF Air University at Maxwell Air Force, with a degree in aircraft maintenance engineering.

His career in electrical rebuilding since 1973 coincided with the introduction of power electronics in automotive applications, where his educational background made him quickly grasp the new technology. Invention of computers and their introduction into the automotive field peaked his interest where diagnosing some hard to find electrical/electronic problems remains his interest and is part of his daily work, in addition to rebuilding rotating electrical units.

He has lived in Champaign, Illinois since 1979 with his wife and 3 children who are now all grown. As a private pilot he enjoys General Aviation and flying various single engine airplanes, and is an avid tennis player who enjoys playing the game and watching various tennis tournaments.



Mark this date now! April 7-9, 2017

TENTATIVE 2017 DEARBORN/DETROIT SHOW SCHEDULE:

FRIDAY, APRIL 7

8:30

Load Bus at Hotel
for Ford Tour

9:00 – 11:30

Ford Tour

11:30 – 12:00

Return to Hotel

12:00 – 1:00

Hot Lunch Buffet

1:00 – 2:30

Seminar: Tim Weyandt
— with Allegiant Power —
AGM Batteries Explained

2:30 – 4:00

Seminar: Bill Bowman
— retired from Delco Remy —
Alternator Electronics

4:00 – 5:00

Reception with Cash Bar

5:00 – 8:00

Exposition Open

“The competitor to be feared is one who never bothers about you at all, but goes on making his own business better all the time.”
— Henry Ford



SATURDAY, APRIL 8

8:00 – 10:15

Seminar: Dan Marinucci
— Automotive Technical Training —
Vital On-Vehicle Tests That
Minimize Starter/Alternator
Returns

10:30 - 11:30

Roundtable

11:30 – 1:00

Hot Lunch Buffet

1:00 – 5:00

Exposition Open

SUNDAY, APRIL 9

7:00 – 8:45

ERA Breakfast
& Annual Board of
Directors Meeting

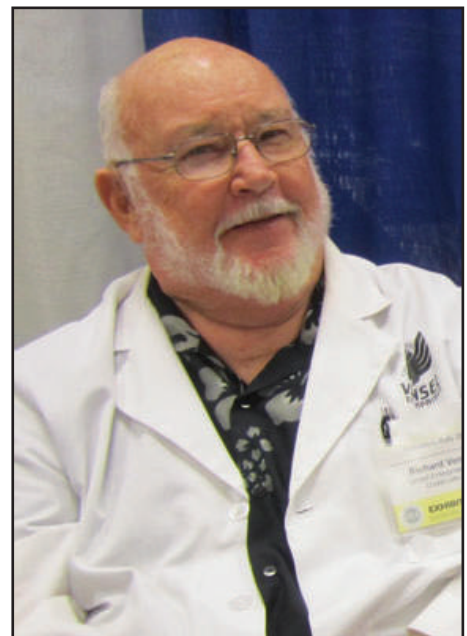
9:00 – 11:30

Seminar: Mohammad Samii
— with Sammy's Auto Electric —
Newer Starter and Alternator,
Testing, Rebuilding and
Case-Studies

“Whether you think that you can, or that you can't, you are usually right.”
— Henry Ford



Most of you are aware that the Electrical Rebuilding Industry lost one of its best friends, mentors and supporters of the business last June. Dick Vensel spent his whole life working in the rebuilding industry. He was a lifelong member of the Automotive Parts Remanufacturing Association (APRA) and a founding member of the Electrical Rebuilder's Association (ERA). To honor Dick's participation in both associations in 2017, the ERA Board of Directors have decided to honor both associations memberships and allow APRA members to participate in the 2017 Tradeshow/Training Event in Dearborn, Michigan this April for the ERA member price. Show your appreciation for all that Dick has shared with all of us for a lifetime by attending this event.



REBUILDER REGISTRATION FORM

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APRIL 7-9, 2017**

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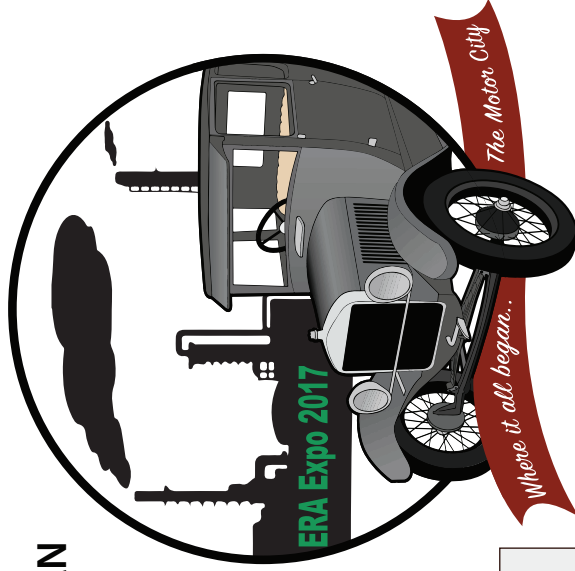
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NAME ON CARD _____

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	ERA MEMBER \$35 LUNCH INCLUDED	NON-MEMBER \$45 LUNCH INCLUDED	ERA MEMBER \$125	NON-MEMBER \$175				
1)								
2)								
3)								
4)								
5)								
6)								
7)								
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TOTAL ⇨								

Cancellation Policy: Cancellations are subject to a 15% processing fee. NO REFUNDS will be made after March 1st.

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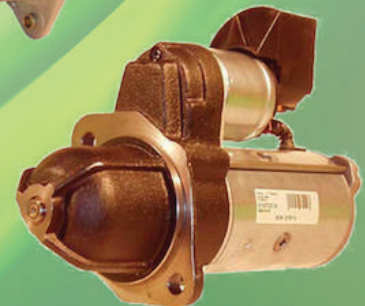
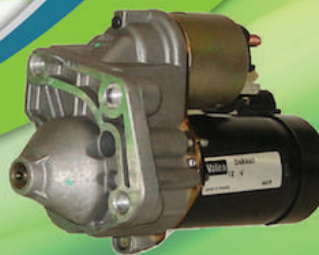
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2nd Prize:

Your Hotel Stay During The Show
Complimentary Of The Electrical Rebuilder's Association
**Includes 4 Days, 3 Nights (Thursday, March 17th To Sunday, March 20th)

3rd Prize:

Complete Show Registration For **One** Person
Complimentary Of The Electrical Rebuilder's Association

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- YOU **MUST** BE REGISTERED FOR YOUR HOTEL ROOM
- YOU MUST BE REGISTERED FOR COMPLETE TRADE SHOW PACKAGE (\$180 VALUE) BY **MARCH 1ST**

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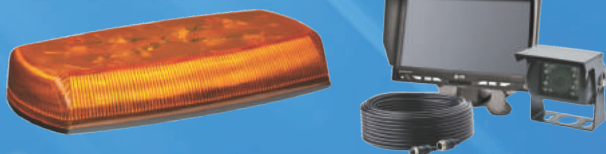


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– Henry Ford



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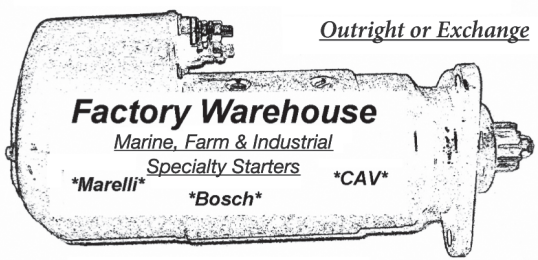
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