

ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

June 2018 \$12.95

AUTO ELECTRIC CORNER

Truck Vibrator Motors and 4G Regulators



A TALE OF TWO ALTERNATORS

Subaru Mitsubishi Look-Alikes

COMMON SENSE | **FACT OR FANTASY**
Bull Crap vs Reality



A WORD FROM THE PRESIDENT

Focus on the Positives — What You Can Control or Change



At this year's show in Montgomery, I had the opportunity to visit with a lot of rebuilders and suppliers within our industry. One thing that impressed me the most was the positive tone when discussing the state of our industry.

I heard more about the successful things that people were doing in their business and not so much about the negative things that were impacting their business. There are a lot of factors that can impact the success of any business. I have always tried to focus on the things that I can control or change.

This seemed to be the attitude of most of the people that I talked with at the show. As our industry has changed over the years, it has left voids and potential markets that need to be filled. It seems to me that is what a lot of our membership are now focusing on. That approach is a lot more productive than reminiscing about the good old days and hoping that they will return. Clocks don't run backwards. It's called progress – like it or not.

I have been in this business for over thirty eight years and I am not sure that

I want the good old days back myself. It was a hell of a lot more work then and somewhat repetitious work at that. Today it is something new every day, a lot more challenging and rewarding.

Don't get me wrong, we still do a lot of the old stuff, but today we charge a hell of a lot more than \$35.00 for rebuilding a generator. That is just one of the voids that the large merchandisers and suppliers have left behind for us to fill and with a lot better profit margin.

So the moral of this story is to have a positive attitude and focus on the things that you can control or change that work for you and your business. So the question is this. Is the glass half empty or half full? For me, it all depends on what I am drinking. Thanks again to everyone that participated in one of our most successful shows ever in Montgomery!

Mike Dietrich

NEW ERA MEMBERS

CAE Pullers
Clearwater, Florida

Dave's Armature Service
Memphis, Tennessee

Davilco Electric
Baton Rouge, Louisiana

Gordo Alternator
Gordo, Alabama

Deimier Starter & Alternator
Mechanicsburg, Pennsylvania

A-1 Electric
Grand Rapids, Michigan

ABOUT THE COVER

Mitsubishi alternator for Subaru with confusing plug code.

Announcing the 2019
ERA Trade Show
to be held in

Springfield

Missouri

Check back in later
issues for more
show information,
including dates and
hotel reservation
details.

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PO Box 906

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office@electricalrebuilders.org

EDITORIAL ASSISTANT / Bob Thomas

DESIGN & PRODUCTION / Stephanie Schroeder

CONTRIBUTING WRITERS / Mike Dietrich,
Mohammad Samii, Bob Thomas

CONTENTS

- 2 A WORD FROM THE PRESIDENT
- 2 NEW ERA MEMBERS
- 3 INDUSTRY NEWS
- 4 AUTO ELECTRIC CORNER —
Truck Vibrator Motors and 4G Regulators
- 6 COMMON SENSE — FACT OR FANTASY?
Bull Crap vs Reality
- 8 A TALE OF TWO ALTERNATORS
Subaru Mitsubishi Look-Alikes
- 15 CLASSIFIED ADS

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Rebuilding is Recycling!

INDUSTRY NEWS

& ANNOUNCEMENTS

Chuck Showalter with Standard Starter Drive

Industry veteran Chuck Showalter has joined the Standard Starter Drive sales team. Showalter and Standard Starter Drive President Mike Tweed both began their careers at Accurate Parts Division nearly 40 years ago. “Chuck brings a wealth of experience as we continue to expand the Standard Starter Drive brand”, Tweed commented. “His experience enhances our continuing support of the remanufacturing industry”, commented Tweed.

Problem Solver from Standard

A new product from Standard Starter Drive that was displayed at the Montgomery Show was this unique starter drive designed to solve problems that installers sometimes encounter. Chuck Showalter calls it the “Jammit Drive” (see Figure 1). It is designed to be used in place of the common 207 drive in applications that have too much pinion to flywheel clearance. The 207's pinion is 9-tooth with an OD of 1.00 inch. The Jammit drive's pinion is 10-tooth with an OD of 1.10 inch.

It is not a cure all for all clearance problems, but a unique solution to a real situation that our customers sometimes encounter – too much clearance with shims making it worse. As the story goes, the idea comes from poor areas beyond our borders where replacing a flywheel is not economically feasible. It is a low cost item that you can keep on your shelf and become a real hero when the situation arises.



Figure 1 – The drive on the right is a common 207, while the Jammit drive's pinion on the left has an extra tooth and is 1/10th of an inch larger to solve “too much clearance” problems on 10MT pad mount starters.

BBB Industries, LLC, Acquires Turbo Supply, Inc

BBB Industries, LLC, a leader in the electrical rebuilding industry, recently announced that it has acquired the assets of Turbo Supply, Inc. The transaction transfers all of Turbo Supply's production and operation assets, intellectual property, inventory and brands to BBB Industries, LLC.

Founded in 1997, Turbo Supply, Inc. is a complete turbocharger source for all major markets. With a corporate office and state-of-the-art remanufacturing facility in Joplin, Missouri, along with branch offices in Texas they provide turbochargers for all applications including over-the-road trucking, passenger cars, agriculture, natural gas compression and construction.

Tim Roth, BBB Industries Executive VP of Business Development commented: “Turbo Supply's remanufacturing expertise and market understanding along with a proven ability of a talented team to provide high-quality products to a broad customer base is a natural complement to BBB.”

Kyle Thiessen, Turbo Supply President said, “Since our founding, we have focused on being experts on new and remanufactured turbochargers, cartridges and components, making us the definitive choice. It's rare that an opportunity comes along to combine forces with a like-minded company such as BBB Industries.”

AUTO ELECTRIC CORNER — Truck Vibrator Motors and 4G Regulators



BY MOHAMMAD SAMI

O Martin/Cougar™ Truck Vibrators...! Of the unusual things that show up for repair/rebuilding, a recent one was called a Cougar® DC Truck Vibrator. It is basically similar to a starter motor driving a set of specially designed counterweights, and when bolted to the bed of a truck or similar device, it can shake the entire bed so hard that it causes the complete emptying of any loose load, such as rocks, gravel, road salt, coal or such (see Figure 1).

The customer who brought it in is a large local company whose unique job is painting those white or yellow lines that you see on the highways and roadways. They own many pieces of strange looking machinery used for various purposes. This device helps to quickly unload rocks or milled asphalts, generated and hauled away during their construction and road painting projects.

The model they have was a 3200 Cougar™ Truck Vibrator. It consists of an electric motor that is very similar to a low-torque 10-MT starter with the same type of field case, field coils, brush holders and pole shoes. It was 12V but a 24V version is also available. It is recommended for use with a truck bed with an 8-16 cubic yard (yd³) capacity, having a bed that is 10 feet or more long. As the label shows, it draws 85 Amps at 12V and generates a force of up to 3200 pounds with a maximum 4000 vibrations per minute or VPM (see Figure 2).

Due to the extreme vibration generated by this device, the field coils are heavily secured in place with a pliable epoxy. The problem with our unit was brush leads that had been sheared off after years of extreme vibration. Once the leads were repaired and the bearings replaced, it worked fine.

Extreme caution should be used in testing this type of unit. No matter how hard you tighten your bench vise, it will shake the bench and everything attached to it literally apart! So the run duration must be kept very short unless you have threaded steel studs implanted into your shop's concrete floor! The unit carries a price tag of \$800-\$900 new, with a hefty shipping fee due to its weight. Your local auto part store does not have it and probably has never heard of it. So it should be priced accordingly.

Old Starter Clocking...!

We had an old starter brought in which the owner said went on an obscure air compressor of late 50's vintage. It had been sitting around idle for years and now he needed to get it working again (see Figure 3).

Rebuilding it was a straightforward ordeal and we were able to find all the needed parts, particularly the armature, thanks to C.C. Battery who came through for

us as they do so often!

Luckily we had stamped the field case to DE housing position as a matter of habit and experience, but this time it really paid off. As you can see in the photo (see Figure 4), the multiple holes in the housing allowed for

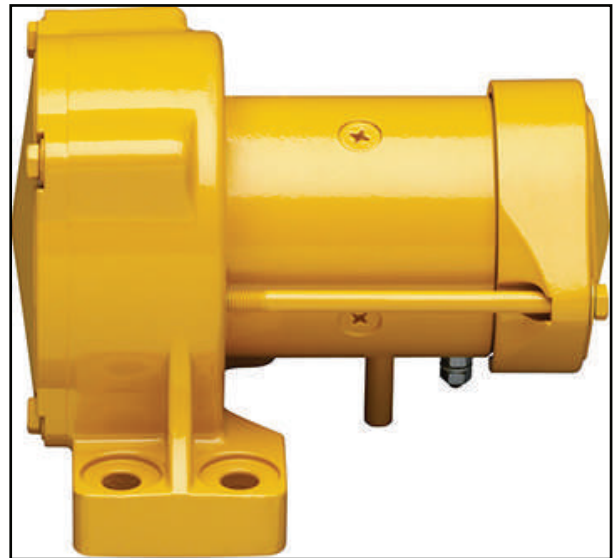


Figure 1 - Cougar/Martin model 3200 truck vibrator

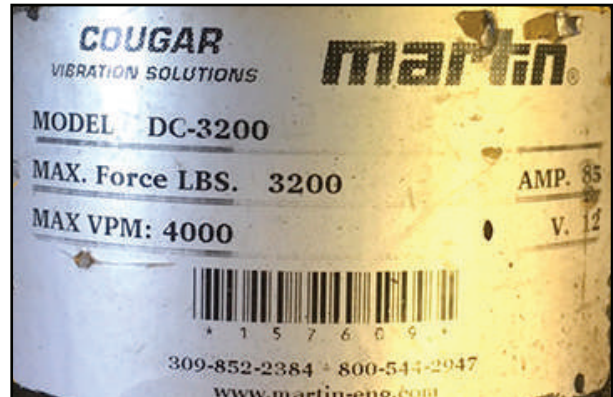


Figure 2 - The specification for the model 3200 truck vibrator

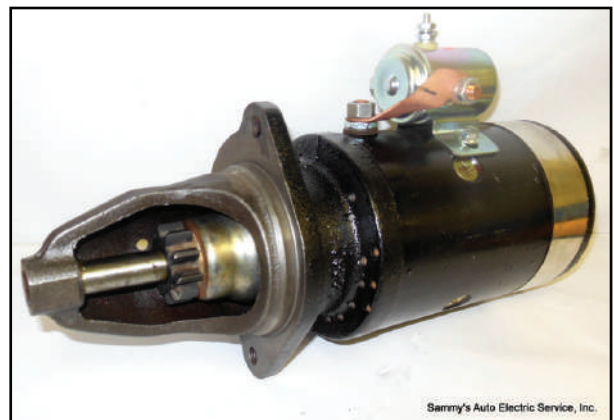


Figure 3 - Old starter for an air compressor after rebuilding

different clock positions. This customer lives 55 miles away and that did not leave much room for guessing. This is a common point to pay attention to when it comes to older units that have been modified or put together with swapped parts through the multiple rebuilding processes that it may have been through over the years.

Ford Charging System

One of the area that was discussed during the ERA seminar at Regitar this past April was a brief explanation of various configurations of the Ford charging system. Since this was a subject of discussion on a recent ERA Forum post, I will explain its operation in a little more detail here.

Our first time experience with the Ford System-2 (a sort of Ford classification) charging system was on certain models of 2002 Ford Explorers with 4.0L engines using a 7787 4-G alternator. In this system, the “L” terminal is not activated by the warning light but by the PCM, which applies a 9V bias voltage to the “L” terminal of the regulator to energize it. This line is appropriately (or inappropriately) called Indicator Control in the schematic (see Figure 5).

When this voltage is applied to the “L” terminal of the regulator it will sink to a low level until the alternator starts charging. Then it will bounce back to the 9V level that the PCM had applied. The PCM is programmed to look at this “dip and bounce”, in addition to the system voltage. If it finds these values within the limits that it is programmed to accept, it will send the proper command on the communication bus (be it SCP or CAN), and that information is picked up by the instrument cluster which decodes it so that the warning light can be turned off. Thus there is no direct connection between the alternator’s “L” terminal and the warning light on the dash and the signals are all traveling via data bus.

The regulators that were commonly available at that time were made to work with standard type warning lights. Meaning the warning light was connected directly to the “L” terminal of the regulator. On these applications (call it System-1) when the alternator started charging, the “L” terminal voltage would go high, meaning 14V system voltage. When these regulators were used in a System-2 applications (i.e. certain Explorers) where the PCM was looking for 9V at the “L” terminal, the 14V would obviously not be within parameters and would constitute a fault by the PCM. So the warning light would not go off, even if the alternator was charging fine.

The early OE regulator for System-2 application was the VP4LU-10C359-AA. Later on aftermarket versions of the above regulator became available where the “L” terminal impedance was modified by installing a resistor inside the chip to allow a voltage restriction. The compatible regulators are now available through our industry’s major suppliers such as J&N, Regitar, Taditel,

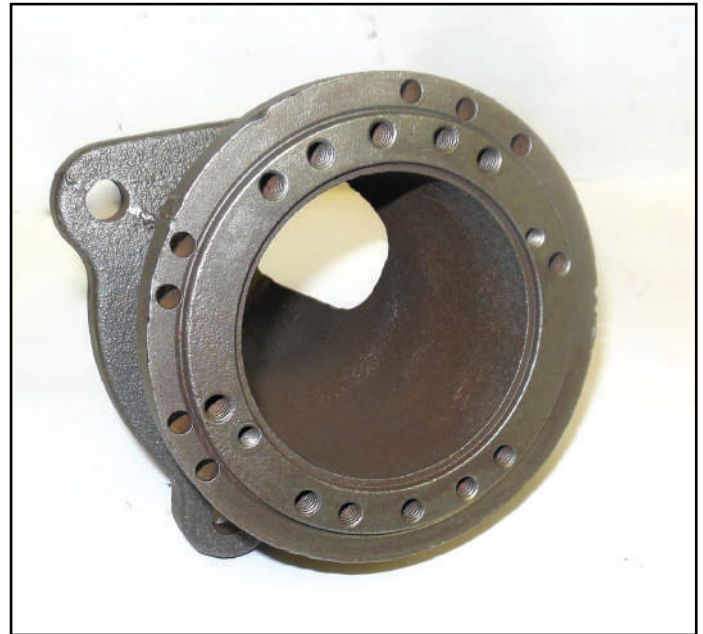


Figure 4 – DE housing with multiple holes for various applications

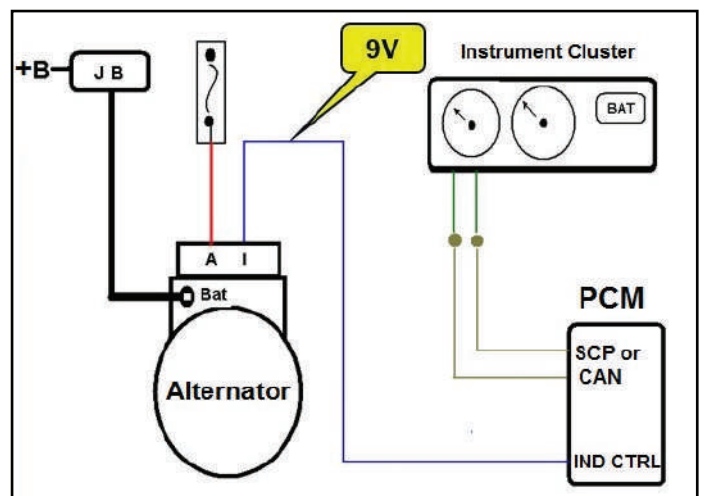


Figure 5 – Typical Ford System-2 charging system details

and WAI. The important point is the selection of the regulator for the right application, particularly now that a PCM version (with A-Sig-Fr pins) are also used for some other 4-G applications. Since they all physically look alike, extreme caution in their selection for the right application will save a lot of frustration that will certainly follow if you get it wrong.

It should also be mentioned that in some later applications we have been seeing 12V rather than 9V limit on the “L” terminal, and those PCM’s have been programmed (reflashed) with the updated programming to see this as normal and not a fault. This occasionally allows older 4-G (OE) regulators to pass through the PCM window and actually work fine, but you would be depending on luck that the vehicle has the update, which is uncertain at best.

Until I see you again, keep up the good work.

COMMON SENSE — FACT OR FANTASY? Bull Crap vs Reality



BY BOB THOMAS

Our industry has been plagued with more than its share of myths and misinformation. Undoubtedly that is because few people truly understand the flow of electrons through a conductor. That lack of understanding has led to assumptions based on observations that may or may not have had anything to do with electricity or science.

In the past, I have written about some of those misconceptions to help readers to not only understand the facts but to be aware of how people came to believe otherwise. Myths and rumors evolve from partial truths and are reached through deductive reasoning, which is often flawed.

Distortion of the facts and false information are nothing new. They have likely been around for many thousands of years, going back to when human beings were first learning to communicate with one another through spoken words, body movement, facial expressions and eye contact. We still use all of those today, but focus mostly on the words, even though the body is often more telling.

Information was shared by word of mouth – literally one person telling another, who then told others. Stories were spread far and wide. Drums, horns, bells, whistles and such were used to send messages over a distance, usually an alarm or warning of danger. Written language, printed words and

inventions like the telegraph and radio increased the distance and speed of communication both the facts and the fiction.

In the 1950's television was born and within 10 years every home in the US had one. This new information and entertainment service was free to all users and paid for 100% by advertising. If you are old enough, you may remember a TV ad with an actor (dressed as a doctor) proclaiming that smoking was good for your health. Keep in mind – that ad was not aimed at non-smokers.

Today, we live in a world with hundreds of television stations and an internet that can literally take you anywhere that you want to go in the world. We all have televisions and most Americans have access to a computer. Many carry a smart phone that's connected too.

According to Netcraft, a worldwide provider of cybercrime disruption services, there are 7.2 **million** computers in the world that are connected to the internet and there are 1.8 **billion** websites vying for the attention of the people who are using those computers (as of January 2018). That is roughly 250 different websites for each connected computer in the world.

Each and every one of those nearly 2 billion websites is there for a specific reason or purpose. Some are honorable, to provide needed or helpful information – such as local,

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COMMON SENSE

state and federal websites to inform citizens on rules and services. Respected hospitals provide information on health, disease and wellness. Banks provide online banking. Many retail stores now sell online to compete for the millions of online buyers using eBay or Amazon.

But not every one of those 1.8 billion websites has honorable motives. Millions exist just to get your attention and make money, any way they can, once they have it. They may be after your personal information that can be sold or they may be paid to expose you to misinformation to sway your opinion on any given topic. Most of them will appear to be totally harmless. Today, very few are there to simply seek the truth and inform the public.

For every major metropolitan newspaper website there are literally thousands of self-proclaimed "news sources" on the web. While the Washington Post, New York Times, Boston Globe, Wall Street Journal and dozens of others have the resources, staff, experience and history of informing the

public through both good times and bad, they are competing with websites that exist solely to supply you with misinformation – and they are outnumbered 1000 to 1.

Remember the 1950's TV ad proclaiming that smoking was good for you? Of course, it was a total lie, both the man dressed as a doctor and the "good for you" part. That ad was aimed at smokers who needed a reason, even a lie, to continue smoking.

If you tell people what they want to hear, they will believe it. If you repeat a lie often enough and loud enough, it becomes the accepted truth. This will create controversy at the public level. The misinformation does not have to be true. It only has to be ongoing to keep the argument alive. Eventually society becomes sharply divided and there is no longer any middle ground.

So as you browse the web, keep this in mind. It is not too difficult to separate fact from fiction, assuming that you want to learn what is real, and what is not.

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A TALE OF TWO ALTERNATORS

Subaru Mitsubishi Look-Alikes



BY BOB THOMAS

Be aware that there are two Subaru alternators that look exactly alike (see Figures 1, 2 and 3). Their applications are 2011-2013 Foresters with 2.5L engines and 2012-2014 Imprezas and Crosstreks with 2.0L engines. Mitsubishi A2TL0091 or Lester 11579 was used on the Foresters while Mitsubishi A2TL0291 or Lester 11631 was used on the Impreza and Crosstrek applications. Both are rated at 125 amps. Except for the part numbers on their original equipment identification tags (see Figure 4) you can not tell one from the other visually. Even the pulleys are identical.

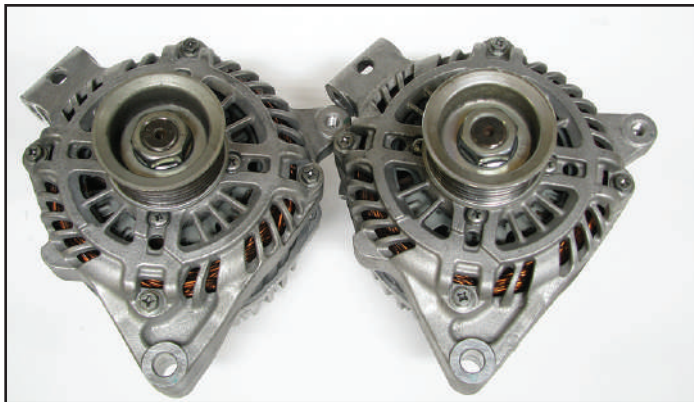


Figure 1 – From the front, these two alternators look like identical twins.

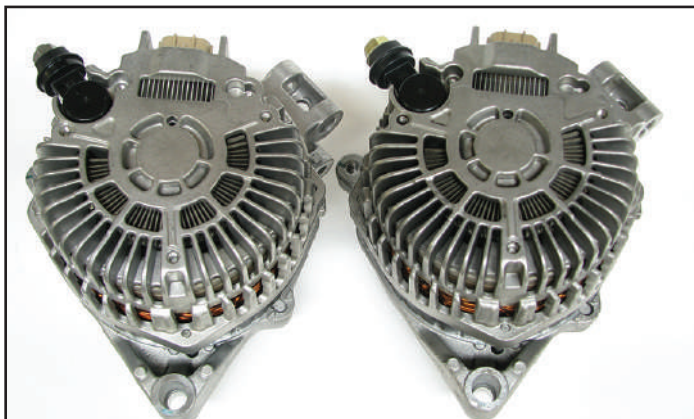


Figure 2 – The rear offers no help in telling one from the other.

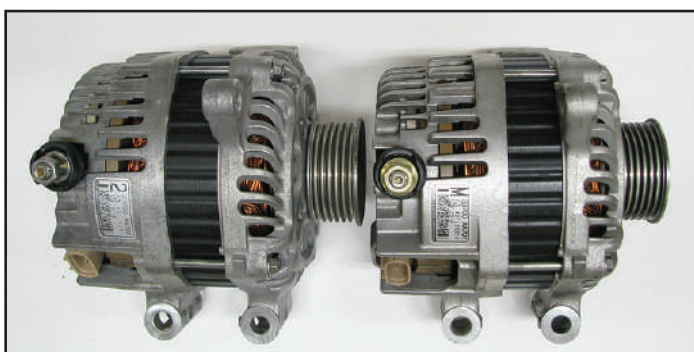


Figure 3 – The front and rear housings, pulleys, rotors, stators, rectifiers and hardware are all identical.

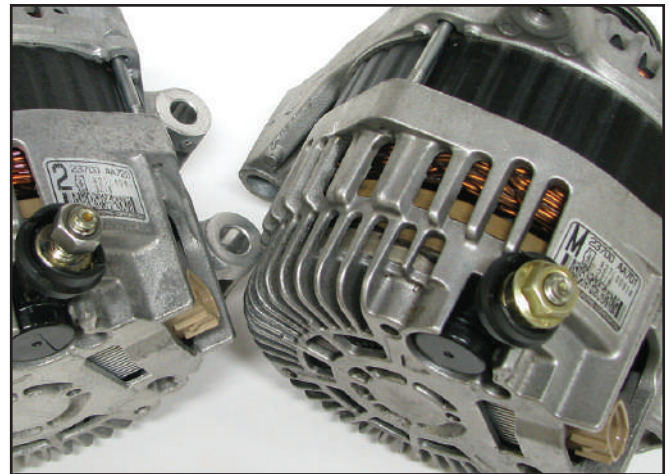


Figure 4 – The only visual difference between the two is their ID tags.



Figure 5 – The regulators appear to be identical but note the different part numbers.

The only difference between the two is inside their voltage regulators (see Figure 5) which incidentally appear to be the same too. Both regulators incorporate the familiar three-pin plug that was first introduced by Denso. Previously, both alternators had been assigned plug code 325. **That information was incorrect.** With input from Regitar along with testing by Mobiletron, Appttrak has assigned a new plug code for each alternator.

The Forester's new plug code is 915 which is identified on that alternator's ID tag as C-S-L. The Impreza's plug code is 9151, also identified as C-S-L. In some places, the Impreza's C terminal may be referred to as G to help differentiate the two, but the original ID tag will show C.

The S and L on both of them represent Sense and Lamp. As you would expect, the sense terminal is B+, supplied through a fused wire from the main fuse box. That circuit is protected by a 7.5 amp fuse. The lamp wire connects to a conventional charge indicator lamp that is powered by the ignition circuit. Voltage coming in from the indicator lamp is used to turn on both voltage regulators. **They will both charge at 14.5v with no connection to their C terminals.** That is by design and it could be called a form of default mode. If the PCM's voltage control function fails for any reason,

A TALE OF TWO ALTERNATORS

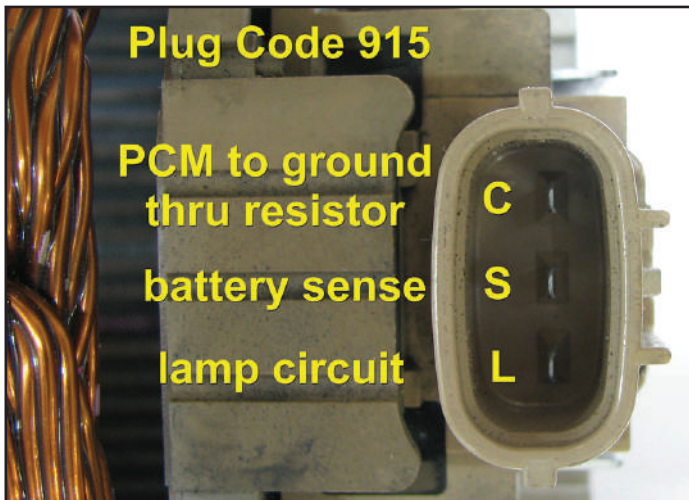


Figure 6 – The plug code 915 for Lester 11579.

these alternators will continue to charge at that Vset (voltage set point).

Additionally, if for some reason sense voltage is lost, the regulators will both still function, but at a higher Vset of 15.5v. That is worth knowing should a customer ever complain about or suspect overcharging. Test the regulator's sense wire for voltage. The 7.5 amp fuse in the main fuse box could be blown or missing.

So we are now down to the only difference between these alternators. Both C terminals produce a reference voltage that

is “looked for” and modified by the PCM to control Vset. The method of modification is different.

The Forester alternator's regulator produces an open circuit output voltage of around 6 volts. If you operate it with only a voltmeter connected to the C terminal, you should see that voltage. The Forester's PCM uses a ground through a resistor to change the Vset (see Figure 6).

On the vehicle, when the battery is fully charged and electrical loads are light, the PCM grounds the C terminal through a 3.9k ohm resistor. That drops the regulator's output voltage from 6v to 3.1v which results in Vset of 12.8v. During testing, I applied a ground through a 2.7k resistor, which dropped regulator output voltage to 3.3v. The regulator then lowered the Vset to 13.1v. If this looks familiar, Honda used a similar system in the 1990's. When testing this vehicle, with no electrical loads, a charge rate of 12.8v could be normal. Turning the headlights on should restore a more normal looking Vset.

Both JIMCO and AMFOR supply a test lead to check this function. Each are designed to result in a given Vset. Vensel handles individual rebuilder sales for AMFOR while you can buy direct from JIMCO. If you call, specify the lead by Lester 11579. Using a test lead is the most efficient and accurate method for testing this alternator, but in a pinch, you could use a resistor value in the 2k to 4k range and simply look for a drop in Vset when you connect it between the C terminal and ground. **The same cannot be said for the Impreza and Crosstrek alternator – Lester 11631!**

That alternator uses a PWM (pulse width modulation)



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signal, created by the PCM on the ground side (see Figure 7). This C terminal has a regulator output voltage of 5.9v which is used by the PCM to create the appropriate PWM signal. With input from a dedicated battery sense, an electrical load sensor and other various parameters, this PCM can change the Vset in exactly the same way that GM did with their RVC alternators dating back to 2004 - over a wide range of Vsets from 12.6 to 15.5 volts.

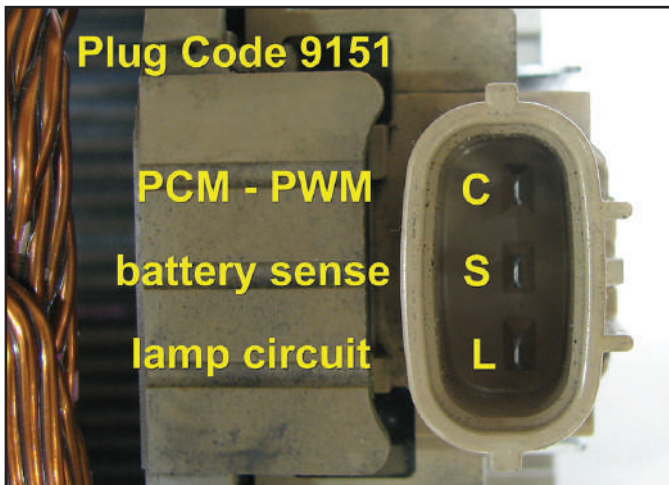


Figure 7 - The plug code 9151 for Lester 11631.

This alternator **must be tested with a PWM device that operates using the ground side** - such as an RVC test box. Simply apply sense and lamp input using your test bench and connect the RVC test box's control wire to the C terminal pin. Then use GM settings to vary the Vset of this regulator.

Warning: If you apply ground to this C terminal, even through a resistor, you will destroy the reference voltage circuit inside this regulator. As a result, the regulator will no longer be able to produce its output voltage. While it will still charge in default mode at 14.5 volts and turn off the indicator lamp normally, it must not be installed on a vehicle. If it is, the PCM will immediately see the lack of output voltage on the C terminal as a defect in the alternator, set a charging system fault code and possibly turn on a check engine warning lamp.

You can easily test a suspect regulator by operating it using lamp and sense only, with a voltmeter connected to the C terminal. If you do not see output voltage of 5.9 volts or something very close, then the regulator is defective and should not be used.

To test either one of these on your regulator tester, you must apply the correct connection as described above and make four connections to the regulator as shown in the photo (see Figure 8). Notice that the field brush is on the bottom looking down as pictured. The top brush is being held out of the way by a piece of insulated wire.

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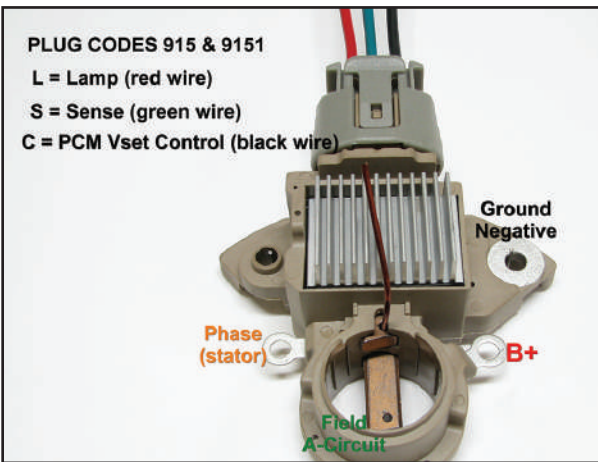


Figure 8 – Connections to use when testing these regulators alone. Only the C connections are different.



Figure 9 – There are no soldered connections. #2 Phillips machine screws are used. A worn Phillips bit will not break them loose.



Figure 10 – They use a double wound stator, common on many other Mitsubishi alternators.

The rest of this alternator is pretty standard for late model Mitsubishi units. There are no soldered connections. Everything is held together with #2 Phillips head machine screws (see Figure 9). You will need a good Phillips tip and a lot of patience to get all the screws out intact without damaging the rectifier. The stator (see Figure 10) is double wound and delta configured.

Notice the heat transfer compound used on the rectifier's negative heat sink (see Figure 11). Its large surface area dissipates heat quickly to the rear end frame. Also notice the quantity and size of the cooling fins on the positive heat sink (see Figure 12). This rectifier and both regulators are available in the aftermarket. Wagners also carries the B+ extension with cover that could be easily damaged by poor core handling.

Special thanks to Dan Bell and Tony Snyder at Whatcom Electric in Bellingham, WA for suggesting this topic and providing much of the data presented on each alternator. Thanks to Gene Kaiser and Regitar for their help in clarifying regulator function and test procedures. Thanks also to Mobiletron engineers who verified the operation of these regulators.

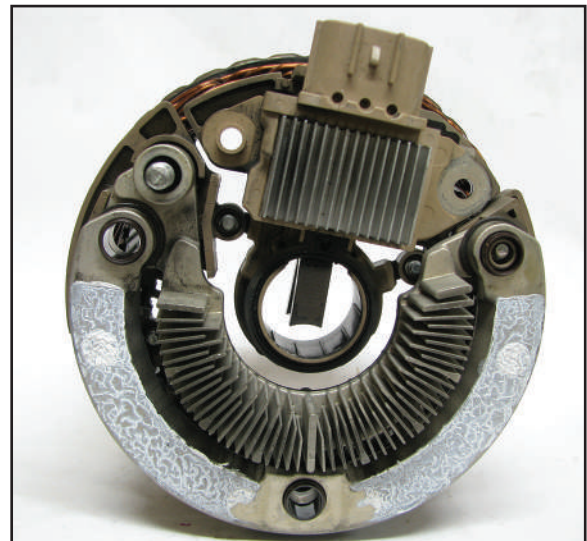
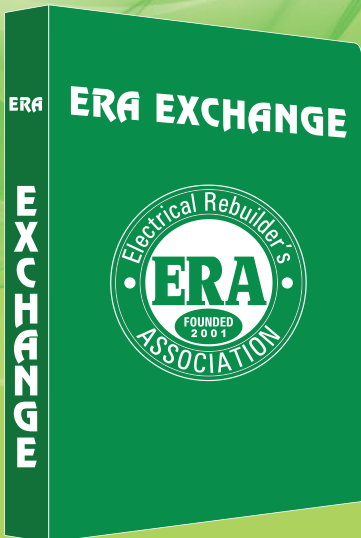


Figure 11 – Notice the heat transfer compound used on the negative heat sink.



Figure 12 – Notice the number, size and design of the positive heat sink.

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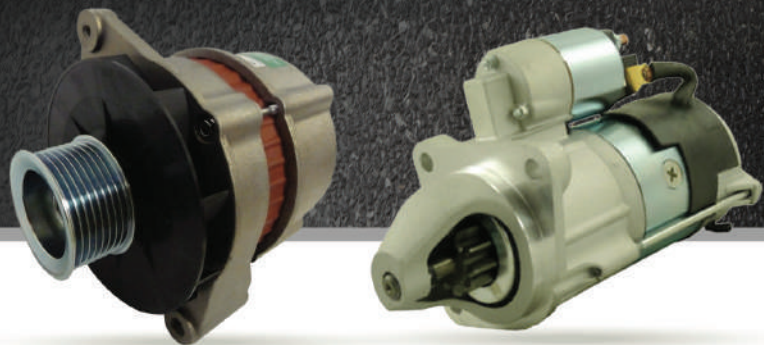
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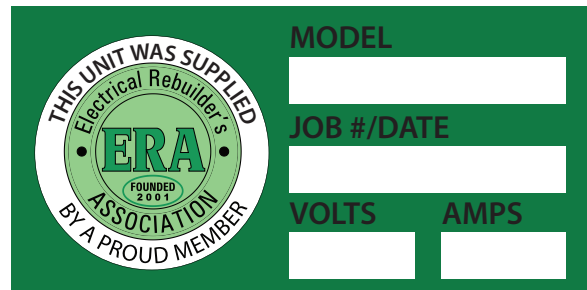
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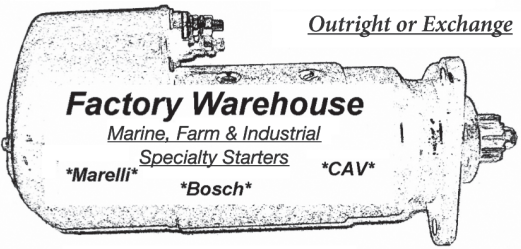









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