ERA EXCHANGE

YOUR GUIDE TO ELECTRICAL REBUILDING

March 2025 $12.95

2025 TRADESHOW
Information Enclosed!

AUTO ELECTRIC CORNER
Regulator Info, Robert Bosch/SEG, Plug Codes and Testing

GENSET TROUBLES

A WORD FROM THE EXECUTIVE DIRECTOR
Building A Tradeshow



What is involved with hosting tradeshows every year? I want to share with all of you some of what is involved with planning and hosting a tradeshow every year for the ERA. It all starts with an idea from one or more of our members suggesting a city to look at or more so a region of the country. The show planning committee has tried to move the event around the country to make an attempt for it to be easier for some of the local rebuilders to attend from that area of the country. However, this line of thinking doesn't seem to matter when it comes to local attendance at the shows. We can plan a show with lots of rebuilders and suppliers within driving distance and you don't attend!

After a city is chosen, many considerations must be looked at. Several dates are put on the table, taking into consideration holidays or any other events that may affect attendance and not planning a date too early, which travel could be affected by inclement weather. Then the vetting process begins with hotels, first they must have ample facilities to accommodate our group size. They must have ballrooms large enough for our expo and seating space enough to hold our seminars and meals. They also have to have the chosen dates available.

The room rates are another factor looked at closely. We make an attempt to stay at facilities offering reasonable rates for our group and hopefully we can get breakfast included in their room rate. Since Covid has subsided the hotels are booking events earlier than ever before. At the penning of this article, we have already looked at several cities for the 2026 show and and spoken with more hotels than in previous years only to find the dates we are interested in are already reserved by another group, taking that hotel out of the running for us.

The cost of the ballroom and meeting rooms, normally priced at an astronomical price ($6,000-$15,000 per event) can usually be offset with the guarantee of a certain number of room reservations and the guarantee of X number of dollars' worth of food and beverage purchased. If that guarantee is not met, the association would have to "buck-up" and pay the difference. So far, we have not had to ever do that. We have to perform somewhat of a "juggling act" by guessing how many attendees we will have vs: what we are willing to sign for as a guarantee to the hotel facility.

Now we have to plan the event schedule so it is inviting and interesting enough for all of you to attend, we have to "guess" what, if any attractions or tours you may be interested in while visiting the chosen city, investigate the costs per person to visit the attraction and include transportation to and from it. I also need to mention developing a schedule of training subjects that are prevalent and current for our group, along with finding presenters that are willing to share their expertise with us.

After all of this information is disseminated, the committee has to set pricing for the activities, all the while holding our breathe to see if we "hit the mark" that we spent so much time planning for. We can only rest easy after the event is over and then judge whether it was a success! All of this effort is not easy and becomes very time consuming, I want to judge success of the event by the number of you that attend each year! I'm anxious to see everyone this year!

Mike Schroeder

NEW ERA MEMBERS

Vic's D.C. Electric Service
Stuart, Florida

ERA EXCHANGE

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INDUSTRY NEWS

& ANNOUNCEMENTS

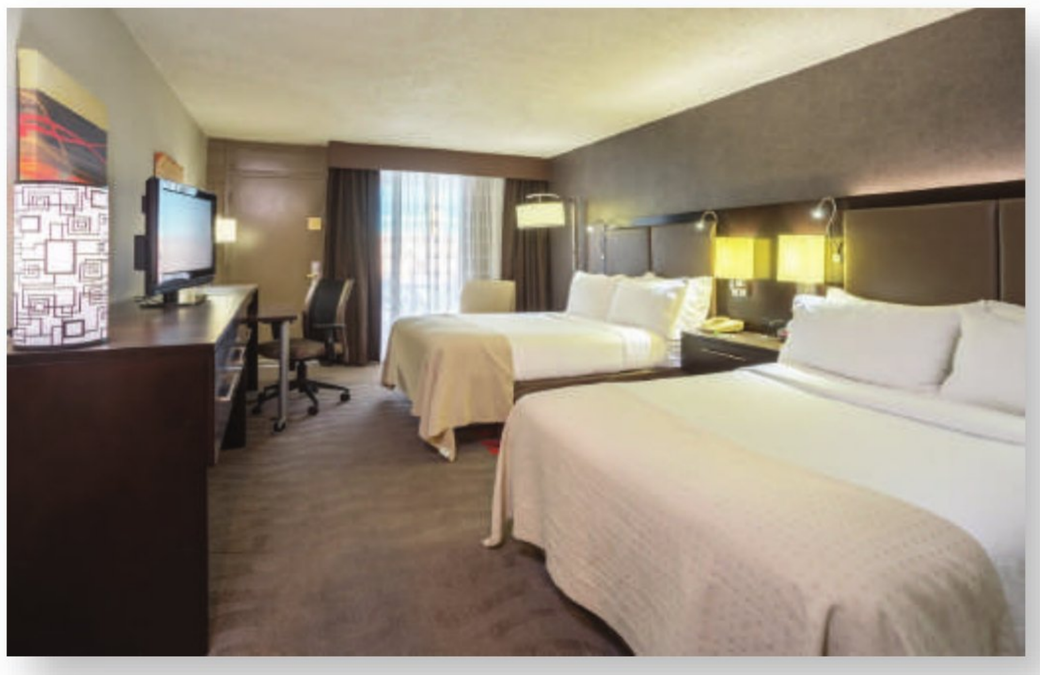


Thursday, April 3rd - Saturday, April 5th

Holiday Inn Harrisburg-Hershey

604 Station Road, Grantville, Pennsylvania, 17028, USA





Rooms are $129 + tax per night (includes buffet breakfast)

Reserve your stay at https://bit.ly/4imDlu2

or by calling 717-469-0661, option #2

HERSHEY'S CHOCOLATE WORLD TOUR ADD-ON

WEDNESDAY, APRIL 2ND, 2025

$85 per person
Buses will load from the hotel and we will be gone from 9:00 AM - 5:00 PM
Lunch is not included



HERSHEY'S GREAT CANDY EXPEDITION
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Experience an immersive and delicious fun-filled tasting journey hosted by two of Hershey's most dynamic Tasting authorities!



HERSHEY TROLLEY WORKS
Embark on the Hershey Trolley Tour to learn all about Milton S. Hershey, the town he built, and Hershey's Chocolate!

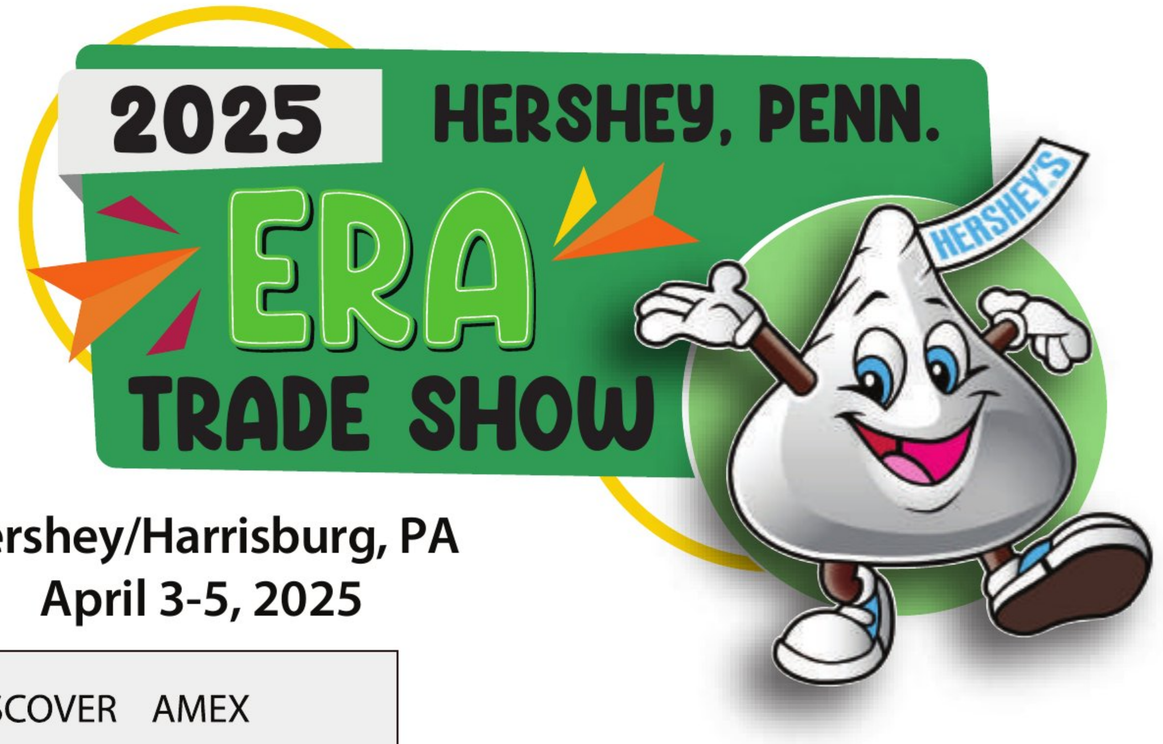
HERSHEY'S CHOCOLATE WORLD REGISTRATION

COMPANY NAME _____

ATTENDEES NAMES (Please print clearly)	**$85 per person**	SUB TOTAL
1)		
2)		
3)		
4)		
5)		
	TOTAL ⇨	

Cancellation Policy: Cancellations are subject to a 15% processing fee.
NO REFUNDS will be made after February 28th.

REBUILDER REGISTRATION FORM



Hershey/Harrisburg, PA
April 3-5, 2025

COMPANY NAME _____

ADDRESS _____

CITY _____

STATE/PROVINCE _____ ZIP/POSTAL CODE _____

PHONE _____ FAX _____

EMAIL _____

SEND THIS FORM WITH A CHECK OR CREDIT CARD INFO TO:

ELECTRICAL REBUILDER'S ASSOCIATION
PO BOX 906
UNION, MO 63084

OR FAX TO: 636-584-7401

OR EMAIL TO: office@electricalrebuilders.org

TO PAY BY CREDIT CARD: (circle one) MC VISA DISCOVER AMEX

CARD NUMBER _____

NAME ON CARD _____

EXPIRATION DATE _____ CODE _____

PLEASE NOTE:
HOTEL PRICING AND ROOM AVAILABILITY IS ONLY GUARANTEED UNTIL 2/28

ATTENDEES NAMES (Please print clearly) **EVERYONE MUST REGISTER**	**REGISTRATION** INCLUDES: EXPO FLOOR ACCESS, THURSDAY & FRIDAY LUNCHEONS, AACA MUSEUM TOUR		**ENTIRE SHOW BUNDLE** INCLUDES: EXPO FLOOR ACCESS, THURSDAY, FRIDAY & SATURDAY LUNCHEONS, **ALL SEMINARS,** AACA MUESEUM TOUR		SUB TOTAL
	MEMBER BEFORE 2/28 **$295** AFTER 2/28 **$395**	**NON-MEMBER** BEFORE 2/28 **$395** AFTER 2/28 **$495**	**MEMBER** BEFORE 2/28 **$450** AFTER 2/28 **$550**	**NON-MEMBER** BEFORE 2/28 **$550** AFTER 2/28 **$650**	
1)					
2)					
3)					
4)					
5)					
6)					
7)					
				TOTAL ⇨	

Cancellation Policy: Cancellations are subject to a 15% processing fee. **NO REFUNDS** will be made after February 28th.

Schedule of Events

2025 HERSHEY, PENN. ERA TRADE SHOW



Wednesday, April 2 (Optional)

8:30 AM Load buses for Hershey World Tour
5:00 PM Buses load to return from Hershey World to hotel

Thursday, April 3

8:00 AM Load buses for AACA Tour
12:00 PM - 1:00 PM Buffet Luncheon
1:00 PM - 3:00 PM ***Latest in Battery Technology including AGM, EFB, Lithium & EV***
with John Cathey of East Penn/Deka Battery
3:15 PM - 4:30 PM ***Battery Charger Repair 101***
with Rick Polete of PLP Battery

Friday, April 4

8:00 AM - 8:45 AM ERA Annual Membership Meeting
9:00 AM - 12:00 PM Show Expo
12:00 PM - 1:00 PM Buffet Luncheon
1:00 PM - 6:00 PM Show Expo

Saturday, April 5

8:30-10:15 AM ***Latest Testing Procedures for New Units & Components***
with Mohammad Samii, ERA Tech Advisor
10:30 AM-12:00 PM ***Rebuilding Heavy Duty Units - Ag • Construction • Industrial • Truck***
with Dan Smith of Romaine Electric
12:00-1:00 PM Buffet Luncheon
1:00-3:00 PM ***Determining Part & Unit Failure Causes***
with Larry Hagemeister of Hagemeister Enterprises, Inc
3:15-5:00 PM **Roundtable Discussion**

2025 Seminar Presenters



John Cathey

Topic: Latest in Battery Technology including AGM, EFB, Lithium & EV

John Cathey is the Manager of Technical Support for East Penn Manufacturing. He is responsible for leading key projects focused on troubleshooting electrical systems for fleets, dealers, and OEMs to enhance and improve overall battery life. He has also been instrumental in developing best practices to improve battery performance and maximize uptime. With over 20 years of experience in the battery industry, John is well-versed in the entire charge/start system. He is an ASE Master Auto and Diesel Technician, holds a total of thirty-two certifications, and maintains a Class A CDL.



Rick Polete

Topic: Battery Charger Repair 101

Rick Polete, one of the owners at PLP Battery Supply, also a retired air traffic controller, is now hands on in the battery sales and charger parts sales and repair business. Opening for business in 1982 as a regional battery sales company located in Southern Illinois offering walk-in sales as well as route delivery in all directions. In addition to battery sales, they offered battery charger sales and service, and in 1995 they published their first charger parts catalog. They are now North America's leading battery charger parts supplier accommodating most brands of chargers. Rick will teach us an easy, step-by-step process to diagnosis and repair battery chargers.



Mohammad Samii

Topics: Latest Testing Procedures for New Units and Components

Mohammad Sammi is no stranger to our group, he has recently closed and sold his shop in Champaign, IL after 52 years in the rebuilding business. Although he has closed his business he continues to serve as the ERA Technical Advisor, answering the ERA Tech help line and penning more articles for the Exchange magazine. He continues to expand his knowledge of this industry by attending some of the tech seminars offered to the country's most elite technicians and service advisors. He is our go-to source for information on the latest vehicle electrical systems. He has always enjoyed sharing his expertise and "tricks of the trade" to everyone in this group.



Dan Smith

Topic: Rebuilding Heavy Duty Units - Ag • Construction • Industrial • Truck

Dan Smith is currently in his 53rd year in the automotive electric industry, starting in 1973 working in his uncle's rebuilding shop. He then opened his own shop, United Auto Electric in Fitchburg, MA, from 1978 until 2001. He then worked for Boston Auto Electric until its acquisition by Arrowhead in 2011. He served as the Northeast Sales Manager and the OEM Sales manager for Arrowhead/J&N Electric. In June of 2022 he started his employment with Romaine Electric, he currently works as the Account Manager for OEM Sales for Romaine. Dan's depth of knowledge in the rotating electric industry is incredible, he is coming to the tradeshow once again to share some of his experiences rebuilding in the heavy-duty world.



Larry Hagemeister

Topic: Determining Part and Unit Failure Causes

Larry Hagemeister, the owner of HEI, Hagemeister Enterprises Inc. in Lebanon, Oregon started working for his uncle that started Hagemeister's in Newport OR in 1970, Larry purchased the business in 1984. They had started rebuilding electrical units several years prior. In 2005 Larry purchased another rebuilding business in Redmond, OR and has just recently sold it. Larry has established himself as an expert in the rebuilding industry. He is a 20-year member of the ERA and currently serves as a Board Member; he often contributes technical articles to the Exchange magazine and now is coming to the tradeshow to share many of his findings while rebuilding and repairing vehicles and equipment.

AUTO ELECTRIC CORNER —
Regulator Info, Robert Bosch/SEG, Plug Codes and Testing



BY MOHAMMAD SAMII

I attended the 2025 Auto-Value Expo, an event put on by the Auto-Value and bumper to bumper buying group that is held annually in Grand Rapids, Michigan. The company owns 275 Auto-Value part stores in Michigan and surrounding States that cater mainly to professional service dealers as well as the DIY market.

There are many training classes along with the show that is sponsored by various vendors who supply the company and also provide the trainers. One of the main rotating electrical suppliers for the group was Genco Auto Electric (later acquired by BBB Industries) who used to hire me to teach charging/starting classes at various skill levels for the technicians at this event.

What got my attention in this year's event was a reduction in the number of vendors for rotating electrical such as starters and alternators. We electrical rebuilders know that the design of the new starter and alternators have changed a lot and their longevity increased to a degree that possibly can last the normal life of a car, of course with some exceptions. The fact that the number of units used during a car's life-cycle does not exceed more than one or 2 units, not counting the abuse and misdiagnosis into the equation. But the fact remains the newer vehicles do not need as many starters and alternators as the vehicles of a couple of decades or so ago did, and this greatly reflects the number of units sold. Barring the power of OE advertising and market proliferation, Internet sales and Amazon, could that be an indication why not much rotating electrical was presented during a big trade show? I personally think so.

A Bosch Regulator

Responding to a Help-Line call, I was asked if I can figure out the plug-code and help to explain how to test this Bosch regulator number 0-272-220-701 or actually a WAI IB-731. (*Figure-1*)

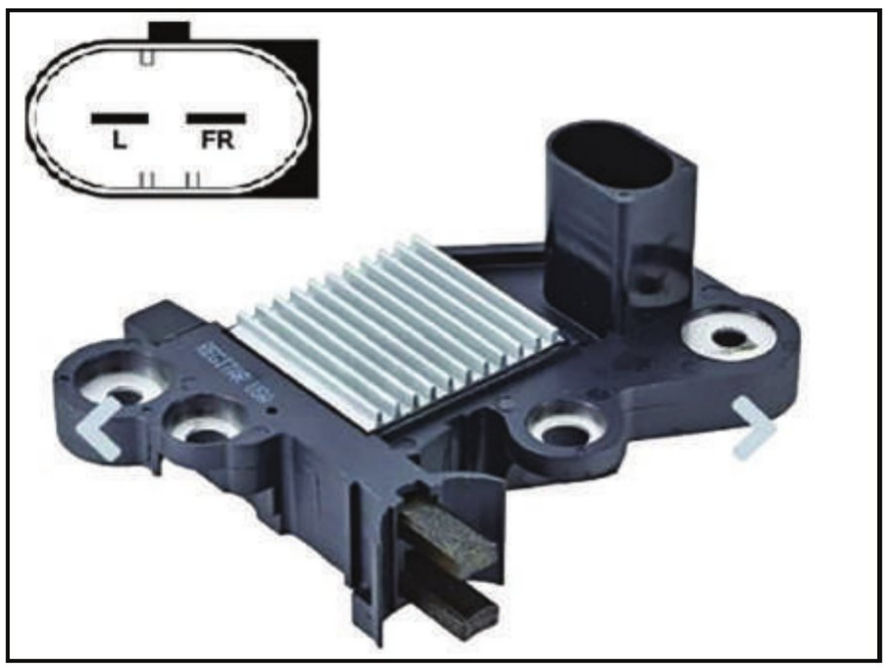


Figure 1 – Bosch Regulator (WAI IB731)



The part number for the unit SJ14155 was an odd one and it did not cross to any unit number published in our available industry crosses but a web search showed it to be a unit as shown in *Figure-2*. To the best of my recollection, this unit was used on a John Deere 5055 or similar series loader/tractors.

The plug-code was a typical Bosch 367, very common on VW and similar applications. The plug-code by itself may not convey sufficient information as testing a voltage regulators requires some details as knowing how it connects to the various wires of a voltage regulator tester.

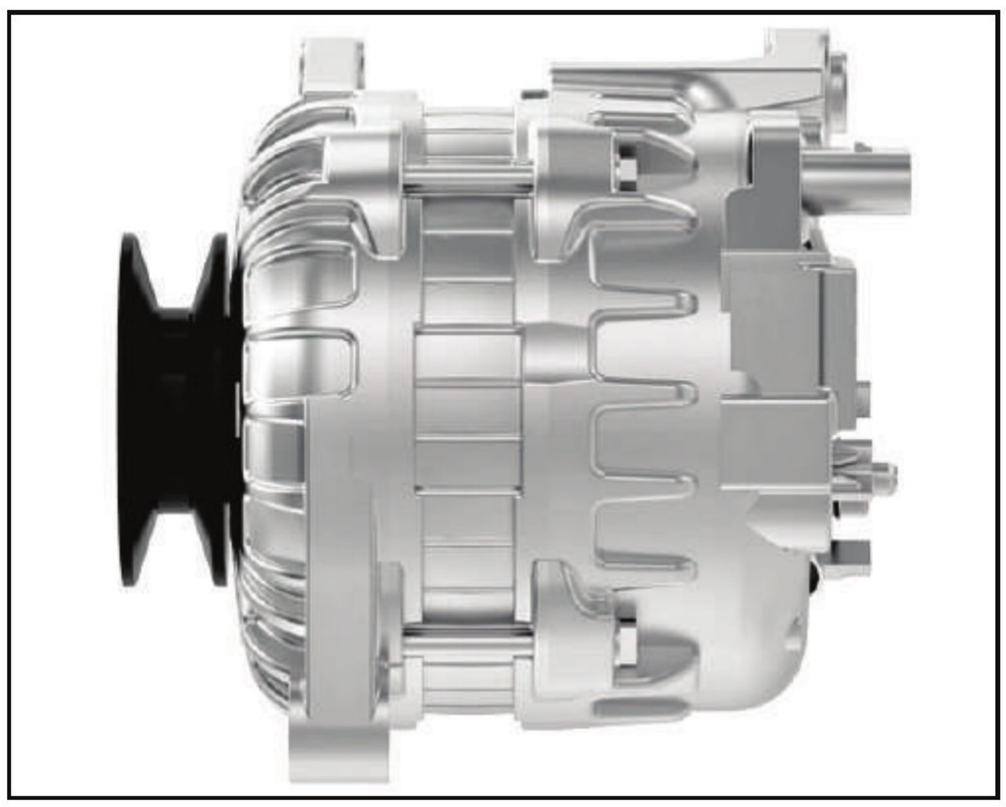


Figure 2 – Bosch SJ14155 Alternator (web photo)

ONLINE CATALOG

PARTREF.com

50,000 Rotating Electrical Units

Lookup by Vehicle App, Part # or Attribute

Includes Product, Bills of Material, Specs & more

Offered FREE to ERA members accessed through ElectricalRebuilders.org

Non-Members who want access, please use contact info below

YouTech Group LLC

(866) 285-1292 • dennis@youtechgroup.com

Fortunately this information is provided by the regulator manufacturer and can be easy retrieved off their website, given you are registered by the company and have an open account. A search through WAI's website for the regulator showed this regulator to be a "B-circuit" which show you right there as how to position your field selector switch and the rest of the connections to be made as it is highlighted in *Figure-3*.

There is a lot of valuable information regarding regulator testing easily available, courtesy of our regulator suppliers. That information is often a less used feature of their website and I encourage you to use it more often. It comes very handy for answering a lot of questions and clears a lot of misconceptions.

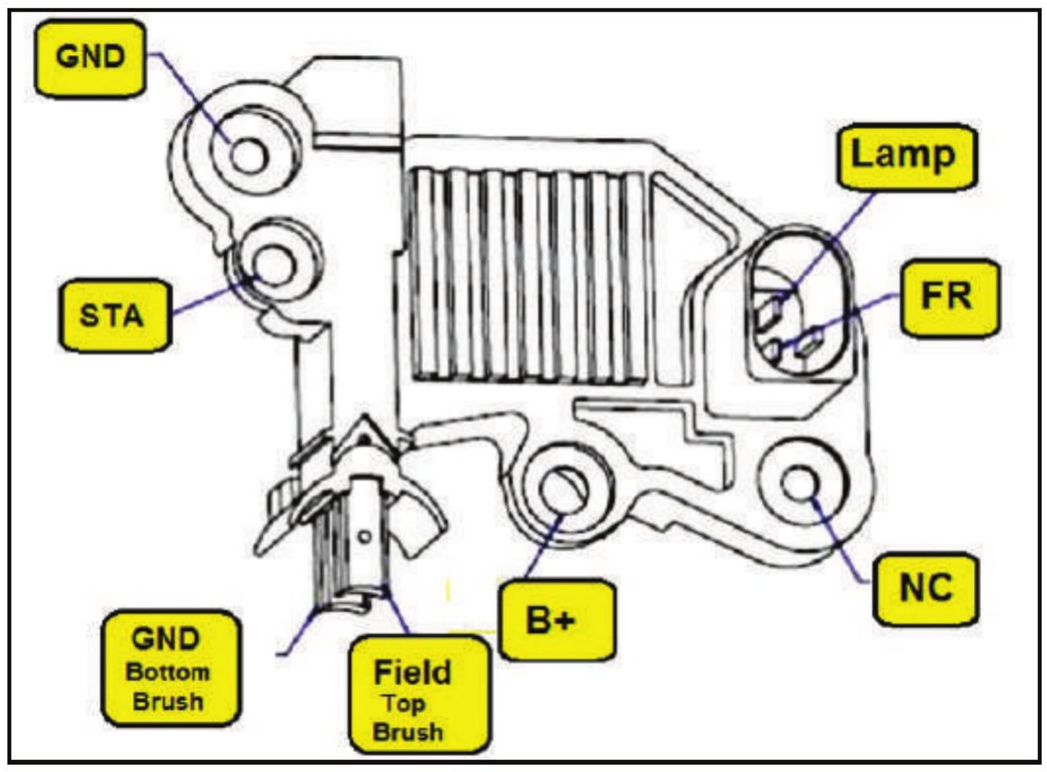


Figure 3 – IB-731 Regulator Test Hookup

Robert Bosch/SEG

The unfamiliar above number of the alternator could be due to changes that has happened within the last few years at Robert Bosch. The entire rotating electrical division of Robert Bosch that we were familiar with was acquired by China's Zhengzhou Coal Mining and Machinery Group. The name changed and the Bosch's rotating electrical division became an independent company under its new owner and is called SEG Automotive North America, a large company with nearly 8000 employees that now possesses all of the Bosch manufacturing facilities along with all the parts and information. They are headquartered in Novi, Michigan with many manufacturing facilities in Europe, Brazil and Mexico.

SEG supplies to the OE market as well as aftermarket with the quality that was always expected from Bosch which I believe now at slightly better pricing. Although I am not sure how much the supplying of service parts for rebuilding industry will be affected, I hope they realize the significance and the contributions electrical rebuilders make to the whole industry and support us with affordable service parts.

I would like to thank Sam Castiglione (PG Keene Electrical Rebuilders, Bridgeview, IL) for his contribution to the above information.

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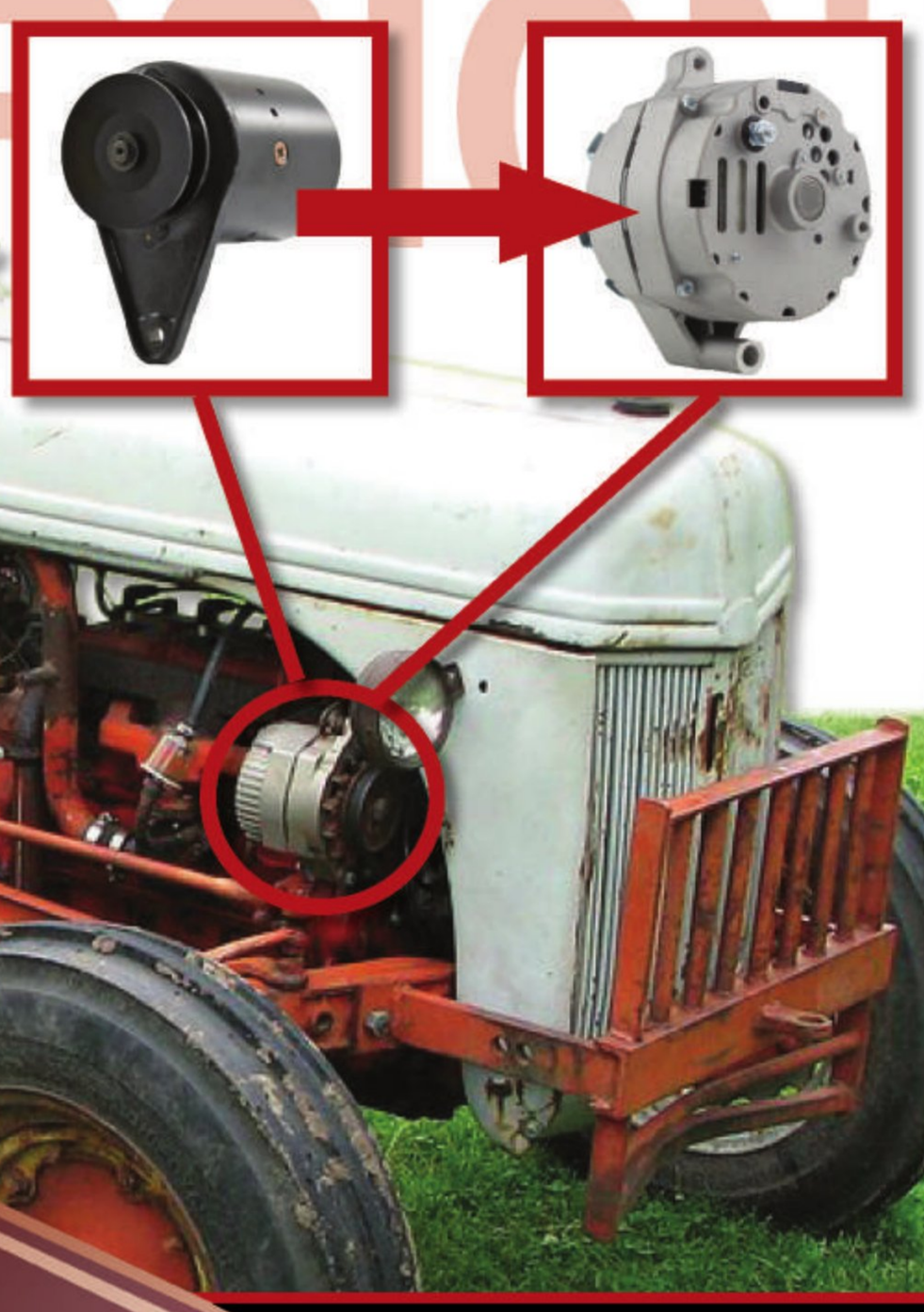
CONVERSION





51-10004
Lucas to Delco
10MT Conversion



51-299
Prestolite/ Ford
10MT Conversion



21-1199
Delco 10SI to
Motorola Conversion

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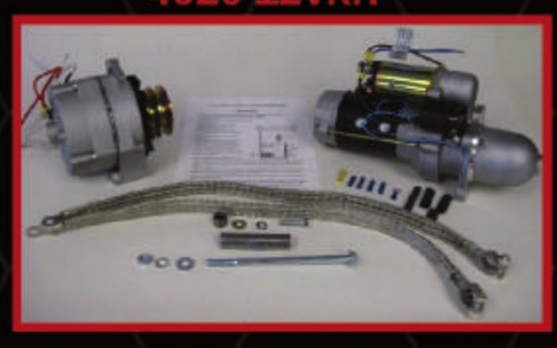
KEYWORD: "CONVERSION"

3708-12VKIT



4020-12VKIT



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*3708-12VKIT & 4020-12VKIT
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Plug-Codes and Testing…!

I believe sometime way back in the 80's it was decided that one identifying feature of an alternator was its regulator plug and the configuration of its regulator pins. I guess this probably was initially decided by D&V electronics of the time because their test benches required a special plug, so a code for each alternator connector plug.

In the general rebuilding field this was not a very significant or highly important feature. The common import alternators of the time had only 2 or 3 pins, usually marked S-IG-L or simply an "S" and "L" which identified their function. The domestic alternators of the time, mainly Delcotron (10-DN and 10-SI series), Fords (1st Generation) or Chryslers with their F1-F2 pins could be easily tested with some jumper wires and a test light, and nothing much more than that.

Then the picture changed and having the right plug and information for proper testing became more necessary when CS alternators entered the market. It became necessary to distinguish between say, a 408 or 411 regulator if you were doing thorough testing (*Figure-4*). Luckily some companies of that time like AmFor Electronics, Jimco, Transpo and others made suitable test boxes and test leads that could accomplish this.

Figure-5 shows the capture of the "L" and "F" terminal under moderate load showing the applied "L" signal and the "F" feedback about 24% load on their now-working alternator. Their new-hire technician was lightly schooled by me to the intricacies of GM RVC system and the "Default Mode" in case the PCM fails to apply the signal. I hope he learned about the self-exciting feature of the system that when unplugged, it can go into default and charge if the alternator is okay, albeit at lower 13.8 Default voltage. I was moderately paid for my time, trouble and advice, hoping the next time they would not condemn a PCM on a guess…!

The next degree of difficulty was the introduction of some Denso alternators for Honda, Toyota and many other such import applications. Where their regulator plugs looked the same but the pin function and internal circuitry was different which made it challenging to test, not to mention choosing the right regulators to begin with due to similar looks. *Figure-5* is a reminder of the similar regulator plugs but all with different codes or variety of pin configuration to correspond with the function of each pin.

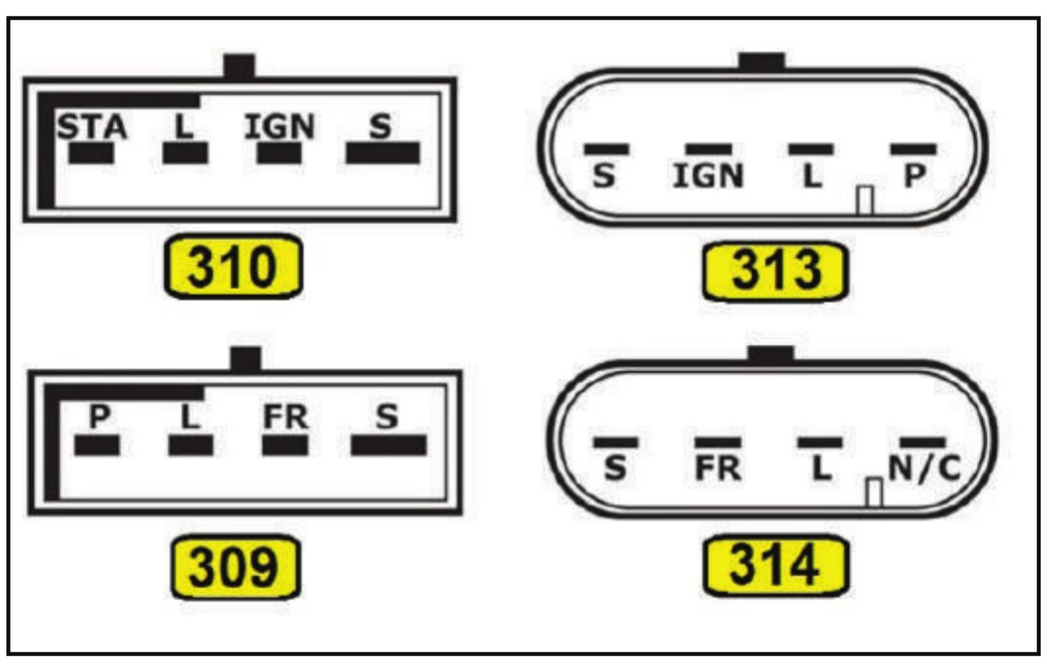

Figure 4 – CS and AD Series Regulator Plugs and Codes



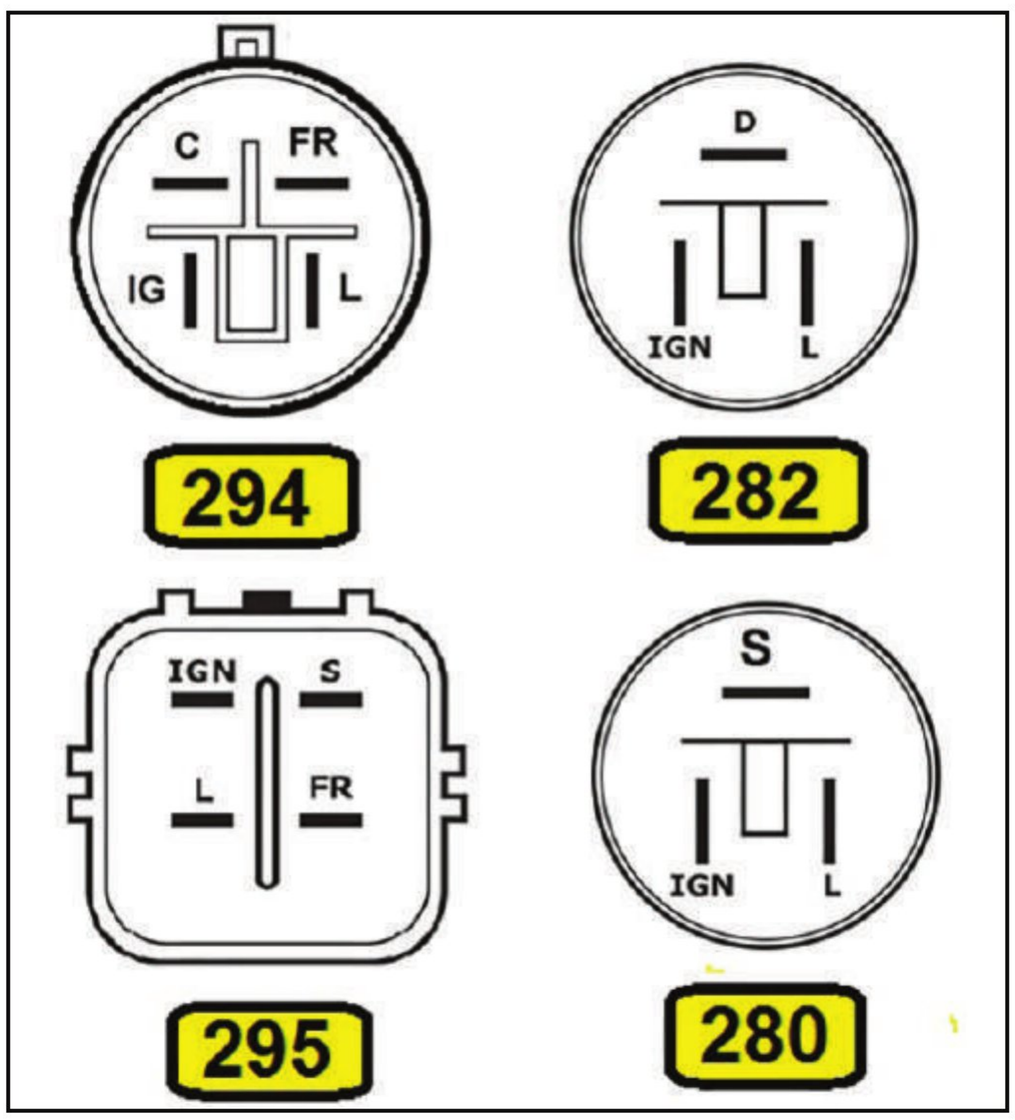

Figure 5 – Various Denso Regulator Plug Codes

Next degree of complication became obvious when Ford introduced the 6-G alternator series with three identical regulator plugs but with different pin functions. An example of this can be seen in *Figure-6* that knowing the details of each variation was and still is of utmost importance.

To add to the complication (some may say confusion), Mitsubishi Electric introduced what is called a P-D system. The "D" pin (Driver) required a pulse-width modulated signal from the PCM to activate the regulator and vary the set point for the required output, and "P" pin (Phase) to supply the stator signal to the PCM as a sort of feedback signal. (*Figure-7*)

P-D regulators with plug-code 303 looked exactly like common plug-code 300 with only L and S pins but their respective regulators were not interchangeable. Many tested these alternators wrongly and many ruined a perfectly good P-D regulators by testing it like an S-L, or a plug-code 300 regulator. To the best as I can remember, the P-D regulators were the first to require a test box or adapters to be able to run these alternators, both initially provided by Jimco and Regitar.

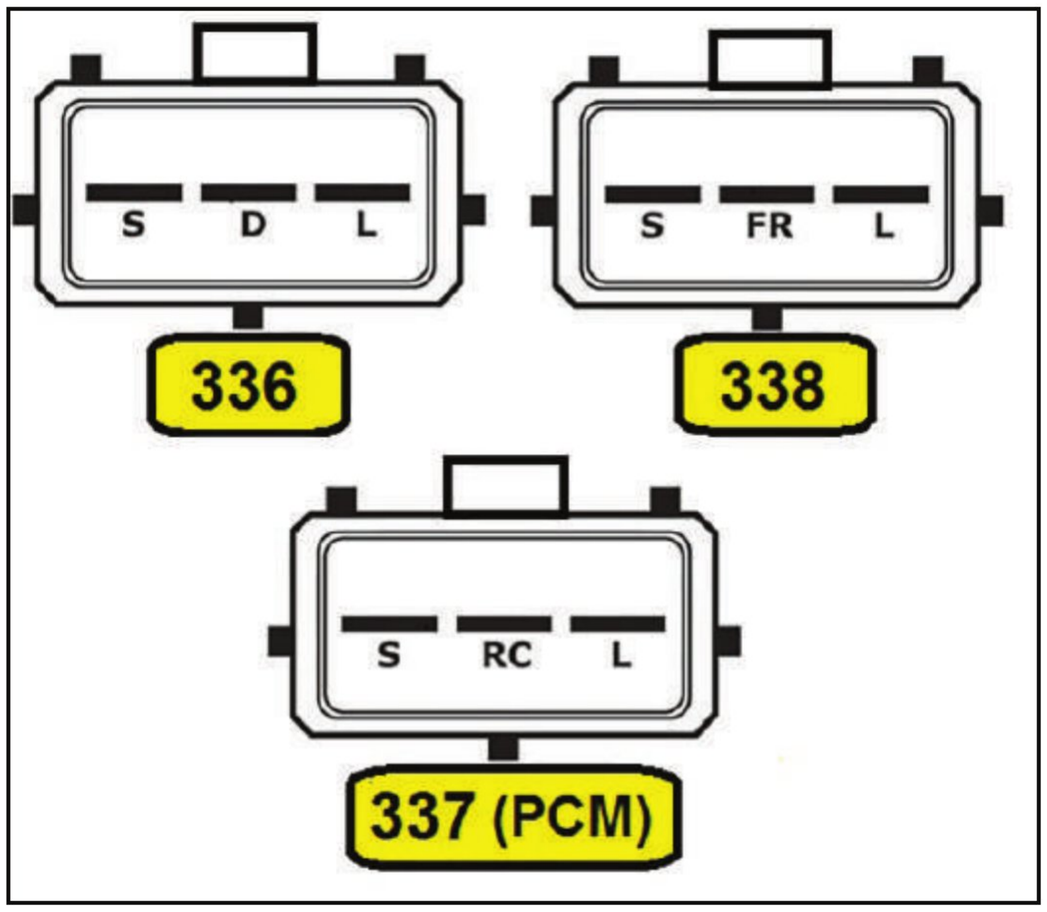

Figure 6 – Ford's 6-G, Similar but Different Regulators

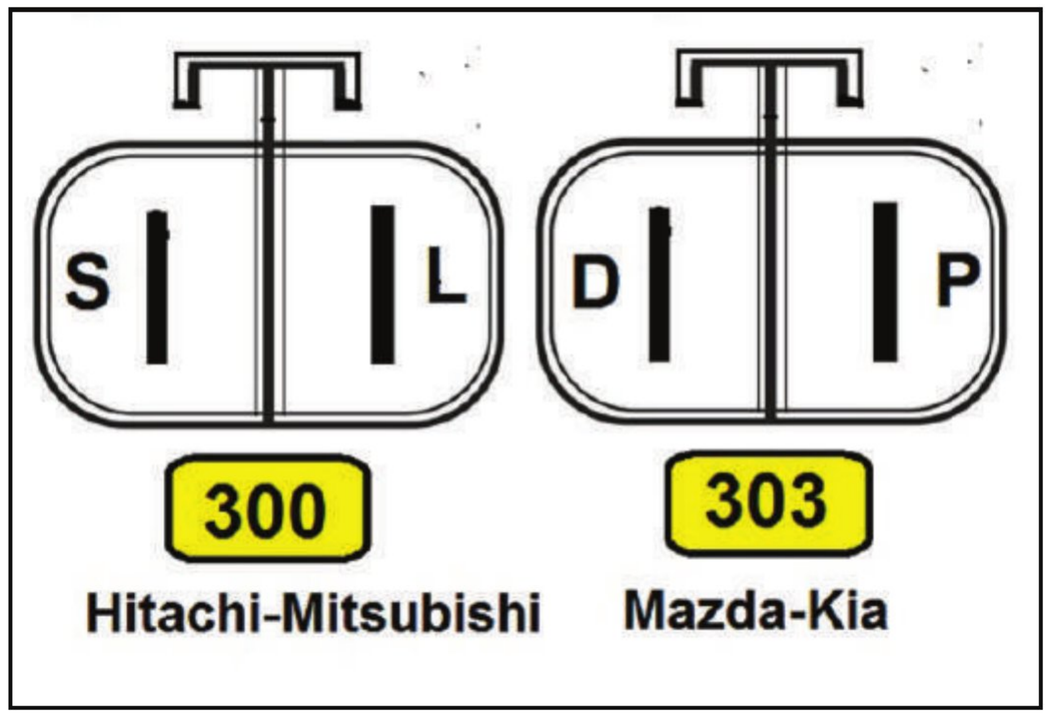

Figure 7 – Standard and P-D regulator plug Codes

Hi Torque IMI Performance Products, Inc.®
WWW.HITORQUE.COM
The Highest Quality Gear Reduction Starter Motors On The Market!
SCAN ME
MADE IN THE U.S.A.
IMI-241-015
IMI-25009-003
IMI-231-001
1.4kW
2.7kW
1.2kW
Wisconsin Applications
Lester# 5494, 5495, 5789, 5219, 5669
Prestolite# 46-910, 46-911, MBG4141, MBG4140, MBG4118, MBG4109, MBG4024, MHA6102, MHA7021
Hyster# 0181785
Clark# 6513373 & 6632567
International & Farmall Applications
Lester# 17308, 4193, 4524, 4594
Delco# 1107564, 1107744, 1107543, 1108657
Yanmar Marine Applications
Lester# 18209
Hitachi# S114-303
Yanmar# 128170-77010, 128170-77010D, 428170-77010

Plug-codes by itself may not determine how an alternator can be tested. As an example, some Nissan and Hyundai /Kia alternators as well as many others may contain a "C" terminal (computer and/or communication) but the nature of the signal applied to each is not necessarily the same. That's when it becomes necessary to have the right plug-code as well a test box able to provide the right signal for the right regulator for proper testing. (*Figure-8*)

As we moved into a new generation of alternators and into what is euphemistically called "Smart Charge", a source of computer signal is needed to drive a certain pin of the regulator for precise adjustment of the charging voltage beyond the level of the common voltage regulator that we were accustomed to.

These systems incorporate a battery current sensor, attached to the battery negative cable (*Figure-9*), determining what goes in and out of battery to maintain a level slightly below 100% State of Charge (SOC) for saving small amounts of fuel as well as extending the battery's life.

Introduction of alternators with a single pin "COM" terminal added another level of challenges in testing alternators. These alternators (actually their regulators) are tied into the communication system of the vehicle and are driven with signal from PCM or other source that are considered a part of BMS (Battery Management System) for a more precise control of the charging voltage, depending on the load, speed, temperature and the SOC.

By and large these modern alternators are commanded by the LIN bus of the vehicle that is a low speed communication bus used for running many electrical accessories such as power-window operation, blower speed control, wiper blade speed control…etc.

Proper testing of these alternators require have the appropriate test box to generate a signal equivalent to the LIN that drives the alternator. These test boxes are becoming a necessity if your work encounters testing such units. (*Figure-10*)

Fortunately some of our suppliers such as Jimco, Regitar and WAI as well as others have introduced test boxes that can accomplish this and more. More details regarding testing the newer generation of the alternators will be discussed during the ERA Show in Harrisburg, PA in April.

There are efforts undertaken by ERA to clarify, complete, and publish the missing plug-code numbers but that is a battle that requires cooperation of all involved to fill the voids that exist in the long list of plug code directory.

Well that's all for this issue. I am hoping to meet many of you during the 2025 ERA Show this year. Until I see you then, keep up the good work and remain healthy.

You can contact Mohammad Samii by email at: sammyselectric@sbcglobal.net, or by calling the ERA Tech Help Line at 636-584-8324 and leaving a message with your call-back number.

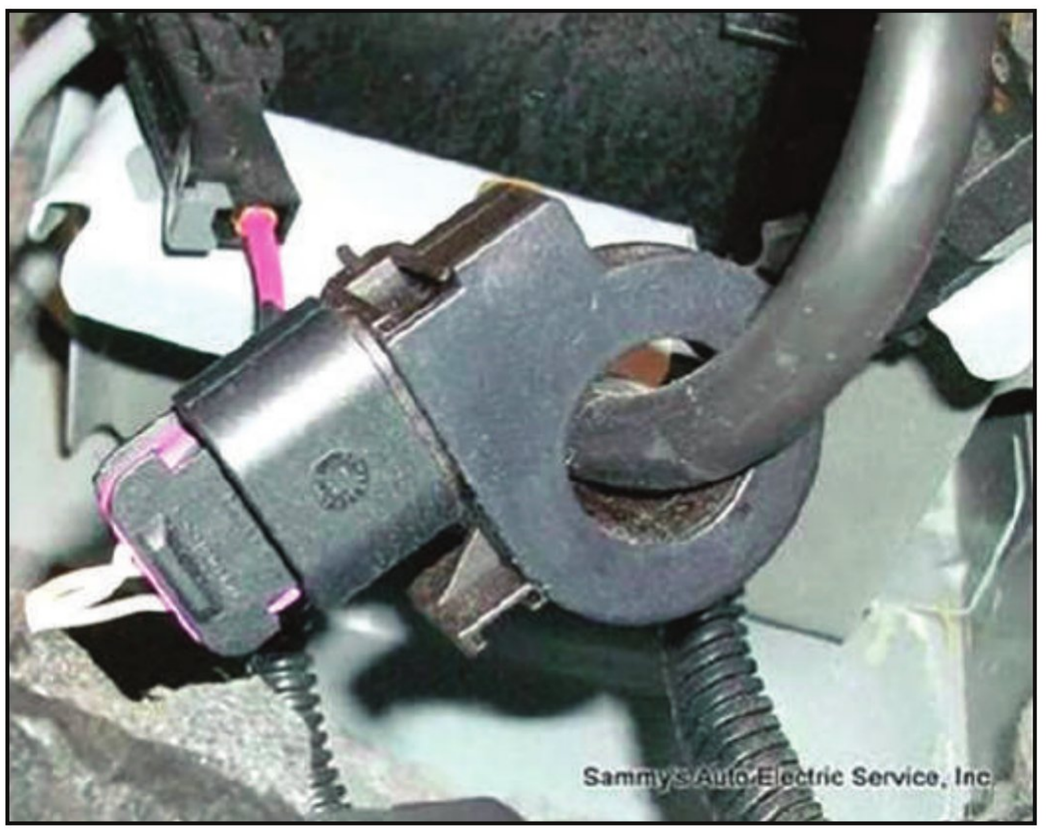

Figure 8 – Nissan and Hyundai/Kia Plug Codes

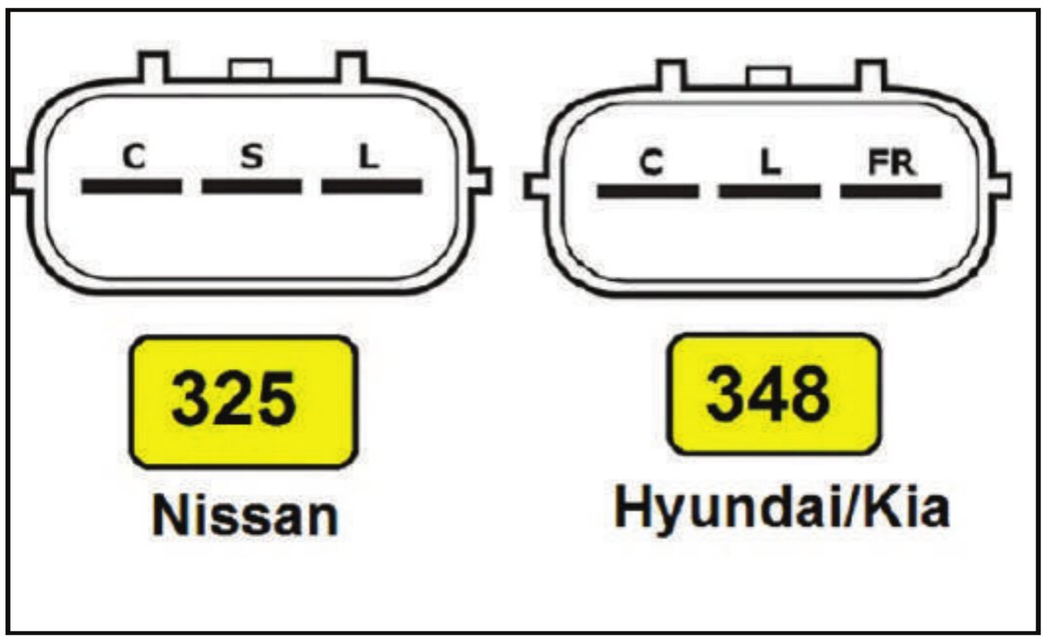

Figure 9 – A GM's RVC Battery Current Sensor

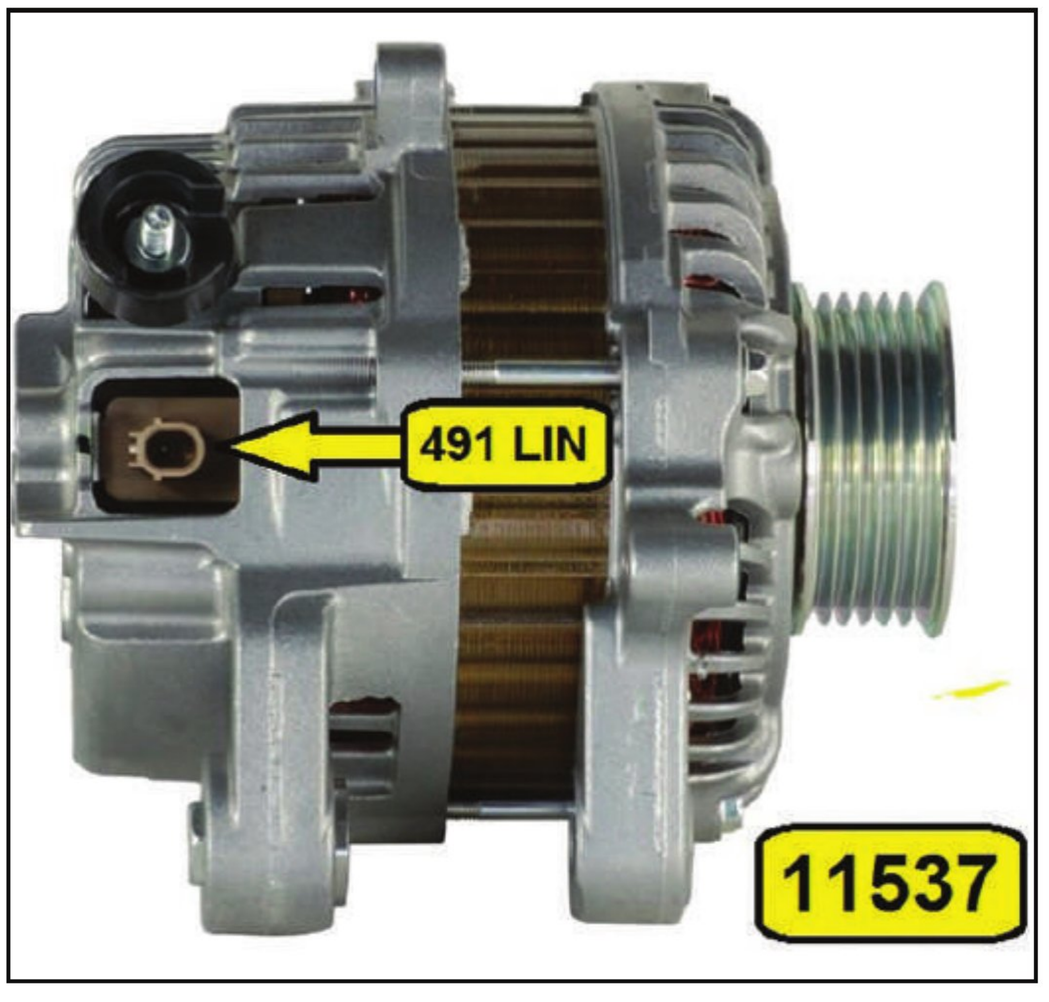

Figure 10 – Honda Alternator with LIN (Single Pin)

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GENSET TROUBLES



BY NATHAN UNGER

#1 Onan Genset

Cold weather makes genset owners nervous. This Onan generator for a private boarding school in a nearby city was not actually broken down but was sometimes making grinding noises, so they brought the starter (MEO6003) for diagnosis and repair.

The drive gear was chewed, and you can also see damage from the mushrooming of the ring gear teeth, embedded in the drive teeth (*see red arrow in Figure 1*). This means that I will recommend the mechanic take a die grinder and clean up all the teeth of the ring gear before installing my rebuilt starter.

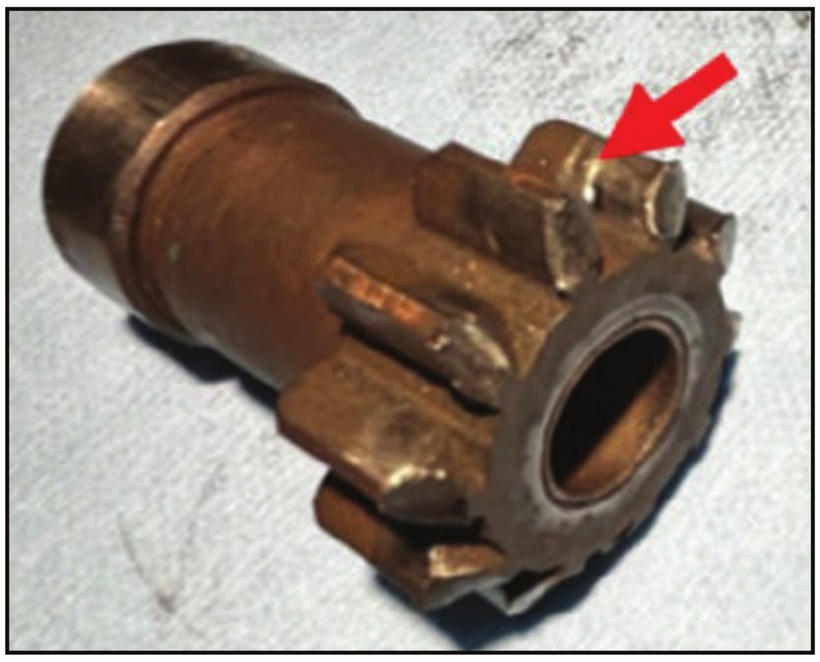

Figure 1 - Chewed gear

But why were the teeth grinding like that? I took the unit all apart and found that the hold-in coil wire had fractured off of the S terminal. What happens then is the pull-in coil throws the drive forward, closes the solenoid contacts, and begins the cranking cycle. But as soon as the contacts have closed, the pull-in coil is cancelled. Since the hold-in coil is disconnected, the solenoid then lets go even though the ignition start switch has not been released. Then the pull coil re-engages and attempts to mesh the drive with the still-rocking ring gear, again and again. Because of the un-anticipated releases, the ring gear could actually be rocking the wrong way once in awhile. It might have come down off of the wrong side of a compression stroke. Hence the chattering and grinding of the gears, and the destruction of the internal drive parts.

By the way, here is an article about a smart start relay that can prevent this kind of damage.

ERE December 2018

https://www.electricalrebuilders.org/techlib/tech_articles/ERA-tech-article-201812A.pdf

Also, the August 2012 ERE has a good article on solenoid hold, pull, and balance behavior.

Or you can find it by copying and pasting this link.

https://www.electricalrebuilders.org/techlib/tech_articles/solenoid_balance_testing.pdf



The drive in question was Prestolite 18-58, counter clockwise, 10 tooth, 1.55" gear diameter. (*See Figure 2*)
Armature number MCH3134 Lester 5060-2272
I located a drive and ordered it up by air freight to get the starter up and running ASAP.

Unfortunately, when the drive arrived, it did not fit! The spline angle on this new drive was only 20 degrees instead of 25 degrees like the armature. (angles may not be exact) Therefore, the drive would not slide onto the armature splines. I had triple checked the part number before I ordered it, and now I did it again. Yes, it was the right part number!

Since it was close to 5:00 pm, I left the job on the bench and gave the matter some thought overnight. Then I remembered Mike Tweed from Standard Starter Drive. Phone 1-765-457-4110.

I was thinking, "If he doesn't know about this situation, then how can I be sure he will send me the correct drive, and not the same wrong one I got from the other supplier?"

In the morning, I called him and sure enough, he had heard of this problem. The 'offshore new' starter drive for this unit should only be sold with its matching 'offshore new' armature because the spline angles are slightly different than OE (original equipment). This is not the first time I have encountered this situation, so I on other occasions I would normally just rebuild the drive that was in the starter. However, in this case the drive was so damaged I wanted to replace it rather than try to rebuild it.



Figure 2 - New drive



Mike told me he had some original drive cores, so he rebuilt one and air freighted it to me by the next day. I was so delighted that I promised him I would put in a good word for him in my next article!

This antique, unusual, and rare starter drive has rollers and springs (*see Figure 3*), but they are mounted on a 'brake shoe' of graduated thickness (*see Figure 4*). It's kind of like a drum brake, and the shoes then compress on the drum lining. The red arrow shows where the spring would have been to keep the roller up the shoe's thickness ramp against the drive cam, like a normal roller and spring drive. (*refer to Figure 3*)

Fwiw (For what it's worth):

To measure the spline angle on the shaft, the simplest way I could think of was to copy and paste a picture of a protractor from Google into Microsoft Word. Next, I shrunk it down to like 4" wide - the correct size for what I needed. Then I printed it on a sheet of acetate I found in a bottom drawer, leftover from the days of the 'overhead projector'. Am I dating myself or what?!

I then trimmed out my custom protractor to suit and wrapped it around the shaft to get a reasonable angle reading.

#2 Repeater Station Genset

This one is quite tricky. The situation: Up on a local mountain, there is a remote repeater station used for communication broadcasting. It's a long trip up there for servicing if it breaks down, so they do not welcome unscheduled down-time.

The communication company sends the signal up to the station, which then, because of its altitude advantage, can broadcast it more efficiently.

Since public electricity is not available up there, it has a large bank of twelve huge 2-volt batteries, connected all in series to make 24v. To recharge the batteries, they have a small 16.8 HP diesel engine driving a 24v, 175a Motorola alternator. 8SC3157V (*See Figure 5*) This way they only have to use diesel fuel occasionally.

I did some rough calculations, and that alternator will easily use half the power that the diesel engine can produce at its operating rpm, if the batteries are really discharged.

We know that an alternator's capability to produce output depends partly on how fast it spins. At the idle speed of the engine, the alternator cannot produce its full output, even though the batteries may be able to take it all at first.

First, the automatic controller starts, then idles the engine to warm up, and then tries to go to full throttle. The problem is that the engine does not produce its full 16.8 HP except near operating rpm. It cannot get up to speed because the faster it goes, the more output comes out of the alternator, which then loads the engine even more. Therefore, the engine bogs down just above idle if the batteries are really discharged. If you were accelerating a truck up a slight incline, you would remedy this situation by not shifting up until you reach the proper rpm. But this setup doesn't have a transmission.



Figure 3 - Clutch body



Figure 4 - Brake shoe

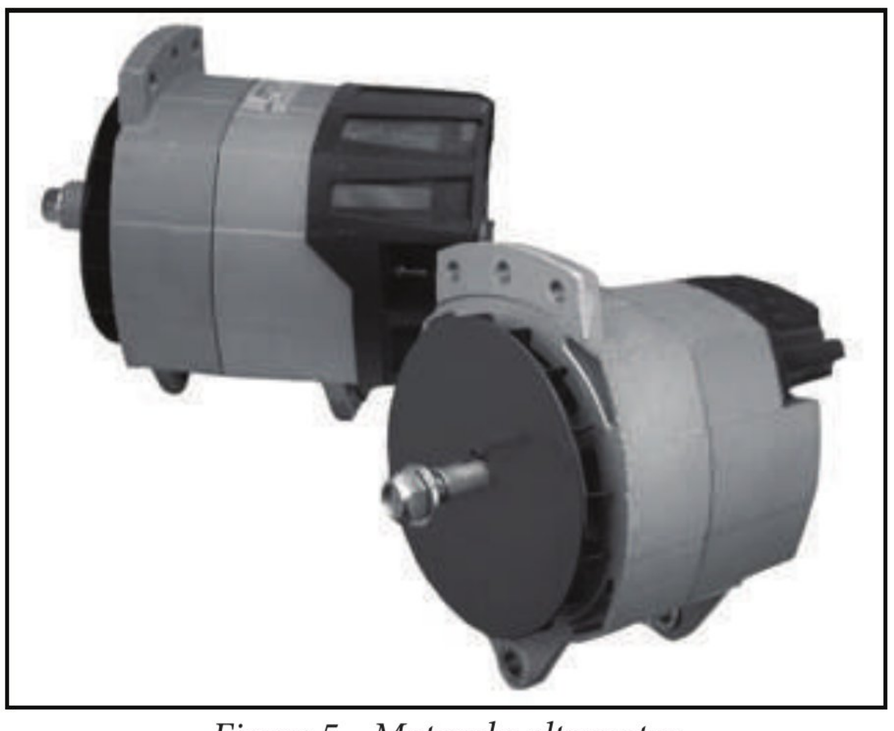

Figure 5 - Motorola alternator

Instead, my customer decided to purchase a MC624 Balmar marine regulator (*See Figure 6*) which has a programmable delay of up to 999 seconds. This way the engine can warm up, get up to the speed where it has adequate horsepower, and after that the built-in timer enables the alternator.



Figure 6 - Balmar regulator

In order to use this external regulator instead of the normal built-in one, the customer wanted me to change this alternator from internally regulated A circuit, to externally regulated B circuit, so he could use his special (and pricey!) regulator with the delay feature. This would give time to allow the engine to get warmed up and ready to take the load.

Interestingly, the regulator manual refers to the designation of "B circuit" as "P type", meaning that the field needs a positive voltage from the regulator to control it.

By contrast, "A circuit" is where the field receives a ground return to control it. (It's kind of like the dome light in my dad's old '63 Rambler that was activated from the grounded door switch.)

The simplest way to change the alternator over, was to remove the regulator, split the alternator halves, clip the wire that connected F1 of the field to the positive (*See the wire indicated by the black arrow in Figure 7*) and re-connect it to the negative instead. This would also reverse the field current but that's OK because the regulator is not set up to be self-excited anyway, so it doesn't matter about residual magnetism.

This would make it B circuit. This alternator has a handy little circuit board to connect the regulator to, so after I removed the regulator and reconnected the wire internally, then everything was correct for use with the external regulator. *See Figure 8* for the final result.

Here is a link to the instructions on programming this regulator, if you are interested. Just copy and paste the link into your browser, if you are reading this online. https://balmar.net/wp-content/uploads/2018/07/PDS-MC-624-H-1.pdf

Page 8 and 13 have instructions on how to set the timer delay. It's easy to do but you have to skim through some 'geek speak'. Jobs like this should be billed out on a cost-plus basis, just saying.

Submitted by Nathan Unger, ASI Rebuilders
Abbotsford BC, Canada

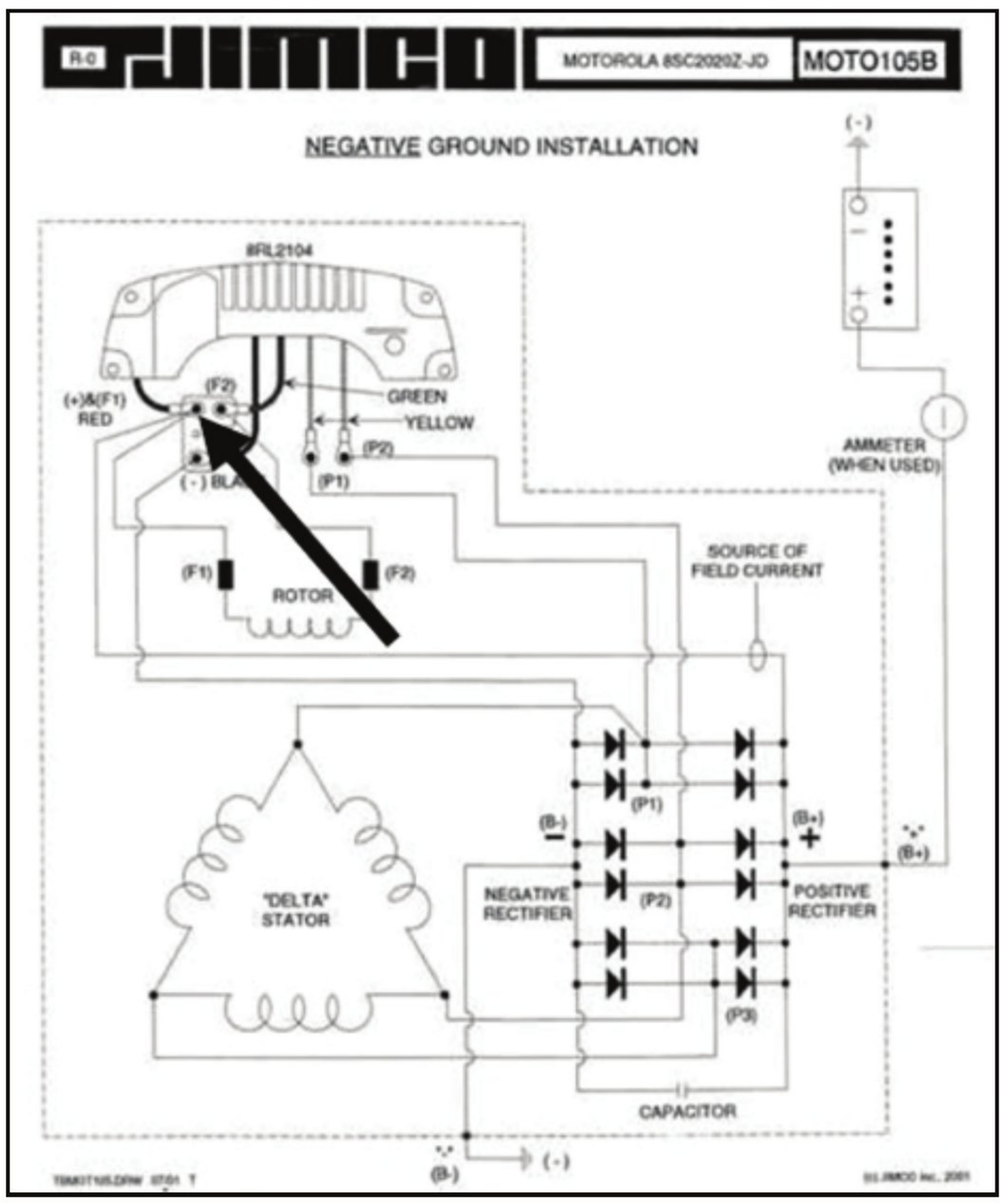

Figure 7 - Wiring

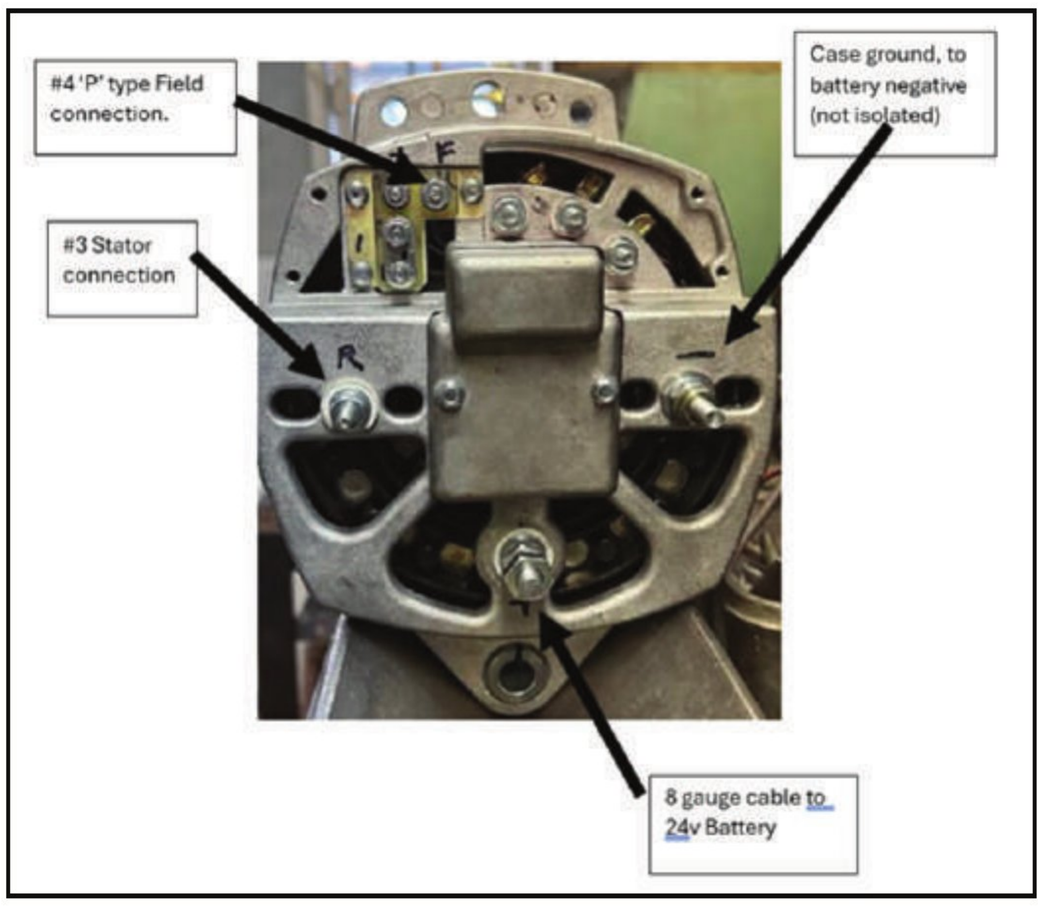

Figure 8 - Alternator connections

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