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2024 Tradeshow Info Enclosed!

A WORD FROM THE EXECUTIVE DIRECTOR
More 2024 Tradeshow Details



Since we were all kids growing up most of us have liked surprises, especially good ones! I am going to tease everyone by saying we have several surprises for the Tradeshow! I will give you a slight hint as to what they are. We have signed up several brand-new supplier members that have opted to come to the show and exhibit their products for the first time. These companies have never been to an ERA Tradeshow, and they are excited to be coming and to meet everyone and show what they have to offer!

We also have some familiar faces to the show that are coming back just to see everyone and say hello! I am sure everyone will be happy to see them as well! So, that is as much as I am going to tell about the surprises, you will have to wait and see the rest, just like waiting on Christmas or a Birthday!

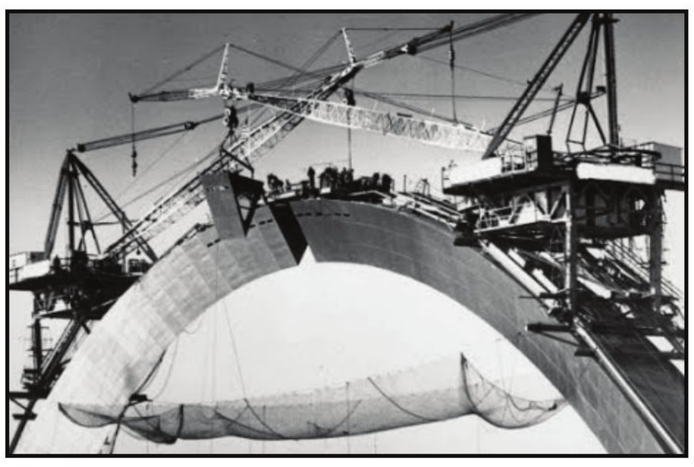
I do want to remind everyone of the fast-approaching deadlines for **Show Registration** and **Hotel Reservations!** The prices go up dramatically on **March 1st!** for both. Just to reiterate some of the highlights of the upcoming show for you,

- Tour of the St. Louis Arch!
- Nascar's Kenny Wallace guest appearance!
- All day Friday Exhibitor Expo!
- All day Saturday Training Seminar Schedule!

I hope to see all of the familiar faces of the past shows and am looking forward to meeting our new members that attend!

Mike Schroeder









NEW ERA MEMBERS

JK Auto Electric
North York, Ontario, Canada

ABOUT THE COVER

Voltmeter across the contacts
Photo Credit: Nathan Unger

ERA EXCHANGE

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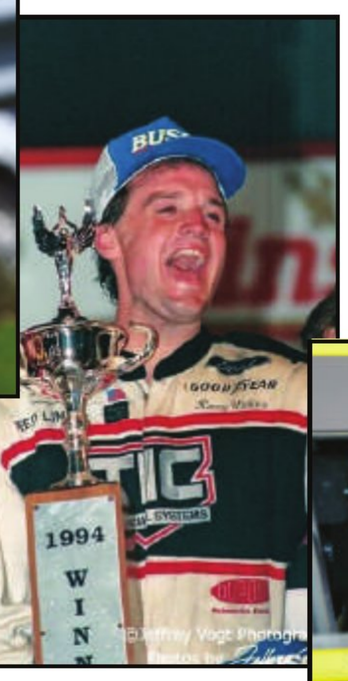
& ANNOUNCEMENTS

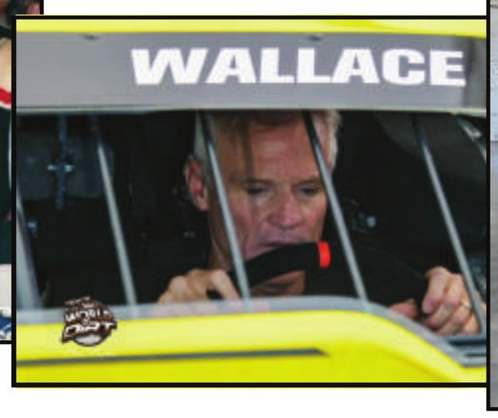
MEET FORMER NASCAR DRIVER AND FOX SPORTS COMMENTATOR KENNY WALLACE AT THE 2024 ERA TRADESHOW IN ST. LOUIS, MO!

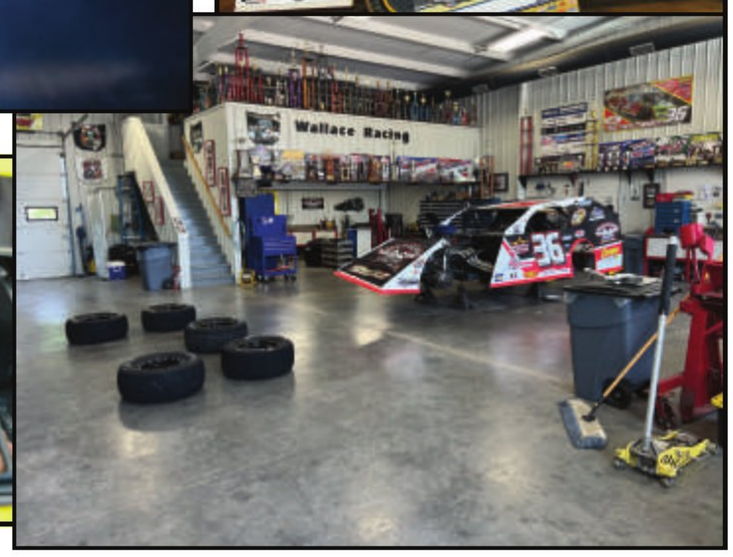












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INDUSTRY NEWS

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9:00 AM	Arrive at Arch & begin tour
12:00 PM	Load buses and depart back to hotel
12:30 PM	Buffet Luncheon
2:00-3:30 PM	***Rebuilding and Testing Newer Units*** with Mohammad Samii, ERA Tech Advisor
3:45-5:30 PM	***Latest Info in Battery Technology*** with Dan DenBleyker of Deka Battery

Friday, April 5

8:00 AM -8:45 AM	ERA annual meeting
9:00-11:30 AM	Show Expo
11:30-12:30 PM	Buffet Luncheon; Kenny Wallace Guest Speaker
12:30-1:00 PM	Autographs, Meet & Greet with Kenny Wallace
1:00-6:00 PM	Show Expo

Saturday, April 6

8:30-10:00 AM	***Late Model Unit and Regulator Testing*** with Mohammad Samii, ERA Tech Advisor
10:15-12:00 PM	***Determining Part and Unit Failures*** with Larry Hagemeister of Hagemeister Enterprises, Inc
12:00-1:00 PM	Buffet Luncheon & ERA Award Presentation
1:00-3:00 PM	***Testing for "Hard to Find Vehicle Parasitic Battery Drains"*** with Dan Marinucci of Communique'
3:15-5:00 PM	**Roundtable Discussion**

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AUTO ELECTRIC CORNER —
Big Audio, Shuttle Bus Door, Jimco Test Box, Ford Aero Alternator



BY MOHAMMAD SAMII

At times what the customer says and demands can be confusing. Asking more questions regarding their actual issue can be a better approach to understanding and solving their problems.

We had this Big Wheel 1989 Caprice (*Figure-1*) that the proud owner had it towed in for a dead battery and lack of charging. After a little investigation it was noticed this car had a CS-130 alternator that according to the owner was modified for higher output. The reason for not charging was a "0" Volts at the alternator output terminal due a burned fusible link. After the fusible link was repaired, we noticed that the alternator still had no output so, obviously defective.



Figure 1 – A Dressed up 1989 Chevy Caprice



Customer was called and was informed of our findings but asked if we could repair his own alternator because it was a special high output unit, which I reluctantly accepted.

Teardown and inspection of the components showed it had a bad OE regulator which was a cause of concern because OE regulators rarely fail unless there is a contributing factor.

While I was changing the regulator and reassemble the unit, my technician called me to come over and bring in the camera…a sign that he has found something worthy of a picture.

Lo and behold, there was this giant speaker, two audio amplifiers, and a second battery in the trunk. Mind you that none of this was ever mentioned by the owner. (*Figure-2*)



Figure 2 – The Surprise in the Trunk

In my judgment the condition of the battery terminals of the second battery was the cause of ruining the regulator. The cables were basically stripped and wrapped around the post. One can imagine under high alternator load, like when the heavy bass is played, the huge draw of the audio coupled by very flimsy connections to the battery can certainly create surges and spikes that would affect the regulator, highly increasing the chances for failure. And I think this was the case with this vehicle which the failed alternator and repeated jumping finally burned the fusible link.

The terminals were serviced and installed properly with appropriate eyelets and hardware, battery was charged and the system work to owner's satisfaction, that is to say if you are fan of that kind of music and its annoying volume. (*Figure-3*)

However, the owner appreciated our work with the alternator and wiring, he was not pleased with us taking care of his second battery terminal, as he considered our extra work being unnecessary. Go Figure…!

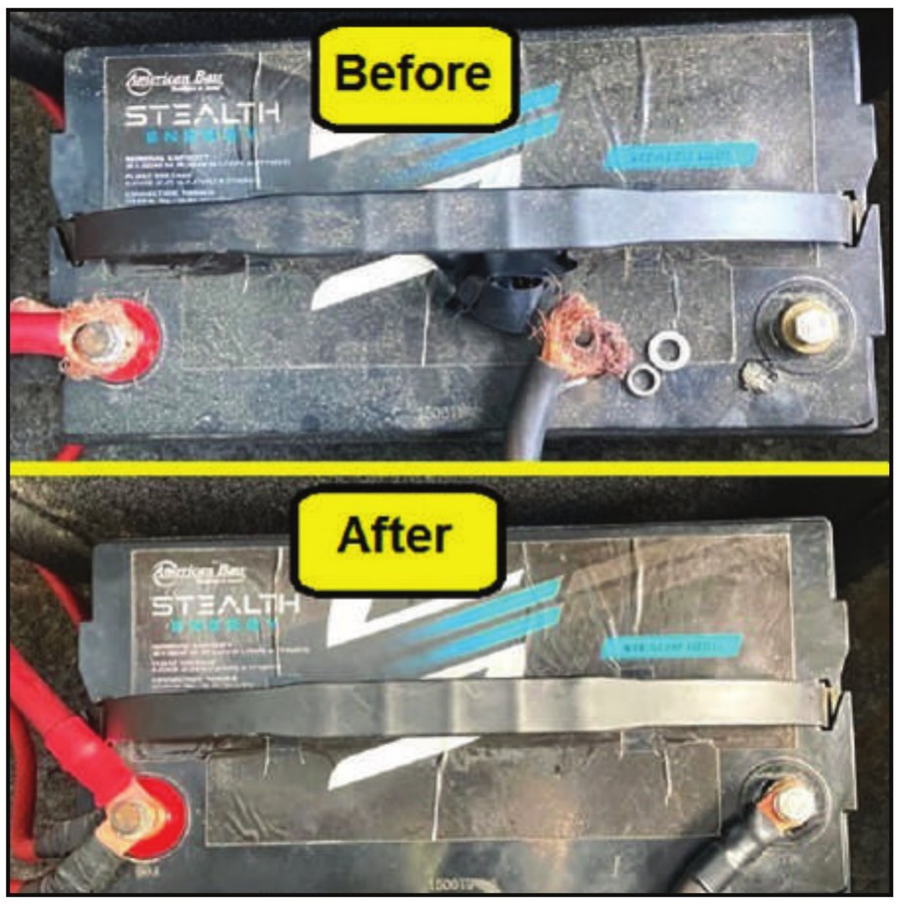


Figure 3 – The 2nd Battery Before and After Service

Bus Door Actuator

Knowing well that many of our members do not do much or any on-vehicle repairs, but this case is even further from many who are used to. We get calls from some institutions like churches and some senior citizens homes regarding their shuttle bus electric doors and since there are not any specialty shops in my area, we try do our best to help with the repair.

This was the latest one we run into. The bus was built on a Ford E-350 Super Duty chassis had the main entry door that would not open electrically. The mechanism that is located just above the entry door consists of an electric motor, reduction gears, an actuator mechanism, and an electronic controller with built in solid-states relays that receives signals from the door switch to operate the motor in the right direction, open or close, as shown in *Figure-4.*

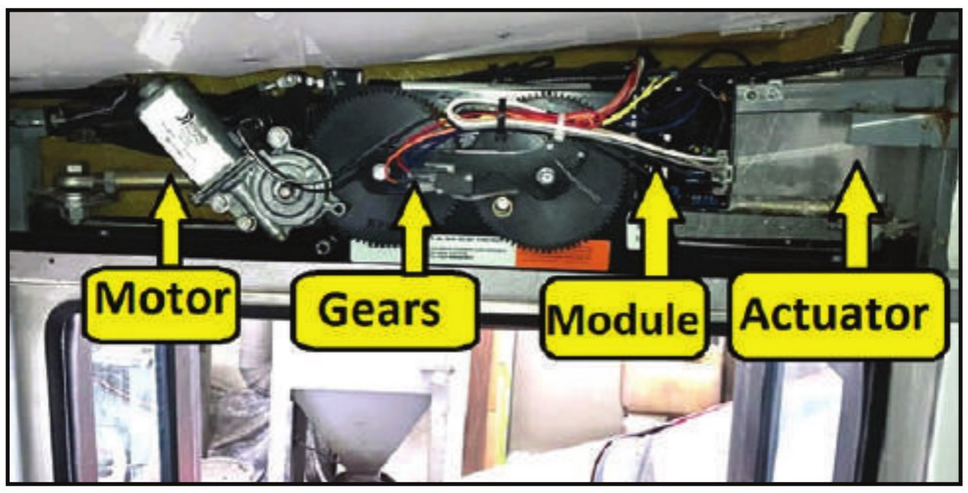
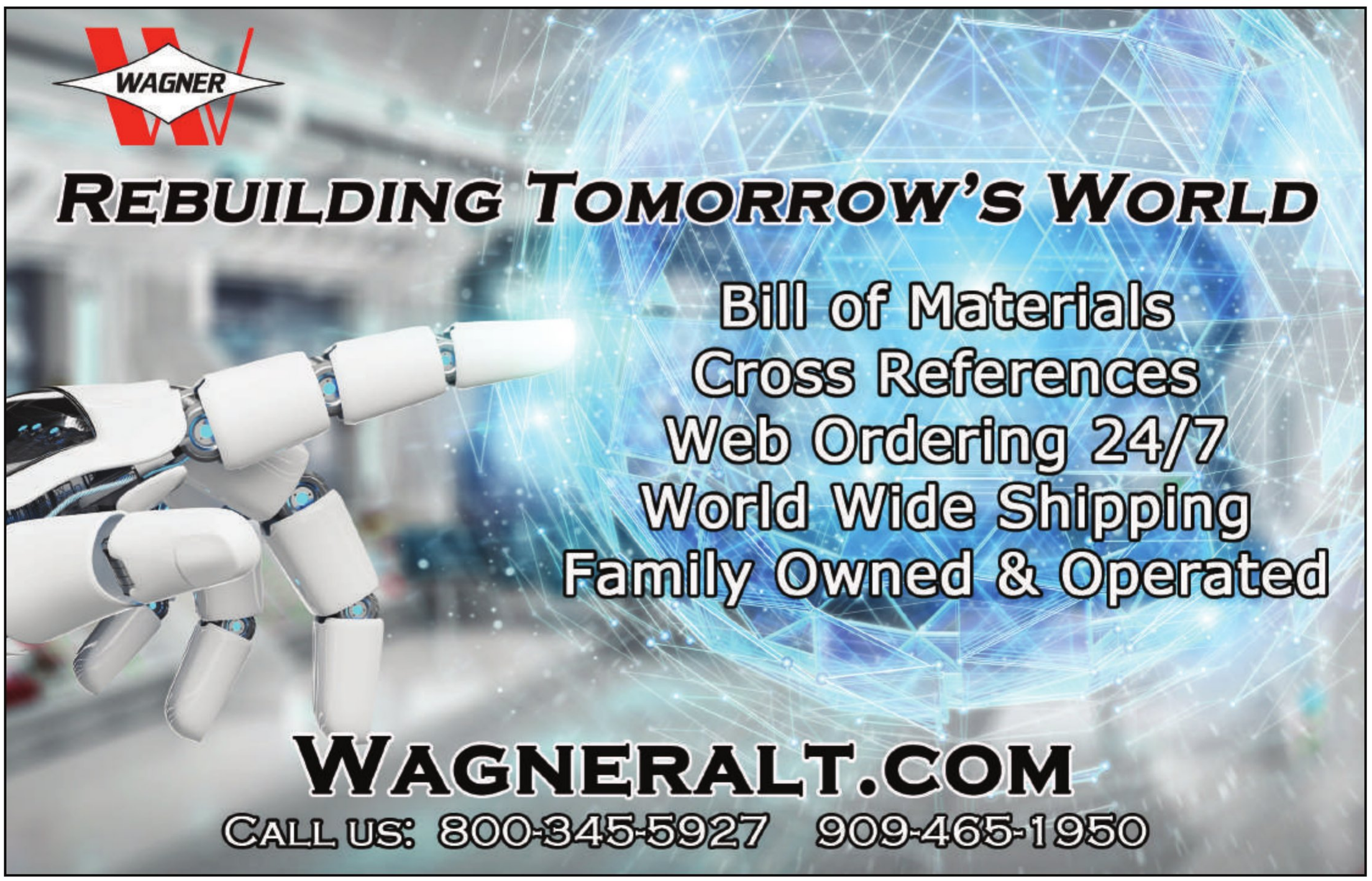


Figure 4 – Bus Door Mechanism



In our case by feeding the motor in the right direction and bypassing the controller, we determined that all is well, everything works except the controller that does not provide power to open the door but does close it. The input from the switch was checked to be fine. So, it came to a hunt for the controller as any attempt to call the Ford dealer for a shuttle bus door part is futile.

Looking at the module I found out it was made by A&M Systems Incorporated in Elkhart, Indiana. Their comprehensive website showed a selection of the modules that can be identified by picture and provided details with schematics, installation, and troubleshooting guide. (*Figure-5*)

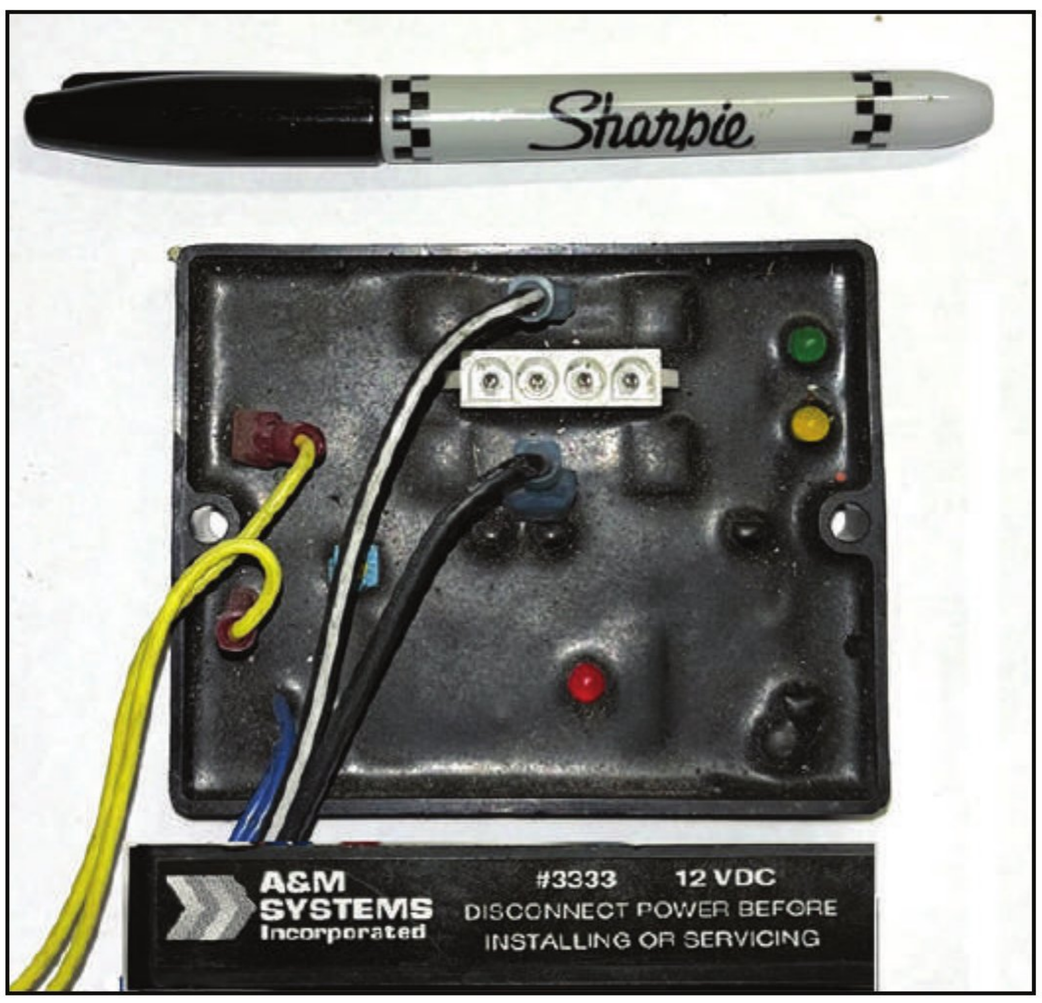


Figure 5 – The Power Module

Our faulty module was identified, ordered, received and installed, making the bus's door completely functional. This sort of work is not common but due to its complication and uniqueness, and the fact not many shops are able to work on them provide a good opportunity and good sale.

This information is provided if you or any of your customers who are looking for parts and service for this sort of things know that there are parts available to help to complete such repairs.

Jimco Test Box

Since a growing number of the alternators need a test box to do a proper final test, a *Test Box* has become something of a necessity that a serious rebuilder needs to invest in and add to his/her arsenal.

Recently I came across this MS016 test box that was kindly provided by Jimco. It has features that are intuitive and easy to learn. It connects to most common 6-pin connector used on most test benches or can be directly powered by its own supplied cables and connectors. (*Figure-6*)

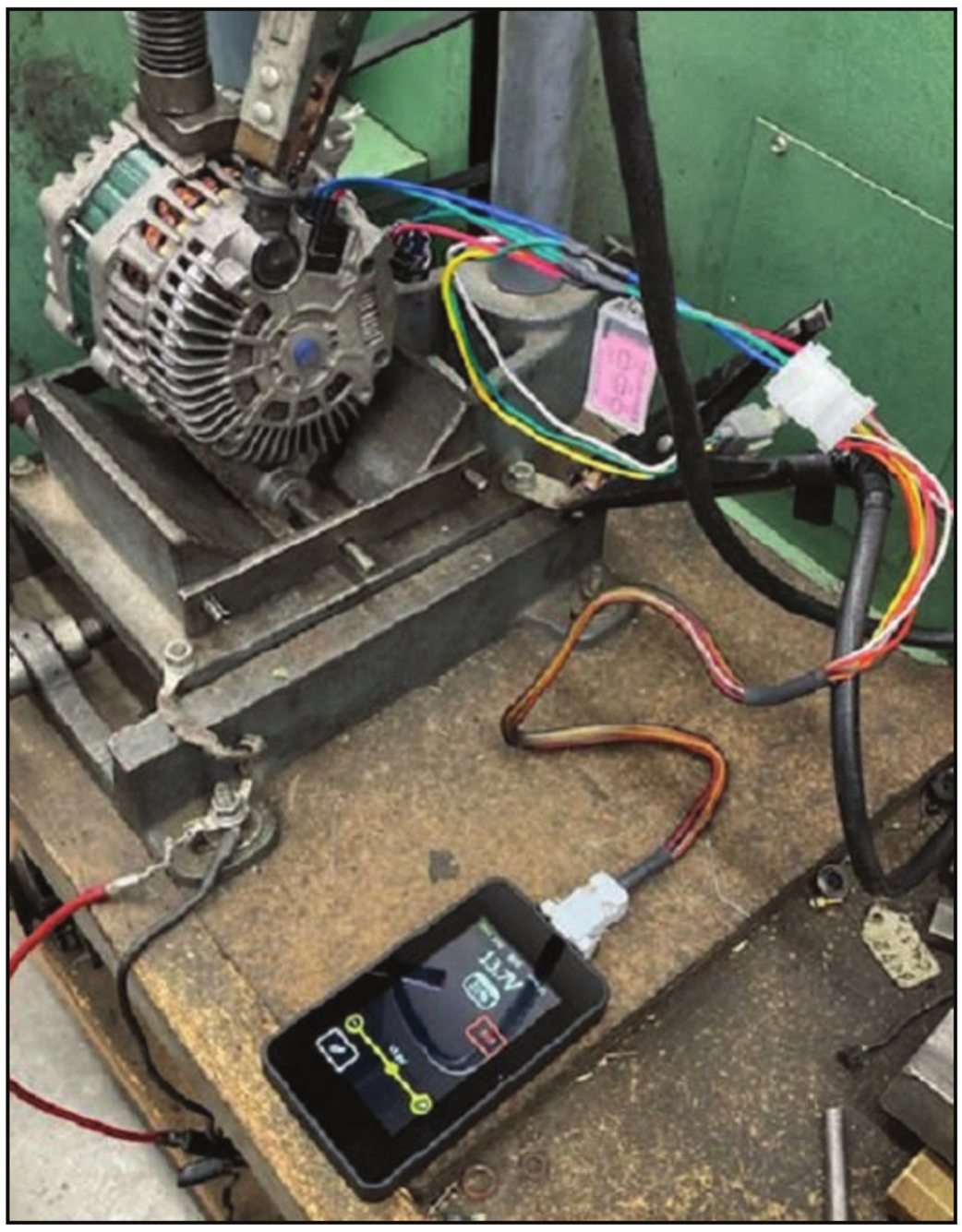


Figure 6 – Jimco Test Box Running an 11273 Alternator

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Once it is powered up, alternator or regulator test is selected, then the page that contains all protocols supported by the box appears (*Figure-7*). Once the appropriate protocol is selected and alternator spins, it applies the right signal to the unit. The voltage selection (Vset) is done by moving the slider in the lower part of the screen or use "+" or "- " signs. Once the charging voltage is selected, the alternator's response will be shown on top of the screen. To confirm this feature, you can simply move the dot to the left or right and notice the alternator's response. While running the alternator, the regulator's duty-cycle (DFM) will be shown on a little square box on the screen, indicating the regulator's feedback (*Figure-8*).



Figure 7 – The Protocols Supported by the Test Box



Figure 8 – Voltage Setting Adjustment

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Generally speaking, this is an easy-to-use test box that is a simple but capable. It can accompany any test bench and work as a needed tool for any electrical rebuilder for proper testing of newer units with COM terminal. With its supplied connecting cables, it is also capable of checking voltage regulators but I have not experimented with that feature of it yet.

Ford Aero Alternator

We received this alternator because of unbearable static noise it was generating in the aircrafts radio system. They identified the alternator as a source of problem by shutting it down (a standard feature in any aircraft) and noticing that the static noise stops.

This was a transit aircraft at an FBO (Fixed Base Operator) that I occasionally did some contract work for them in the past. They currently work mostly on turbo-prop and jet aircrafts and are not quite versed in a single engine Cessna aircraft that this alternator came off of.

It was a rather new Ford alternator, a DOFF-10300J unit rated at 12V and 60 amps, put together and certified by AEROTECH which is a big name in aircraft rotating electrical (*Figure-9*). You can see the delicate safety wiring of the unit around the special thru-bolts. (*Figure-10*)

An open phase was confirmed after running it on the test bench, hearing the growling noise and seeing distorted scope pattern. After teardown and disassembly, I noticed that the PMA certified rectifier assembly had failed without showing any bad individual diode. All six HD diodes were fine!



Figure 9 – Ford Aero Alternator

Further inspection of the rectifier showed the internal connection in the lead set between the points shown on *Figure-11* had failed and was open…thus the problem.

Using my last remaining PMA rectifier still in its original box from many years ago, I repaired and assembled the unit. After final testing and safety wiring, the unit was done and the stranded flyer enjoyed a much quieter flight home.

That's all for this issue, I am looking forward to see many of you in St. Louis. Until then, keep up the good work and stay healthy.

You can contact Mohammad Samii by email at: sammyselectric@sbcglobal.net, or by calling the ERA Tech Help Line at 217-398-3864.

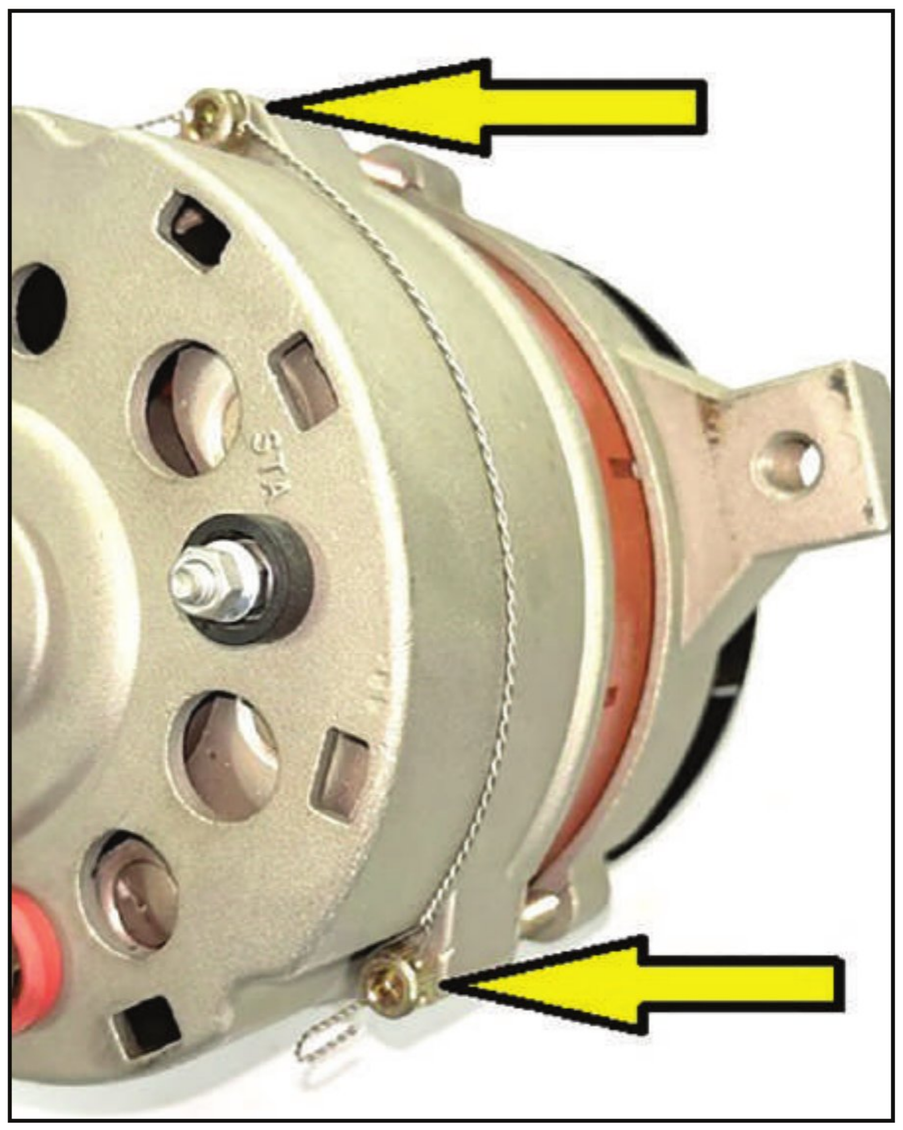

Figure 10 – Safety Wiring of the Thru-Bolts

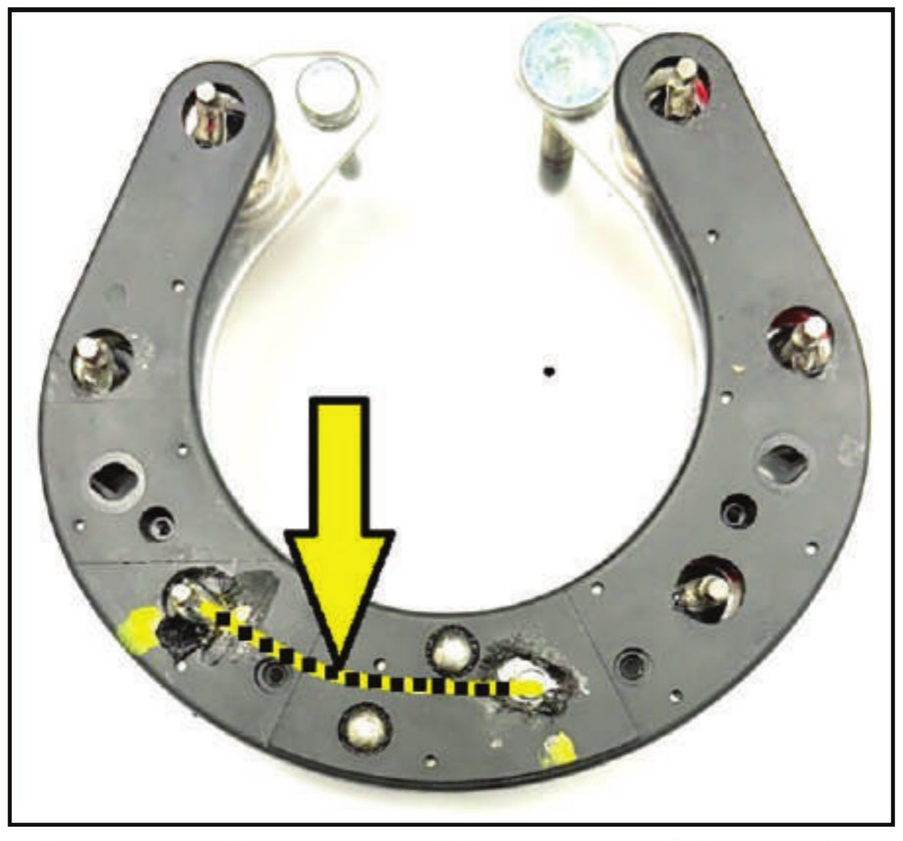

Figure 11 – Open Internal Connection of the Rectifier

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Frost Fans Blow Breakers



BY NATHAN UNGER

A local farmer (and friend of the family) stopped by to tell me about a technical problem he was having. He was frustrated because the replacement starters were only lasting about a year, and then the problem would be back.

One of their blueberry farms was situated near the Pacific Ocean but just behind a coastal mountain range. This meant that the warm air off of the ocean had to go up over the mountains first and would lose about ten degrees before it came down to his farm. He had more problems with frost than other farms not blocked by the mountains. The land had been, of course, cheaper, but now he had the cost of installing, running, and maintaining nine frost fans. These are big-bladed fans powered by 8-cylinder Ford engines. (*See Figure 1*)

They have internal temperature sensors which monitor the location temperature to within 1/2 of a degree.

When air temperature gets down to a preset threshold, the automatic start system will fire up the engines and circulate the air. Colder air sinks down so he needs to bring down the warmer air layer that is from 10-50 meters above the farm by tilting the fans somewhat downwards. There is quite a science to this.

The problem was that the internal breaker on the start circuitry would blow, usually after dark on a cold evening. If a frost fan is disabled, that becomes an emergency and has to be dealt with as soon as possible, or the crop could be destroyed.



Figure 1



He isolated the problem by changing parts. Replacing the starter seemed to fix the problem. (*see Figure 2* Lester # 6646) Not that the starter wasn't cranking at all, but the intermittent nature of the problem was getting to him. Unfortunately, the replaced starter would give the same symptoms again after only about a year in service.

The breaker was protecting the auto-start system and the engine from various faults, one of which is a click-no-crank condition caused by the solenoid on the starter. The solenoid should only draw about 14 amps continuously during cranking, with a very brief current spike at first up to a maximum of 54 amps during pull-in.

But what was the fault that would trip the breaker? The short answer is – poor solenoid contact design. (*See Figure 3 and Figure 4*) Notice the pasty, unevenly colored high resistance spots, and overheated appearance of the left contact side of each picture.

Whenever I get a job in, I make it a habit to take a look at the general appearance of the starter. In this case, you'll notice what appears to be hammer marks on the side of the solenoid. Some customers will tap the solenoid with a hammer so they can often get it working just one more time. (See black arrow, *Figure 5*) This means there are intermittent problems. If there is rust like at the white arrow in *Figure 5* on the solenoid, then there is probably rust elsewhere in the starter too, contributing to bad connections.

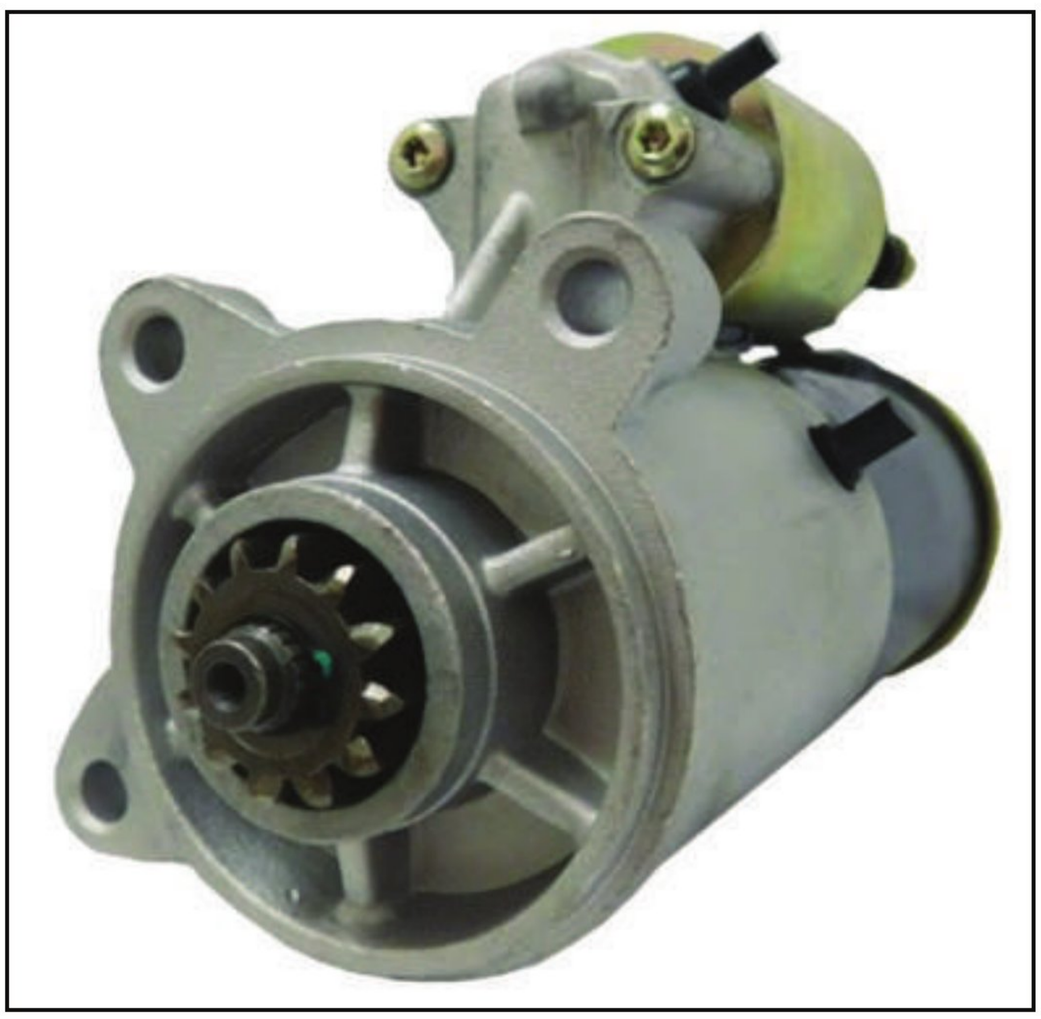

Figure 2

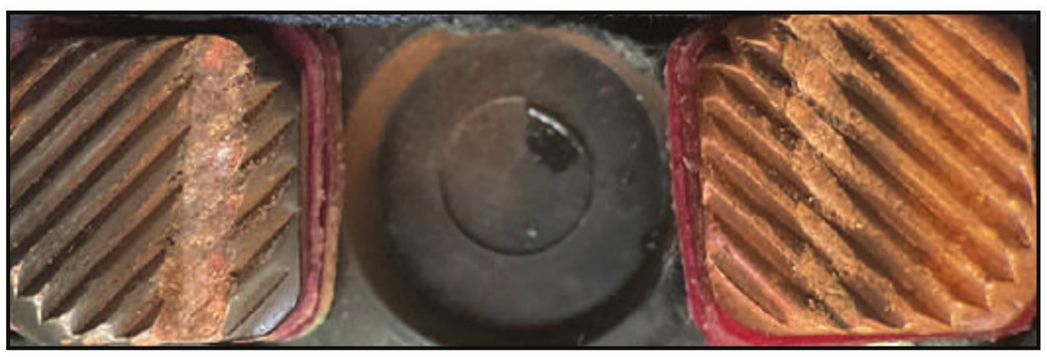

Figure 3

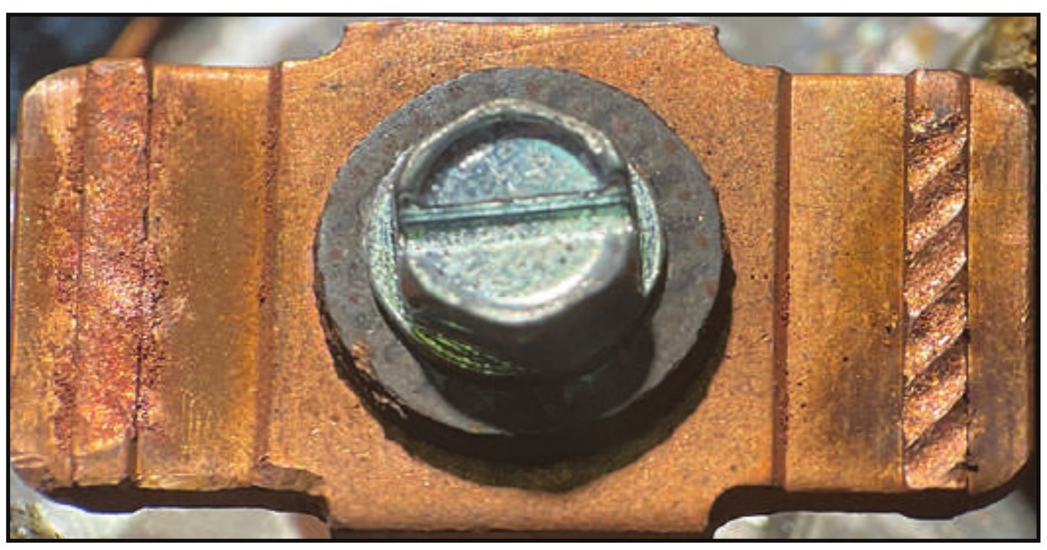

Figure 4

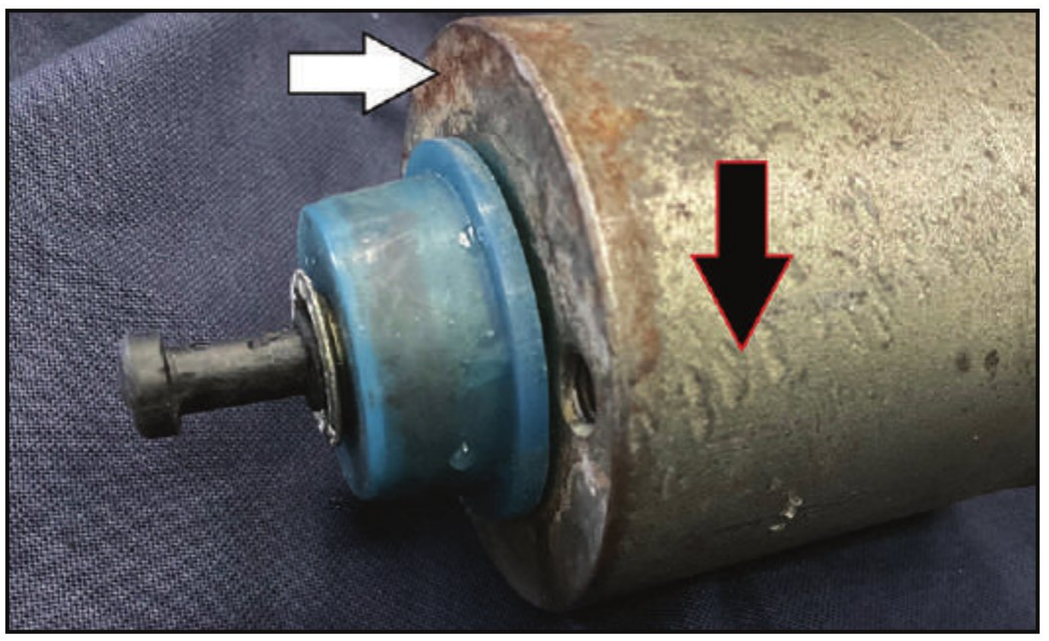

Figure 5

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FROST FANS BLOW BREAKERS

To refresh one's memory of how the coils are connected inside the solenoid, see *Figure 6*.

- The motor stud is on top, the B+ is on the bottom, and the 's' is on the right.
- The hold current is about 14 amps at 12.8 volts applied.
- The pull current is about 40 amps at 12.8 volts applied.
- Together, that comes to a possible 54 amps through the S terminal bolt, even if only briefly during pull-in.

Here's how it's supposed to work: When you apply 12v to the 'S' terminal, the starter snaps into action. Both the pull coil and the hold coil are connected to the 'S' terminal, so they both exert magnetic pull on the solenoid plunger.

This closes the contacts within a small fraction of a second, and 12v is applied to the motor terminal bolt because it is now contacted to the B+ which is always live.

What is not so obvious, is that the contacts are also applying 12v to the pull coil's other end – because it is connected to that same motor terminal bolt. (*See Figure 7*)

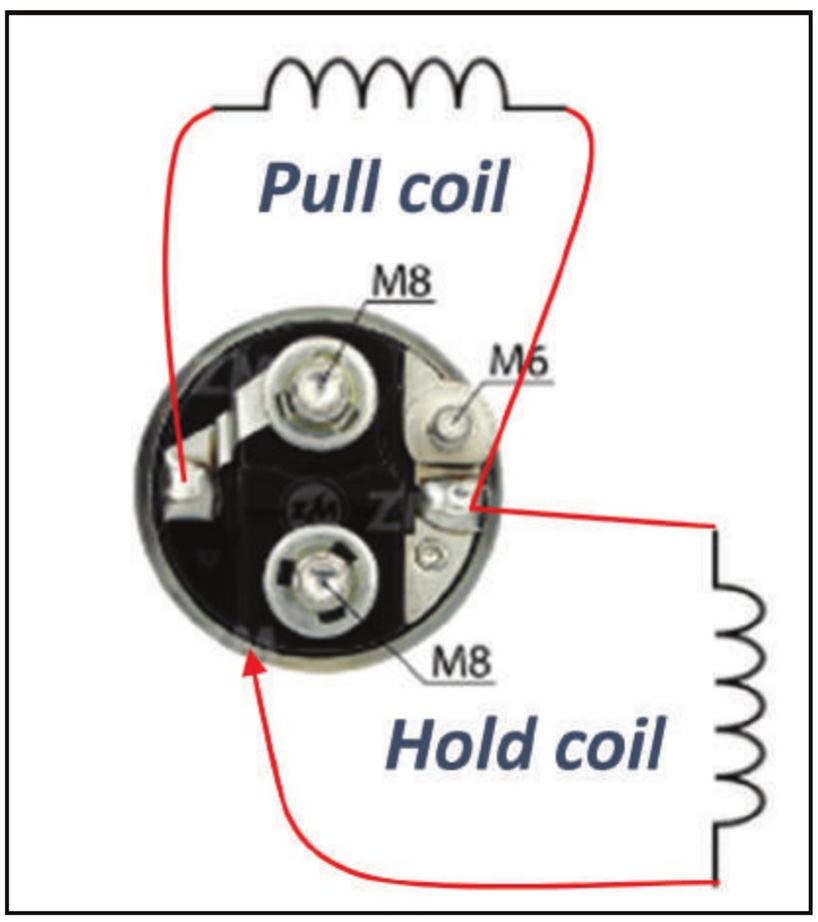

Figure 6

Now you have 12v on the 'S' terminal end, and 12v on the motor terminal bolt end. This means that during cranking, there is now no voltage difference across the pull coil and therefore no current in the pull coil.

There is about 1/20th of a second delay from when the 12v is applied to the 'S' terminal until the contacts close to apply the 12v from the B+ to the motor terminal. During this very short period, both the pull coil and the hold coil together are drawing current, totalling about 54 amps.

Again, as soon as the contacts close, the pull coil is no longer drawing current. Therefore the current goes down from 54 amps to 14 amps. (54 – 40 = 14)

To recap, that total higher current is only present for a brief instant, until the plunger gets pulled in and the contacts close. At that point, the current through the S terminal decreases down to 14 amps. This is because the pull coil now sees 12v on both ends of it, and there is no actual voltage difference to cause any current to flow in the pull coil. (*Figure 7*)

Or to put it yet another way, the ignition switch side applies voltage to the pull coil, and the other end is returned to 'ground' through the starter motor. But as soon as the solenoid contacts close, now there is 12v on both ends of the pull coil. This means that the current through the pull coil is very brief. So brief that even though it contributes to exceed the breaker's limit, it doesn't warm the breaker element long enough to cause it to trip.

Next, lets look at the case where the contacts are fouled. (*See Figure 8*) Besides the fact that the starter won't crank properly, at least some current will continue to flow through the pull-coil. The voltage that was supposed to supply the motor is insufficient, and therefore the pull-coil doesn't get enough voltage on its return side to cancel the pull-coil current. The breaker was designed to trip if the solenoid current was excessive for too long.

If the contacts are fouled, then there won't be 12v on the return side of the pull coil, so the pull current will add to the current load on the breaker as long as the starter is attempting to crank. (*Figure 8*)

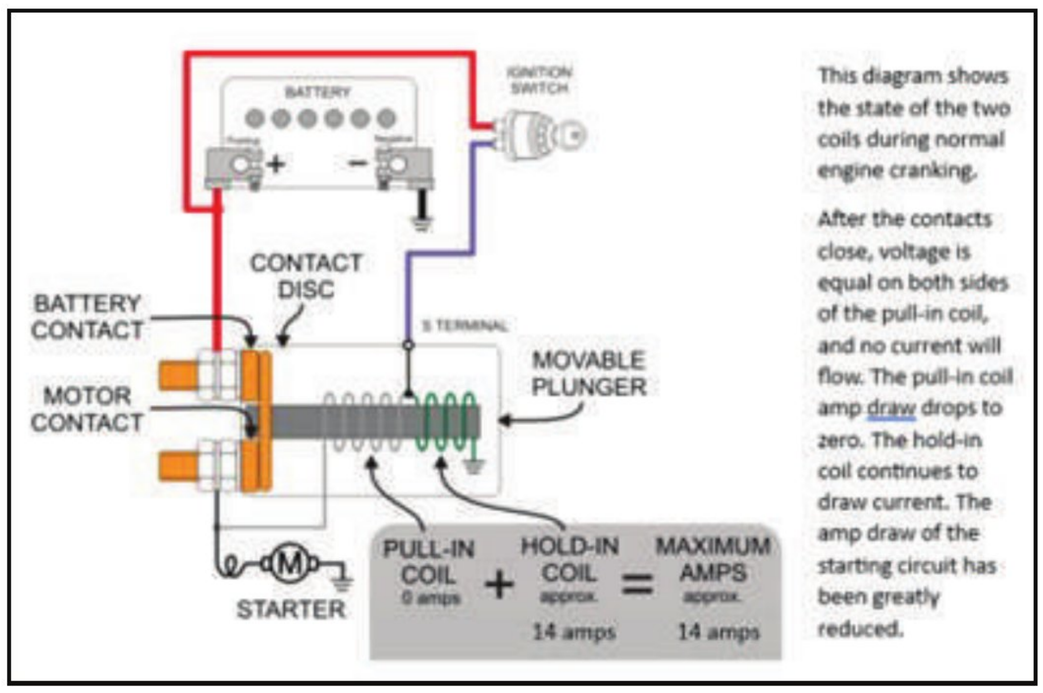

Figure 7

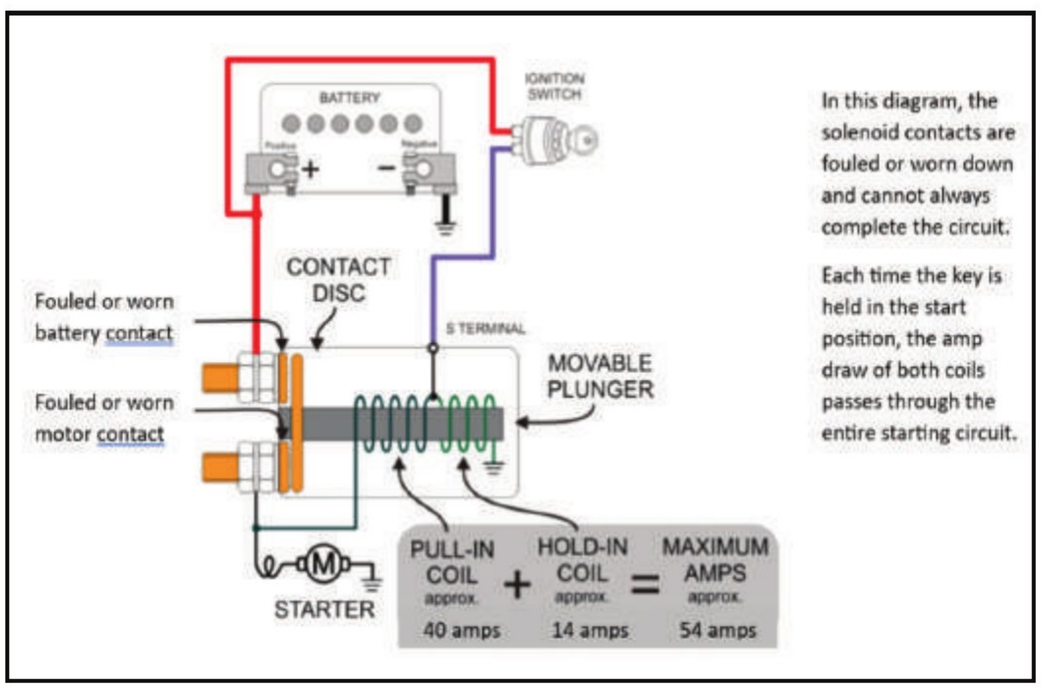

Figure 8

FROST FANS BLOW BREAKERS

There is an interesting article about this over-current problem in the technical library of the ERA website called, “When Contacts Wear Out”.

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

The principles in this article also apply to fouled contacts, not only to worn-out contacts.

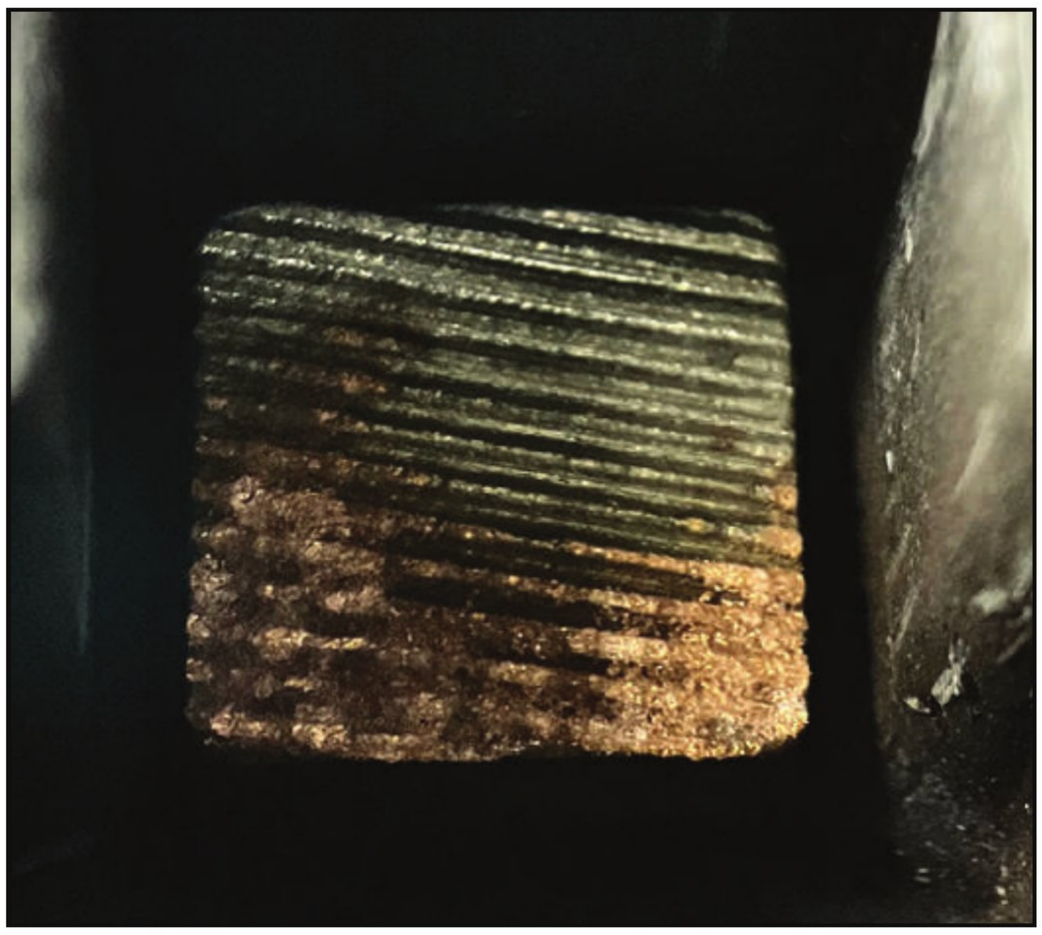

Figure 9

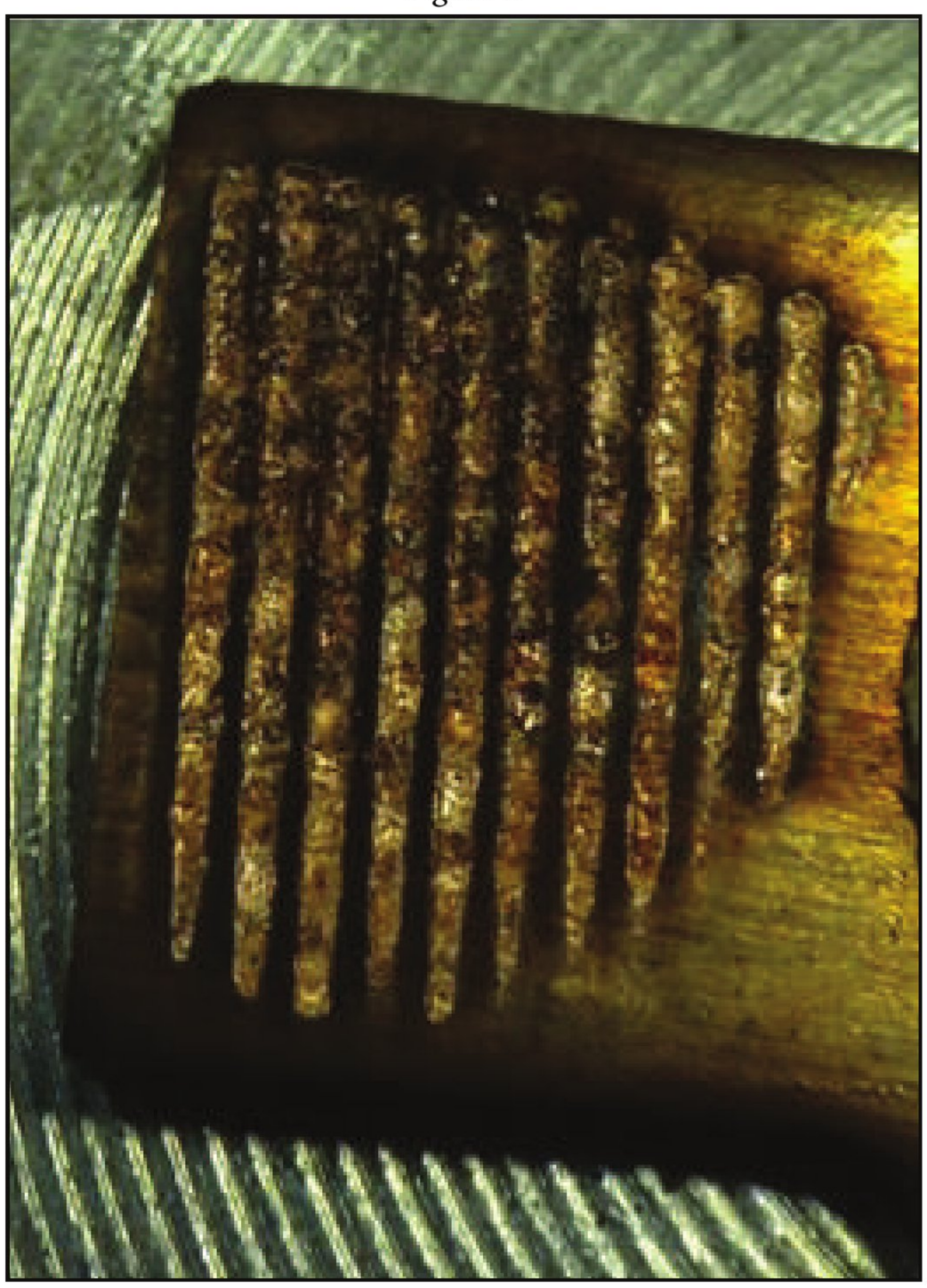

Figure 10

Now let's look at the contacts of some failed starters. (*See Figure 9 and 10*) Notice the ridges, the heat discolouration, the high resistance spots? *Figure 11 and 12* are examples from other starters.

When things get bad enough, these contacts will not do their job, because they have too much resistance. They are made with thin little ridges on the contact bolts. To make matters worse, the copper is not pure enough, and the impurities come to the surface during the arcing of the contacts.

This solenoid design lasts for probably about a year, just over warranty. There is even a “conspiracy theory” out there that the manufacturer does this on purpose to sell product more often.



Figure 11

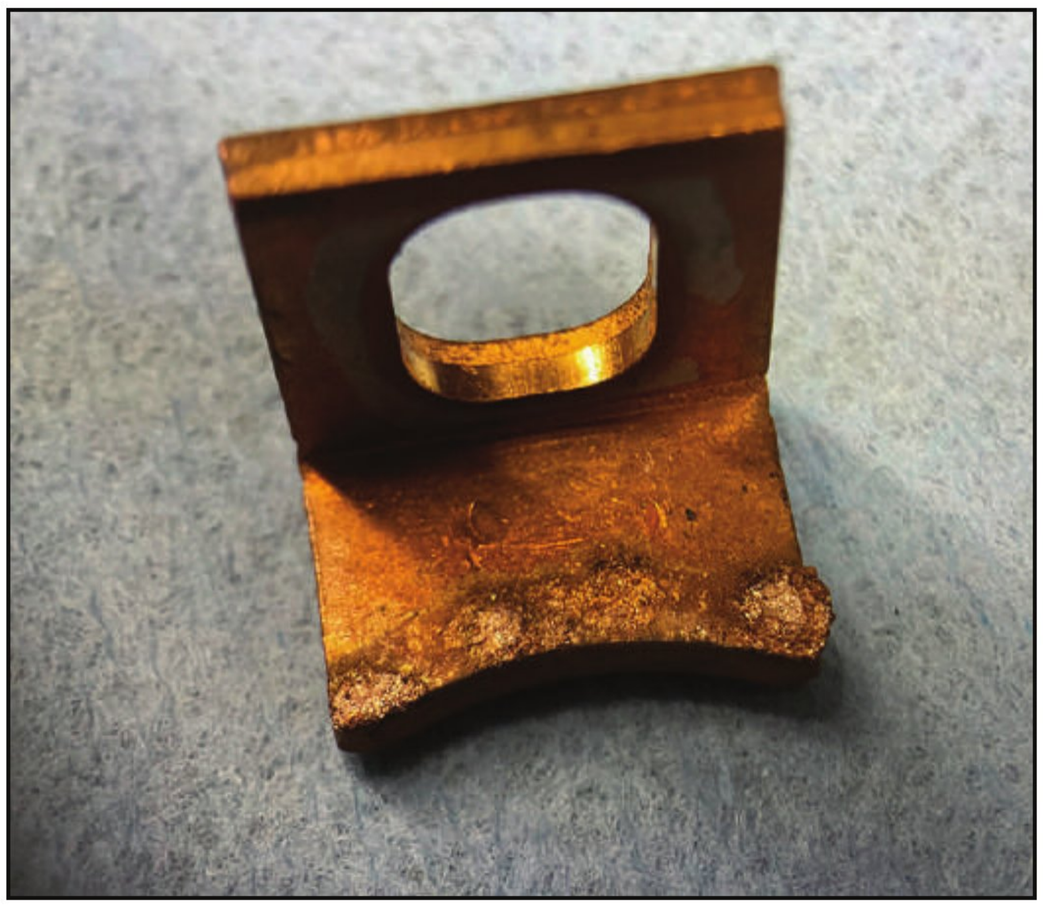

Figure 12

You can guess when the breaker will trip - when the machine is needed, in the dark cold of a frosty night, after 7 or 8 months of inactivity. There could also be problems with condensation, exhaust fumes, and in some cases oil or antifreeze dripping on the starter, all of which can easily add to the fouling of the contacts.

Personally, I recommend ZM solenoids, which my customer was more than happy to pay for.

ZM solenoids use better copper, if you look at the bolt with the satin-finish on the left in *Figure 13*. The shinier bolt on the right is typical of what I find in problematic solenoids. I've read somewhere that the shiny copper has additives like chromium and impurities which greatly contribute to shorter life.



Figure 13

Diagnosing this problem in the field

You can easily measure this contact issue on the bench and in the field. To reveal the true extent of the problem, it should be done when the starter is being activated to crank the full load, and 5 or 6 times in a row, to get sort of an average.

Put your voltmeter across the contacts (B+ stud to Motor stud), and it should show no more than about 50 milli-volts during free-run testing on the bench, or 0.25 volts during cranking. If the contact voltage is way too high, there is possibility of contact fouling. In fact, I recommend doing this test on every starter. *Figure 14* is a representation of that.

And don't forget, there is the matter of the excessive current having maybe damaged the start circuit somehow, or the ignition switch contacts. When the starter is installed, the technician should verify the voltage available at 'S' during cranking. It should not be lower than 10 volts as a rule. Or to put it another way, if you are measuring from the battery to the 'S' you should not see more than around 0.8v during cranking.

Figure 7 and Figure 8 are courtesy of ERA Technical Documents. Many thanks to Mohammad Samii and Bob Thomas for technical support.



Figure 14

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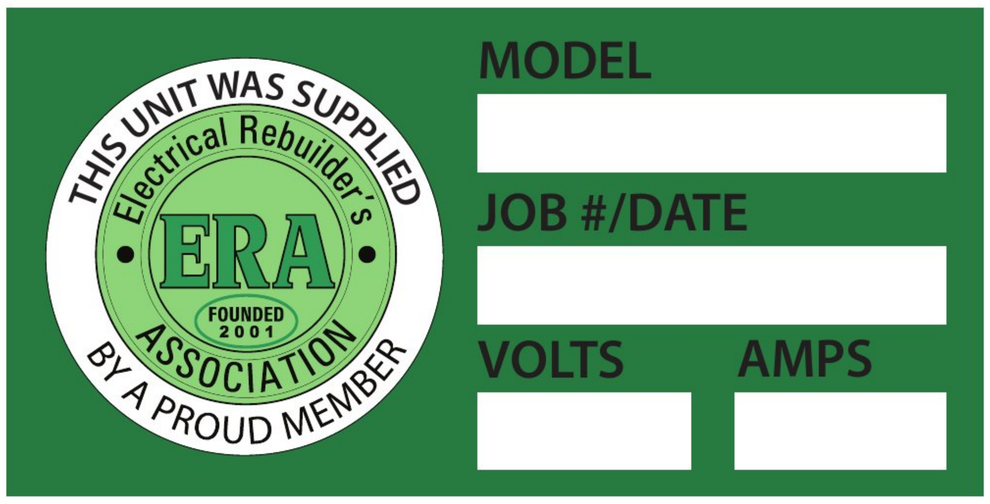

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