



## 2G Solution White Paper

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How AIM went about engineering solutions to overcome inherent design problems with the Ford 2G IAR charging system.

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**F**or those who have owned or worked under the hood of Ford vehicles, alternator problems have been an ongoing challenge especially when it comes to the performance of the 2G Ford IAR charging system. The 2G charging system covers the years from 1985 to 1994 and has been problematic due to the inherent weak design characteristics of the alternator and its associated wiring. As a result, the 2G has proved inefficient in meeting the vehicle's power requirements at all times without overheating.

When you put the 2G under load tests, the performance curve is typically lackluster, particularly on the low end. This has contributed to overheating under certain conditions. For instance, if electrical demand exceeds the already low capacity at lower engine speeds for extended periods of time, the battery becomes depleted. Finally, when the vehicle experiences higher engine speeds, common during freeway driving, the 2G alternator will overheat.

The 2G series has had the potential for overheating since airflow over critical components in the alternator is inadequate, exacerbated by design weaknesses. Plus, the relatively small "footprint" of its rectifier and the infamous "BBS" output connector, has traditionally been points of failure because of the high temperatures they generate. The inconvenience and expense of alternator failure, not to mention the risk of occasional underhood fires, are well documented hazards. Numerous magazine articles and technical bulletins have appeared over the years in attempt to come to grips with this widespread issue.

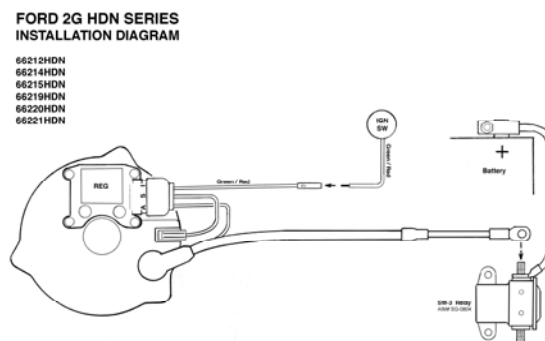
Just go to the largest online community of automotive technicians at IATN.net (International Automotive Technicians' Network) and type in the word "Ford 2G." There you'll instantly become acquainted with a myriad of challenges that technicians have faced over the years with the 2G.

### **The Mountain That Can't Be Passed**

Representative of consumer problems with the 2G is John McIntosh of Portland, Oregon. He's the owner of a 1993 Ford F350 truck with a 7.5L engine and a 4x4 crew cab. With the original 2G alternator on board, McIntosh reported that he never had enough power to run all the truck's accessories. He had a repeated history of failures with OE alternators, including three different installations.

“I had to ration to keep the voltage from falling too low when traveling. In fact, at times the voltage would drop to 10.2 volts,” explained McIntosh. In addition, his headlights would go dim over mountain passes. “I was always limping along on limited power and scared of taking long trips for fear of alternator failure,” said McIntosh. “I once got stranded on a mountain pass at night and I had to slowly roll to a rest area without headlights.”

McIntosh is the type of customer that motivated AIM engineers to find a solution to overcome design problems inherent with the Ford 2G IAR alternator system. As a result, AIM introduced its 2G HDN Series alternator to the automotive aftermarket last year as the “ultimate” solution. Not only does AIM’s solution help the “high amp, high end” vehicle, it is a beneficial upgrade because all 2G vehicles may encounter issues with the alternator.



## Arriving At A Solution

“Due to design weaknesses, the 2G proved to be inefficient and problematic, contributing to overheating and failure under certain conditions,” said Steven Seabourne, president, AIM. “Our HDN series alternator has been designed to exceed all OE engineering requirements and to provide superior performance. In addition, our solution addresses wiring issues that have been common in these older vehicles. Performing very much as one would expect from a high end boom box component, AIM’s 2G HDN series alternator is affordable.”

When AIM set out to find a solution, the major objective of the 2G HDN series was to achieve a cooler operation of the alternator. This was accomplished by porting the SRE frame to draft more air over the rectifier and regulator. The rectifier itself was improved upon by increasing the surface area of the heat sink and employing a finned positive bridge. Large positive and negative

heat sinks feature ½ inch press fit diodes, welded connections and HD lead frame. This improvement further reduces internal heat generated which translates to a much higher level of reliability.

“Rectifier stability is crucial,” commented Seabourne, “because it must be able to transmit, or carry all the power demanded by the system load.”

AIM’s 2G HDN features a dual internal fan that allows for greater volume of air flow and cooler operation in comparison to the single fan of the original 2G series. AIM has upgraded the frame design to allow for maximum air flow, which provides greater efficiency in the removal of excess heat, critical during periods of higher power requirements. In addition, the rotor and stator are designed for maximum performance by making ample power available at all times without overheating the alternator. This is especially important at low engine rpm.



*Offset front (left) and back view of the AIM 2G Solution*

Another OE weakness was addressed when AIM engineers determined to eliminate the problematic BBS (Battery, Battery, and Stator) plug. The original design was prone to developing excess heat caused by increased electrical resistance from a weak pressure plug contact. By using a 6mm output battery post instead, the AIM-engineered 2G HDN series alternator provides a much more reliable transmission of output current, eliminating any potential for fire or overheating. A final improvement was made by using a larger “303” front bearing. The design upgrade by AIM provides greater belt load capacity, causing less heat to be generated and increased bearing and belt life.

## **Bearing Up Under The Load**

McIntosh purchased the AIM 2G alternator solution from NAPA, and reported an “easy installation” on March 23, 2007, needing less than a half hour for the install. In addition, he installed Gates Greenback belts to handle the torque of a higher amp unit.

As a result of putting the AIM alternator on his Ford F350, McIntosh is now able to tow trailers with the increased load to his vehicle’s electrical system. In addition, the AIM alternator is able to handle the load of additional, non-factory, aftermarket accessories such as a 50-watt stereo system with an 800-watt amplifier and KC driving lights. At times he also tows a camper which has a refrigerator and two DVD/TV players.

“After starting it up, I was thrilled to see the voltage level not even flinch,” he said after installing his new AIM 2G alternator, “and holding steady at 14.7 volts.”

McIntosh says he will continue to tell everyone he knows about the unit. “I am thoroughly impressed and have been recommending it to others.” When he considered purchasing a custom boom-box alternator for more amps, he opted against it because of the steep price of over \$500, especially he says, “when I can get AIM’s solution for a whole lot less.”

## **Final Considerations**

AIM provides customers with a complete set of instructions for installing the 2G HDN series alternators. AIM engineers point out that verifying the condition of the rest of the charging system is crucial before moving forward with installation. As they point out, “the charging system is only as good as its weakest link.” Here are five crucial steps:

1. With the battery being the heart of the charging system, be sure to verify the state of charge and condition using a load test. If the battery is weak, the rest of the system will suffer, including the alternator.
2. Be sure to size the output cable to match alternator capacity. This is a must! AIM recommends AWG 6 up to 10 feet for use with the HDN series, which is now included with the company’s newest HDN series.

3. Verify by visual inspection and voltage drop tests, the state of the output circuit. AIM engineers advise that high resistance is like a “clogged artery” that results in overheating of both conductors and the alternator. This results in poor charging system performance.
4. After installation of the 2G HDN alternator, check for voltage drops. With the engine at 2500 rpm and a full current load applied, .4V on the positive side and .2V on the negative side is considered acceptable.
5. Finally verify alternator output will decrease to less than 15 amps with a fully charged battery and all loads off.

AIM engineers recognized that there was only so much that could be done to improve upon the original 2G design. What they discovered is that addressing all the issues of the charging system was essential to finding the best solution. By replacing the original 2G alternator with the AIM HDN series, owners now have a system that is designed to exceed all engineering requirements along with the wiring issues. For those who love their older Ford's, the AIM 2G Solution is one important step they can take to extend the life of their vehicle.

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### **More Information**

To learn more about AIM's 2G HDN series of alternators, phone 800-366-3246 or visit [www.aimpartsonline.com](http://www.aimpartsonline.com).