AMP gauges at the dash are troublesome.

They should be by-passed, and then install a VOLT gauge.

by Mark Hamilton

THE PROBLEM

The antiquated AMP gauge system has reduced more Dodge owners to pedestrian status than any other kind!

And (wire) "terminal illness" at firewall connectors has also been a major problem.

(Chrysler Corp. stayed with the old AMP gauge system long after other automakers switched to VOLT gauges, and Dodge trucks used the AMP gauge more recently than others, so we have used a Dodge truck as a model for this project.)

Dodge is not the only make with concerns about AMP gauge systems, early FORD Broncos, International SCOUT, and many old cars and trucks used the AMP gauge system too. But when the electrical system will be up-graded with more powerful alternators and more accessories, the AMP gauge should be removed, and the "main power system" should be modified.

With normal but frequent use, most of these Dodge trucks will have electrical wiring problems. The first to fail were often the trucks equipped with factory air conditioning. The air conditioning system adds a significant electrical load. And the "air" gets used in hot summer weather when heat will increase resistance at connections. The additional current flow when using the air conditioning and increased resistance with heat will break down the weak areas more quickly. With sufficient use, the non-air equipped trucks will also have electrical problems stemming from the same cause.

Typical Dodge electrical problems result from a very antiquated power distribution system. The main source of power for the Dodge electrical system is based upon an old design AMP gauge at the dash and related wiring system. It's a system that worked okay with a very small electrical system on Model A Fords way back in the late 1920's. But the old AMP-gauge-at-the-dash system is not reliable with increased current loads of the more modern electrical system.

Compounding the situation, the wiring system for the AMP gauge actually became weaker than it was over fifty years earlier. Assembly line labor was not so expensive in early years of the car. Affordable labor could consistently connect wires with "ring terminals" at screws or studs with nuts–resulting with reliable (low resistance) connections. With increased labor cost mandating fast moving assembly lines, and many more wiring circuits to install, "click together" connections have been widely used since back in the 1950's. And by the 1960's, even the AMP gauge (heavy current load circuit) was routed through a "click together" connection. The least reliable of "click together" connections for a heavy current load circuit is the male/female flat blade terminal design. And it happens that Dodge was built with this terminal design, even at the main power delivery circuit.

In summary, the AMP gauge and related wiring found in Dodge trucks of the sixties and seventies period was built with a recipe for failure. A 70amp alternator supporting powerful electrical accessories was typical equipment by 1979, and the load was too much for the method of wiring construction used. Naturally, it's a system that often reduced Dodge owners to pedestrian status.

This feature clearly explains the shortcomings of using the old, traditional, AMP gauge at the dash. And largely because of the circuit design shortcomings, the best choice of gauge to monitor the electrical system is a "VOLT" rather than AMP gauge. A good explanation of the AMP vs. VOLT gauge may be found at www.autometer.com in the Tech Tips / FAQ section of the web sight.

THE HISTORY

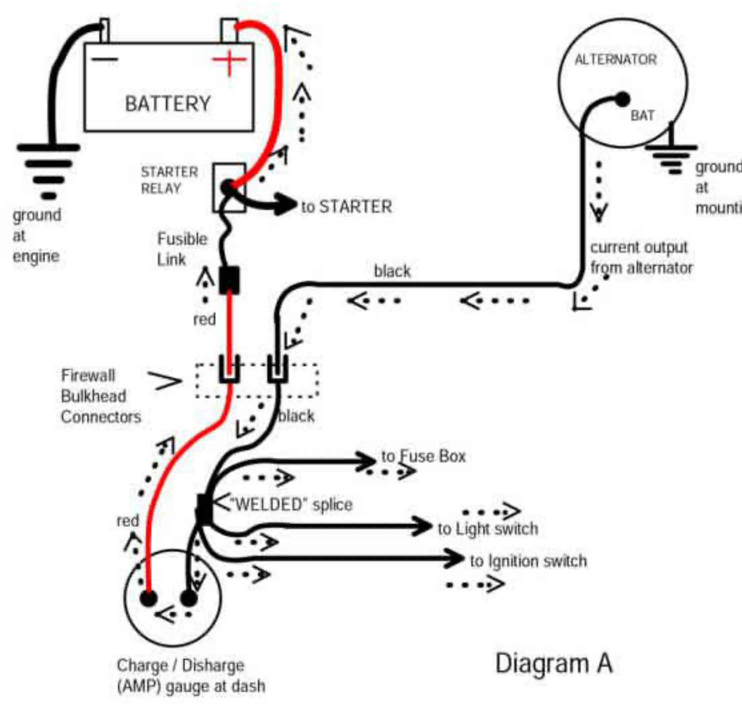
In some ways, the Chrysler Corporation was pretty far advanced where electrical systems were concerned. (Chrysler gave us the Dodge, Plymouth and Chrysler line, and nowadays they all may be referred to as MOPAR.) Back in the early '60's, MOPAR was the first to give us alternators rather than the older technology generators–Indeed the improvement was great. GM followed, and then Ford finally installed alternators as "standard equipment" on '65 models.

1964 year model Chrysler products showed up with "Fusible Link wires" for reliable short-circuit protection of the main power circuit from the battery to the electrical system. Chevy didn't use Fusible Link wires until '66 models.

And Ford didn't use Fusible Links until some years after GM.

Chrysler/Dodge/Plymouth introduced a very good electronic ignition system with 1971 models. Ford introduced a somewhat less reliable electronic ignition with only some of their '74 models. And GM gave us a very good electronic ignition with '75 models.

In spite of being the first to give us "break through" technology with components, it seems that the "DODGE BOYS" were reluctant to depart from a very antiquated wiring system. The old, traditional, "full current load type" AMP-GAUGE-AT-THE-DASH and related wiring system was still in use with '79 Dodge trucks. The AMP gauge circuit wiring had to deliver electrical current used by the entire electrical system, plus handle current to recharge the battery. The problem was that current load and the alternator output rating was a large amount by the end of the '70's. Alternators with about a seventy amp available output were standard with air-conditioned models. And a weak terminal design was used where the AMP gauge wiring passed through the firewall. The large demand for electrical current often resulted with failures in the lengthy AMP gauge circuit, even in vehicles that were relatively new.



The original AMP gauge system served as the main power distribution system. This circuit is the power source for the entire electrical system. (see diagram A)

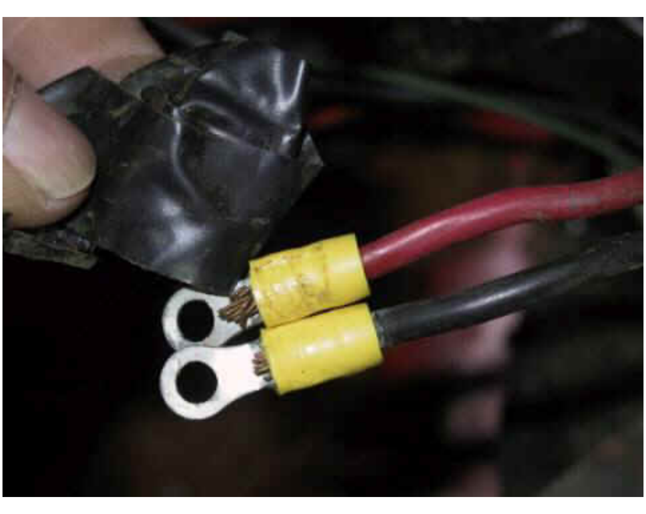
Amp gauges at the dash were standard equipment with Model A Fords, back in the late 1920's. And the fifteen amp capacity gauge at the dash worked fine with minimal electrical systems of that period. Current output from the small Model A generators was not even sufficient to support sealed beam headlights. (The old Model A was equipped with a small light bulb backed up by a large reflector in the headlight assembly.) The Model A only had one tail/brake light at the rear, a simple ignition system and a small battery about completed the electrical system. Such a small amount of electrical current flow through good connections at the AMP gauge wiring was no problem with the Model A Ford. And with current output limited by a cutout relay on the generator, the AMP gauge could handle the small battery charge rate. But as electrical systems became more powerful, Ford discontinued the old AMP gauge system long before the '70's.

GM also up-graded their system long before the Dodge Boys. When GM introduced the alternator with '63 models, it was controlled by a more complicated but more efficient voltage regulator system. And the new GM system could support a warning light at the dash. The warning light was often standard equipment and the gauge was an option. GM vehicles built with the gauge option also had a more modern design of AMP gauge at the dash. The newer AMP gauge was a remote shunt type design–a length of the battery charging wire in the under-hood harness served as the shunt. The dash gauge and related wiring no longer handled heavy current load. Same with Ford in '65 and newer model cars–the Ford system could work with a warning light at the dash, and cars that came dash gauges had a remote shunt type amp gauge.

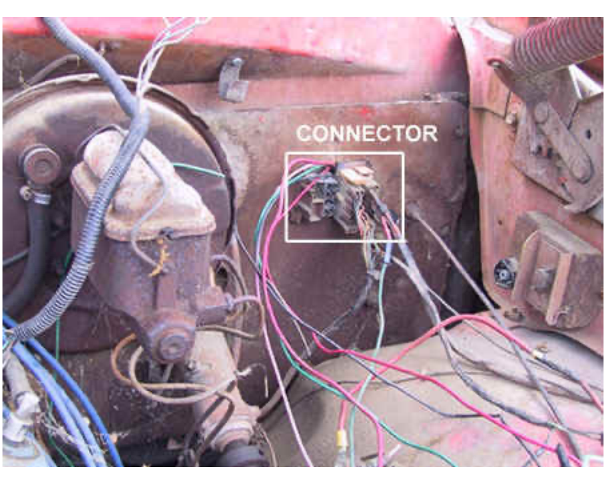
The Dodge alternator/voltage regulator system had no provision to operate a warning light. And Dodge (trucks) stuck with the old antiquated "full load type" AMP gauge design, at least into the late 1980 models. As is typical of Dodge trucks that were used a lot, the AMP gauge in this '76 Dodge was burned out. The plastic mounting area behind the dash is completely melted, and the lens and plastic trim is shriveled too. (This gauge is included in Diagram A.)

Amperage is a measure of current flow, and all of the current used to recharge the battery was routed through this gauge–which caused the gauge to display the battery charge rate. Both the alternator and the battery were mounted up front, under the hood. And the AMP gauge was at the dash. It was an arrangement resulting with a very long wire circuit charging the battery.

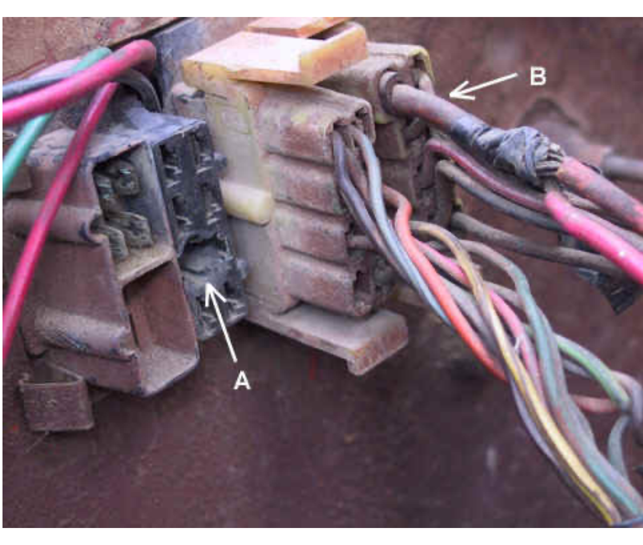
Large amounts of current flow through the AMP gauge will generate some heat too. The plastic cover at this gauge was only distorted by heat–but some Dodges have sizable holes burned in the dash where the AMP gauge used to be. Apparently, the shunt in the gauge has a sufficient amount of resistance to generate a damaging amount of heat with battery charging current flow.



A previous owner had replaced the terminals at the back of the AMP gauge, and then did a weak by-pass of the gauge by taping the two wire terminals together. (No doubt an attempt to get the old Dodge up and running.) It's fairly common to find the wires disconnected from the gauge, and a machine screw and nut clamping the terminals together, and finished by wrapping the screw and terminals with tape.



The AMP gauge wiring passed through the "firewall bulkhead connector," where standard, .250 inch wide, male/female flat blade connectors were used. (This connection is shown in Diagram A.) These terminals were reliable with circuits of much less current flow, as with turn signal, clearance lights, and temp or fuel gauges. But the design was certainly not up to the job of handling the entire alternator output. This was a problem spot in the AMP gauge system that often made Dodge owners walk.

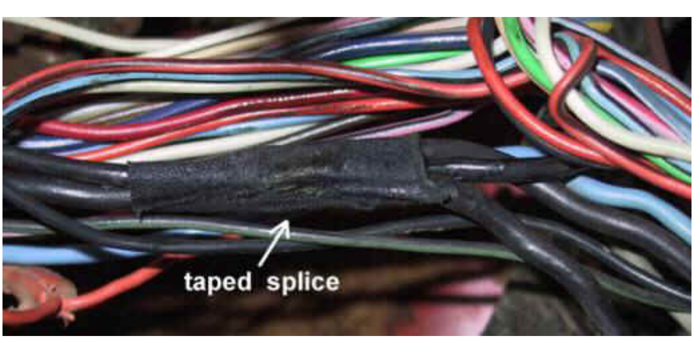


Arrow **A** in the photo at the left points out a melted cavity in the plastic connector body, where a case of "terminal meltdown" occurred. This connection served as a pass-through for the main wire from the alternator to the dash area. When driving, the entire electrical system current load will pass through this connector. (Also seen in Diagram A.) Ignition, lighting, heater fan, accessories, and electrical power in general flows through the connector. The wire color code is black at this circuit, and this model was equipped with 10 gauge wire. (Many earlier models had only a 12 gauge black wire.)

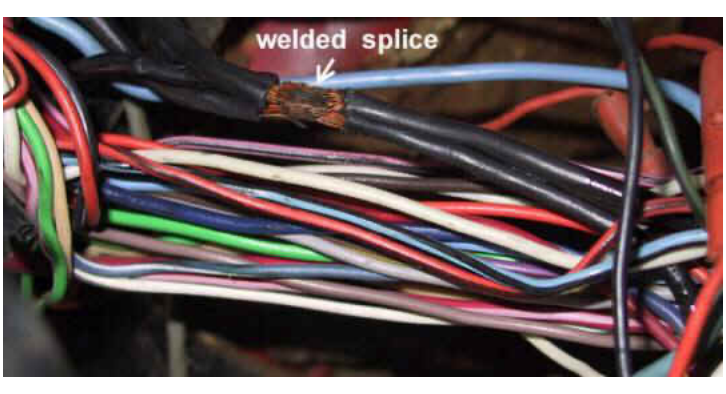
Arrow **B** points out the red, 10 gauge, battery charging wire.

After removing the connector with the red 10 gauge battery charging wire, a close inspection revealed that this side of the AMP gauge circuit was also suffering from a case of "terminal illness." (See arrow in photo at the left. This is the terminal used by the 10 gauge red wire at arrow "B," above.))

The plastic connector body surrounding the female flat blade terminal is beginning to melt away. And severe oxidation of the terminal itself is evidence that this terminal has been glowing hot. Notice that the other terminals in the connector body are still in good condition. The rusty appearance of this terminal is typical of wire terminals that have been hot while handling large amounts of current flow. (If moisture had caused the oxidation, all the terminals would have been corroded.)



We have opened part of the dash wire harness, to show the factory "welded splice" where wires branch off to the ignition switch, light switch, and the fuse box. (This splice is shown in Diagram A.) The "welded splice" is insulated by a factory installed, sticky cloth tape.



The original tape has been removed for this photo to expose the "welded spice."

Pressure and heat fused the copper wire strands together when making the splice. The method seems to be reliable, as in thirty years of workshop experience the author has never seen a failure with this splice. When electrical power loss occurs, this is certainly not the first place to look for the problem.

Click here to see Part 2, where we will by-pass the gauge and repair the wiring