



Cooling System Electrolysis		Anthony Woodford Racing Vista, CA Prepared by Ron Davis Racing
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Subject: Testing for Electrolysis in Cooling Systems
History: We have had reports of certain electrolysis abnormalities with some vehicles, especially 2nd generation RX-7's which can quickly eat through and destroy aluminum radiators. An electrolysis test should be performed before installing ours, or any aluminum radiator to detect and repair any such situations. These problems are a result of something wrong with <i>your</i> vehicle, allowing abnormal currents into the coolant system. AWR will not warrant against such situations. Please read below to insure that your car is free of this condition.

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The following are failures that are not manufacturer defects and therefore not covered under warranty.

Improper Flush - Cooling systems require a through flush of the radiator, engine, overflow tank, hoses and heater core, failure to do so will lead to mixing coolants and contaminates creating a corrosive cocktail for the cooling system.

Corrosion – The correct coolant and distilled water mixture prescribed by the coolant manufacture of choice must be maintained. Water with high trace elements of minerals will create problems for aluminum radiators not normally seen in copper/brass radiators.

Electrolysis – Electrolysis is the systematic removal of the protective layer on the inside of the radiator tubes due to improper grounding in

the electrical system. Electrical grounding problems can stem from poor installation of aftermarket accessories or incorrect vehicle collision damages.

Electrolysis facts

An electrical current passing through the coolant can cause system component failures, due to electrical ground problems and the generation of static electricity elsewhere in the vehicle. Electrical grounding problems can stem from poor installation of aftermarket accessories or incorrect vehicle collision damage repairs. This can destroy cooling system components regardless of the quality of cooling system maintenance. Depending on conditions it can be as quick as 7 days to ruin a radiator. The only way it can be stopped is to correct the electrical problem causing the current. Damage resulting from an electrical current can be pitted liners, oil coolers, radiators, extreme aluminum corrosion, and abnormal water pump and head gasket failure.

Testing for electrolysis in cooling systems

A multimeter or voltmeter capable of reading both AC and DC currents is required to test cooling systems. The meter needs to read zero to the maximum voltage of the system being tested in tenths of a volt. The meter leads must be long enough to reach between the coolant and the groundside of the battery. An ohm function of a multimeter is very helpful to pinpoint areas of resistance in an electrical system that will cause an electrical current to ground through the coolant rather than the engineered electrical circuit.

Procedure

Attach the proper meter lead to the groundside of the battery, negative-to-negative or positive-to-positive.

Install the second lead in the coolant touching the coolant only.

Read the DC and AC voltage with all systems off. If a block heater is present, also take a reading with the heater turned on. If an automatic battery charger is present, as a standby system, also take a reading with this system running.

Read the DC and AC voltage with the electrical starter engaged.

Read the DC and the AC voltage with the engine running and all systems turned on: lights, coolers, fans, heaters, air conditioning, cell phone, two-way radio, including the phone and radio on both standby and transmit.

The above procedure will test a complete system except for an

electrical current, which can be generated by the rear end transmission. This is particularly true with air bag suspensions, rubber pad suspensions and rubber-mounted transmissions. Any current generated will travel up to the drive shaft to ground through the engine coolant. Grounding rear ends and transmissions is strongly recommended.

Voltage of zero to .3 is normal in a coolant of cast iron engine. Such an engine will be destroyed with time by .5 volts, and engine manufactures are reporting .15 volts will destroy an aluminum engine.

The current will be AC if the problem is due to static electricity.

If the coolant shows an electrical problem with all the equipment turned on; turn off one system at a time until you finally turn off the system that stops the electrical current. When the current stops, this will indicate the electrical system causing the problem.

Be partially careful of starters. They can cause as much damage to a cooling system as a direct connection to an arc welder. This is due to the amperage present.

Always change the coolant if a current is detected. The electrical current will destroy the protecting chemicals in a properly inhibited coolant.