

1960 - 1962 Corvette: Service Bulletin: Harrison Aluminum Radiator Repair

Subject: Repair Instructions - Aluminum Automotive Radiators

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**UNITED MOTORS SERVICE
HARRISON RADIATOR
BULLETIN**

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FIRST ISSUE

**REPAIR INSTRUCTIONS
ALUMINUM AUTOMOTIVE RADIATORS**

1. GENERAL INFORMATION

- A. Aluminum radiators installed on some 1960, all 1961 and 1962 Corvette automobiles are identified by name plates attached to the supply tank or to the top of the radiator core. Late model Chevy II L6 vehicles use an aluminum radiator identified by a label attached to the radiator support cross tie. This bulletin outlines the special instructions that should be followed when repairing aluminum radiators with epoxy resin.
- B. Standard service procedures for copper and brass radiators may actually destroy a radiator made of aluminum. Precautions must be observed when repairing or servicing aluminum radiators.
- (1) Test tank water must be absolutely clean. It must not contain any trace of flux or caustic solutions. Never put an aluminum radiator in a tank that is used for testing or cleaning copper and brass radiators.
 - (2) Never use wire brushes, caustic cleaners, or heavy sanding to clean exterior surfaces.
 - (3) Avoid extreme heat, such as from a torch or a high-temperature oven when using epoxy resins.
 - (4) Use only those antifreezes, additives, and cleaners specifically recommended for use with aluminum radiators by their marketers or which meet the requirements of GM Specifications.
 - (5) The cooling system should be protected at all times by an acceptable inhibitor compound, recommended for use with aluminum radiators by their marketers or which meet the requirements of GM Specifications.
 - (6) Always follow the special directions printed on the epoxy resin container.

2. SUPPLIES AND EQUIPMENT

- A. The following supplies and equipment, necessary for repairing aluminum radiators, should be readily available.
- (1) Test tank of clean, pure water.
 - (2) Compressed air that can be controlled at specific pressures.
 - (3) Plugs and fittings.
 - (4) Cleaning solvent such as naphtha, a good grade of lacquer thinner, or alcohol.
 - (5) Medium-grit sandpaper.
 - (6) Epoxy resin and hardener - selection depends on its ease of preparation; ability to cure at moderately low, easily controlled temperatures; and resistance to porosity. Kits frequently include a tube of resin, a tube of hardener, and a spatula. Approved materials are listed at the end of the instructions.

- (7) Mixing tools and surfaces - wooden spatulas, putty knives, and rubber squeegees can be used to mix the resin and hardener. Any clean mixing surface such as a sheet of heavy paper or cardboard is satisfactory. Both mixing tools and surfaces should be disposable because the resin sets up quickly and is very difficult to remove. Special solvents are available for cleaning supplies and equipment.
- (8) Reinforcement material - glass tape (cloth cut in strips) that is "treated" to make it suitable for use with epoxy resin is recommended. Tape 2" in width with rough or loose edges is best for most repairs. Aluminum screen or a thin sheet of aluminum may also be used.
- (9) Heat source:
 - (a) 375-watt infrared heat lamp.
 - (b) Oven that can be maintained at no higher than 350° Fahrenheit.
- (10) Thin strips of clean aluminum stock cut 1/4" wide.

3. TYPES OF REPAIR

- A. Leaks in aluminum radiators can sometimes be repaired while the radiator is installed on the car. In general, however, it is necessary and desirable to remove the radiator before attempting to make a repair.
- B. There are basically two types of epoxy resin repairs - leak repairs and structural repairs. Leak repairs consist of sealing the surface to prevent leakage when structural strength is not required. These are usually small seepers or pin hole type of leaks which could occur in the tubes, tube seams or in the cup areas at the end of the water passages. These require no structural reinforcement.
- C. Structural repairs consist of sealing the surface and adding strength through the use of glass cloth or glass tape impregnated with epoxy resin. Large leaks at the cups (the units at each end of the water passages), the inlet and outlet pipes, filler neck and anchorage require structural reinforcement.
- D. No radiator should be returned to service if the repair blocks off more than two water tubes or if more than 5% of the air centers have been removed and replaced.

4. LOCATING LEAKS

- A. Test water used for locating leaks must be absolutely clean. Most test tanks used for conventional radiators contain residues of flux and cleaning solutions that are caustic and will attack aluminum. If an aluminum radiator is exposed to these caustic residues, the aluminum will be damaged and leakage may occur.
- B. Testing 1960 and Early 1961 Model Radiators P/N's 3147516 and 3151116 (supply tank attached to header)
 - (1) In these radiators the supply tank and the core must be tested separately.
 - (a) Install a pressure cap or rubber test plug in the filler neck and block the outlet pipe. Block the inlet pipe with a test fitting, so designed that an air line can be connected to the fitting.
 - (b) Connect an air line to the test fitting but do not apply air.

- (c) Submerge the core in clean test water and apply pressure gradually up to 15 psi. Air bubbles indicate leakage points which should be marked with a grease pencil.

NOTE: A PRESSURE CAP OR TEST PLUG IS USED INSTEAD OF A HEAVY TEST CAP TO PREVENT DAMAGE TO THE ALUMINUM FILLER NECK.

- (2) The supply tank attached to the header may be tested as follows:
 - (a) If the supply tank has a fill check hole, it should be plugged.
 - (b) Connect an air line to the overflow pipe on the rear of the tank.
 - (c) Block the bleed tube from the filler neck to the supply tank with a small rubber plug or seal off with testers finger.
 - (d) Submerge the supply tank in clean test water and apply pressure gradually up to 4 psi. Mark leak areas with a grease pencil. An identification plate is mounted with rivets to the top of the supply tank. Air leaks at these rivets are normal and need not be sealed.

C. Testing 1961 & 1962 Model Radiators P/N 3150916 & P/N 3151016 (supply tank attached to left exhaust manifold of engine)

- (1) Unless there is evidence of supply tank leakage, the tank need not be removed from the engine compartment. The 1961 radiator is tested as follows:
 - (a) Insert test fittings into the inlet and outlet pipes.
 - (b) Connect air line hose to 3/8 inch diameter vent tube on top of the core. (See step C(3)).
- (2) The supply tank may be tested as follows:
 - (a) Install a pressure cap or rubber test plug in the filter neck. Block 3/4 inch diameter outlet pipe with a test fitting.
 - (b) Connect air line to 3/8 inch diameter inlet pipe. (See step C(3)).
- (3) Submerge the tank or core in clean test water and apply pressure gradually up to 15 psi. Air bubbles indicate leakage points which should be marked with a grease pencil.

D. Testing late model Chevy II L6 aluminum radiators P/N 3152112.

- (1) This radiator is a conventional downflow design and may be tested as follows:
 - (a) Install a test plug in the outlet and one in the inlet, either of which should carry the fitting for attaching an air hose.
 - (b) Install a pressure cap or a plug in the filler neck for sealing.
 - (c) Submerge the radiator in clean test water and apply pressure gradually up to 15 psi. Air bubbles indicate leakage points which should be marked with a grease pencil.

5. PREPARING REPLACEMENT AIR CENTERS

- A. If leakage is in the tubes, the air centers surrounding the leakage should be removed in order that a repair can be made. Air centers can be removed with a pair of thin-nose pliers ground off to fit between the water passages. Air centers should be pulled out to a depth of 1/4" beyond the tube damage.
- B. In order to improve the appearance of the repaired area and to give support to the tube, a new section of air center should be prepared and installed. A section of replacement air center may be prepared from a thin sheet of clean aluminum stock that is cut into a strip 1/4" wide. Fold this strip in alternate directions at intervals sufficient to simulate the air center stock of the existing centers.
- C. After the tube leak has been repaired, and before curing of the epoxy, the air center section should be installed following the epoxy resin instructions outlined in this bulletin. To obtain a good rate of heat flow into the new section, the metal folds should fit snugly against the tube surfaces.

6. PREPARING THE SURFACE

- A. If resin is applied to a surface that is wet, dusty, or covered with oil film and road grime, the resin will not adhere properly. Therefore, both the surface to be repaired and the surrounding area should be dry and thoroughly cleaned before applying the epoxy resin. This can be done by brushing on a suitable solvent such as naphtha or a good grade of lacquer thinner. In the case where a tube is to be plugged, both ends close to the tank should be opened and cleaned inside to insure a good surface for proper bond and sealing.

NOTE: UNDER NO CIRCUMSTANCES SHOULD CAUSTIC CLEANING AGENTS BE USED ON ALUMINUM. THEY WILL CAUSE DETERIORATION OF THE METAL AND RESULT IN LEAKAGE.

- B. Light sanding with medium-grit sandpaper will give a rougher surface for better bonding. Clean the radiator to remove sanding dust.
- C. After cleaning, thoroughly dry the area to be repaired, applying moderate heat if necessary as described under "Hardening and Curing the Resin".

7. MIXING THE RESIN AND HARDENER

- A. Epoxy resins must be used exactly as the manufacturer recommends on the resin container. Specific handling precautions should be carefully observed. Instructions concerning the mixing, applying, hardening, and curing of epoxy resins must be followed to produce an effective repair.
- B. Hardeners and hardener-resin mixtures can cause skin ailments. Contact with a hardener, or hardener-resin mixture, or working over fumes from the plastics which are setting, can result in a rash to the exposed areas of skin. Extreme care must be used to prevent contact of these materials with the skin. Most soaps and hand cleaners will remove resin.
- C. Some epoxy resins are available in tubes and measurement is made by equal length beads. Beads of base resin and hardener may be squeezed on a clean surface such as a heavy-weight paper or cardboard and thoroughly mixed together with a wooden spatula.

- D. When mixing large quantities by weight or by volume, always use different implements with each unblended component. If one implement is used, hardening may be started where it is not wanted. Unblended resins and hardeners have unlimited storage life as long as they are not mixed.
- E. The "working life" of many mixtures is between 10 and 15 minutes, depending on room temperature. The warmer the temperature is, the shorter the "working life". Use up the mixture before it hardens as it cannot be reclaimed. Mix only enough for the job. Do not return leftover mixture to either container.

8. APPLYING THE RESIN

- A. When repairing a leak, apply epoxy to the area using a wiping or a troweling motion to work any air bubbles out of the material. The entire leak area must be completely covered. The resin should also be applied generously to an area around the leak to provide an adequate bonding surface and give added strength.
- B. In general, extremely thick quantities will add nothing to the effectiveness of structural strength of the epoxy resin. Experience will teach the proper quantity required to produce a satisfactory repair without creating a curing problem.
- C. If finishing is anticipated, it may be necessary to build up an excess of resin. When adding more resin, continue to use the troweling motion while building up the thickness to fill in any gaps or voids.
- D. Structural repairs require the use of glass tape or some other type of reinforcement such as aluminum screening or aluminum sheet metal. Apply epoxy resin to both sides of the tape with a spatula, rubbing the resin into the material until it becomes saturated. The tape should then be laid over the defect or leak area.
- E. For cup leaks the tape should be wrapped around the cup. After the tape is applied, additional epoxy resin should be spread on the outside of the tape until it is no longer visible. For increased strength, alternate layers of resin and saturated glass tape can be used.

9. HARDENING AND CURING THE RESIN

- A. Some epoxy resins will harden or set in about 1-1/2 hours at room temperature (72° F.). With moderate heat these may set in about 30 minutes.
- B. Complete hardening or "curing", however, requires a longer period of time - 24 hours at room temperature or 90 minutes with moderate heat for some resins.
- C. The safest and least expensive source of moderate heat is a 375-watt infrared heat lamp placed 10 to 12 inches from the repaired area.
- D. A low-temperature oven may also produce satisfactory hardening or curing if the temperature can be controlled accurately. Temperatures recommended on the epoxy resin container should be followed. Never use a torch on epoxy resins.

10. FINISHING THE JOB

- A. Testing.
 - (1) Test to determine if the repair is satisfactory by following the same procedure outlined under "Locating Leaks".
- B. Cleaning.

- (1) Many radiator cleaners on the market have a caustic base and must not be used on either the inside or outside of aluminum radiators. No commercial cleaner should be used unless it is recommended for aluminum radiators by its marketer.
- (2) Until such time as acceptable cleaners are generally available, the only acceptable method of cleaning the internal passages of aluminum radiators is pressure flushing with clean water. Likewise, only water should be used to clean large sections of exterior surfaces.
- (3) Dirt, bugs, and other foreign matter may be removed from the air centers by flushing from the engine side with an ordinary water hose (without nozzle) and city water pressure. Excessive pressures that may cause damage to the air centers should be avoided.

C. Straighten Air Centers.

- (1) Air centers which are bent should be straightened, using duck-billed pliers.

D. Finishing Epoxy Resin Surfaces.

- (1) After the repaired area has been cured, it may be filed or ground to a smooth finish with the methods used on ordinary solder. Such finishing, however, is usually not required as epoxy resin dries, or hardens, with a smooth finish.
- (2) The repaired area or the complete radiator may be painted. No special primers are necessary.

E. Installing Radiator.

- (1) When replacing anchorages on 1960 and early 1961 Corvette radiators (with attached supply tank), make sure that the mounting supports (bolt angles) are properly located. Bolts holding these supports to the radiator must be drawn up snug with a wrench but not overtightened to prevent damage to the tubes.

F. Additives.

- (1) After the radiator is installed, an acceptable rust inhibitor or antifreeze must be added to protect the radiator and other cooling system components. Use only antifreeze and inhibitors which are marked and represented by the marketers or manufacturer as satisfactory for use with aluminum radiators or are known to meet the requirements of the applicable General Motors Specifications.

KIT INFORMATION

The following are approved products used for repairing radiators. Notification of other products will be made as they are approved.

Resiweld Plastic Alloy No. 613	H. B. Fuller Company 255 Eagle Street St. Paul 2, Minnesota
Metalhesive F	Aerobond Adhesive Engineering 1411 Industrial Road San Carlos, California
Epoxi-Patch Kit No. 60	Hysol Corporation Olean, New York
Anchor Shurbond No. 202 Epoxy Radiator Compound	Anchor Alloys Inc. 966 Meeker Ave. Brooklyn 22, N. Y.

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