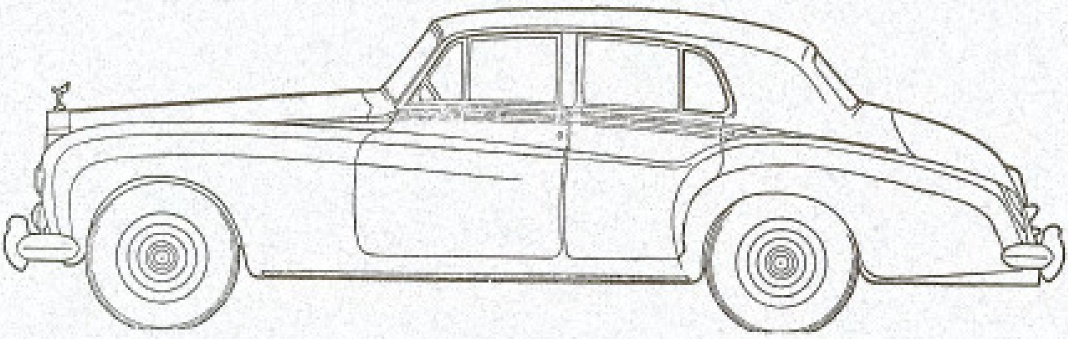
THE ROLLS-ROYCE OWNERS' CLUB

REPRINTS FROM

THE FLYING LADY

SILVER CLOUD/S: 1955-1966



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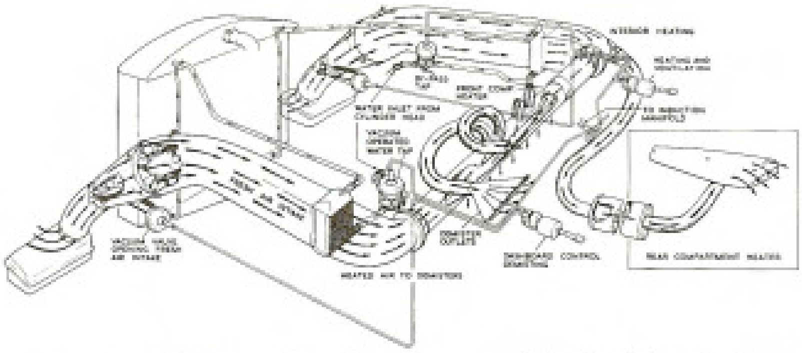

SC-1 or S-1 Heater/Demister System Repair

(Part 1) Bob Mendenhall (CA)

Soon after acquiring my '58 Bentley S-1 saloon, I discovered that the front wings were badly rusted. The outside looked fine, but the inside surface resembled a close-up view of the moon. So I removed the wings to replace them with some "pre-owned" specimens that were in better condition. How I secured them is a long story that will remain untold for now. They are not fibreglass, they are real rust-collecting steel ! When I removed the phantom (and I mean they were almost gone) front wings from my S-1 (B263FD), I exposed the heater and demister systems which also needed attention. These ductwork arrangements are mainly aluminum and mine had suffered bitterly from salt corrosion, the same condition that devoured the wings.

I have had no previous experience in aluminum repairing, so I hope my explorations will be of value to other restoration novices. Repairing these heating systems requires little technical knowledge, but it takes time.

Description

The heater and demister are similar except for a warm air duct on the heater (right) side to heat the rear seat area. The car's forward motion forces air into each of the small horizontal grilles below the headlamps. The moving air goes through a valve, opened by a switch on the fascia panel; then a fan forces it through a small heat exchanger where it is warmed. The warm air goes into one end of a cross duct that extends across the scuttle. This duct is open at each end but is divided lengthwise by a slanting metal separator.

Warm air from the demister (left) side comes out the top through ducts and slots under the windscreen. Air from the heater side exits through slots in the bottom of the cross duct and warms the driving area. The slanting divider in the duct equalizes warm air distribution across the width of the car.

Parts of the System

The demister (left) ductwork is shown in Figure 1. The heater (right) ductwork is the same except that the mountings are reversed so it can be fastened to the right valance panel. I've assigned numbers to the various sections of the ductwork in order to avoid having to describe each section more than once.

Section 1 is the air intake which is located behind the small horizontal grille under the headlamp. The air intake is wide in front and narrows to the rear. It has a circular outlet opening on the top. The air intake is made of two sheet aluminum sections that are riveted together. The rear is not closed off but has a half-inch slot to allow excess air to exit. A phosphor-bronze screen between the two parts of the assembly stops pebbles and dirt. A three-inch rubber collar is fitted over a flange on the top and this guides the air into the next section. The rubber collar is Section 2.

Section 3 contains a flat disk rotating valve to close off the passage. There are two parts: a cast aluminum housing for the valve (3a), and a sheet aluminum cone-like piece (3b) that increases the duct diameter. The two parts are riveted together but can be separated, if required, by drilling out the rivets.

An aluminum casting is fastened inside the circular joint between Sections 3 and 5. This machined part (Section 4) has a 2-speed electric motor and fan mounted on it. The connecting wires to the motor go through rubber grommets in the motor cover and on top of the duct.

Section 5 extends from the joint at (4) to the heat exchanger. The circular duct bends through an angle, then is formed into a square cross section to match the input shape of the heat exchanger.

The heat exchanger (6) resembles a small radiator. Connecting tubes at the top and bottom extend through matching holes in the valance panel. Water circulating hoses are attached to these tubes to bring in warm water from the engine and return the cooled water to the front radiator. Openings in the exchanger allow the cool air to be warmed as it passes through.

The Section 7 duct is lined with insulating material. The square input matches the back of the heat exchanger but the duct becomes circular and completes a 90-degree bend to meet the inlet of the cross duct. Four studs on the scuttle match the holes in the mounting flange and four nuts are used to secure it. This description of the heating systems will be supplemented with additional details.

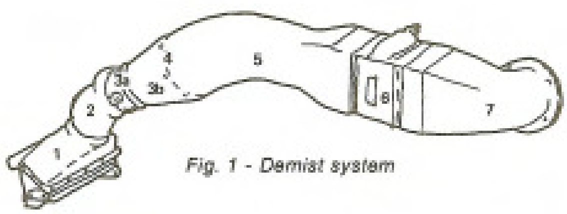

Fig. 1 - Demist system

System Removal

The easiest way to remove the ductwork is with the valance panel still attached to the car. The panel is firmly braced and enough leverage can be applied to remove the rusted screws and bolts. It is also easier to urge the pieces of duct to relinquish their homes when a little persuasion is necessary! I found persuasion wasn't quite enough with the bronze nuts that held the heat exchanger to the panel, so I left it in place to be removed after I took off the valance panel.

The amount of dirt I found on top of the heater ducts was surprising. The flat top surface of the duct was covered with dirt, stones, sticks, mud, and other debris — all well mulched into place. I transplanted three plants I found growing there, two mangos and a primrose, and they are doing nicely! A putty knife helped clear much of the mess, and a long, thin screwdriver cleared out the debris lodged between the duct and the panel, only about a half-inch away. There was an additional coating of road film and oil, so I used solvent to remove another layer. The weight I've removed will probably force me to remove a couple of shim washers from the front springs to get the car level again!

I've now repaired both the demister (left) and heater (right) systems but I did each one separately so that I could use the other assembled panel as a guide for hardware placement.

The valance panel has many attached pieces of hardware but because of its size (about 3 by 4 feet), it is hard to see all the detail in a photo. I drew a rough sketch as I cleared off the panel, but as several weeks passed between removal and replacement, I'd forgotten what some of my hieroglyphics were supposed to be.

Most motorcars are heavily undercoated around the wheel area. This can make it difficult to remove some of the fasteners. The four nuts holding Section 7 to the scuttle will need the undercoat removed before they can be undone. After they are off, this section can be removed. This must be carefully done to avoid damaging the heat exchanger or the aluminum duct. The duct flange on 7, slides over the outside of the heat exchanger opening. I found a flat rubber loop around this joint with plenty of undercoat and sealant holding it in place. I used a putty knife to pry away this seal from the metal. When the seal was loose, I could pull the scuttle flange away from the studs, then I gently moved the duct up and down to free it from the heat exchanger.

After the top section is out of the way, the lower sections can be removed. Collapse one side of the rubber collar (2) to shorten its length, then slide it off both the lower air intake outlet flange and then off the control valve casting (3a).

The air intake is fastened to the valance panel by two bolts and a bracket. I found it easier to remove the intake from the bracket than the bracket from the panel, because both the bolt and nut were more accessible with wrenches. The air intake assemblies on my S-1 were badly corroded and had to be replaced. If they are not in good condition, be sure to save all the bits and pieces to use for reconstruction patterns.

Before removing Sections 3-4-5, some work must be done on the inside of the panel. The cast aluminum valve control section (3a) has a shoulder extending through a grommeted hole in the panel. Attached by three screws to this shoulder is a horizontal steel bracket. The other end of this bracket has a right-angle bend with a hole for mounting the valve actuator. A wire from the front of the actuator is fastened to a bell crank mounted on the valve shaft inside the shoulder. A spring from the bracket to the other leg of the bell crank keeps the valve closed when not actuated. The other end of the actuator has pneumatic tubing going to the actuator control which, in turn, is connected to a switch on the fascia panel. This actuator bracket, bell crank, and spring must be removed from the panel before the rest of the system can be disassembled.

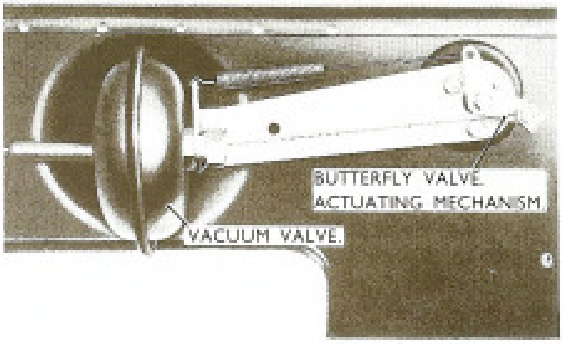

Fig. 2 - Butterfly Control Bracket

The top end of Section 5 is still attached to the heat exchanger (6). Care must be used again to avoid damaging the exchanger. Use the same technique employed when removing 7; a prying, jiggling motion — working the overlapping edges free from the exchanger. Again you may find a flat rubber loop sealing the joint.

Use a putty knife to split the undercoating and free the duct. The two bolts holding the mounting brackets at Section 4 must be removed, then the 3-4-5 section can be taken off and laid aside. It may be fragile, so treat it with care.

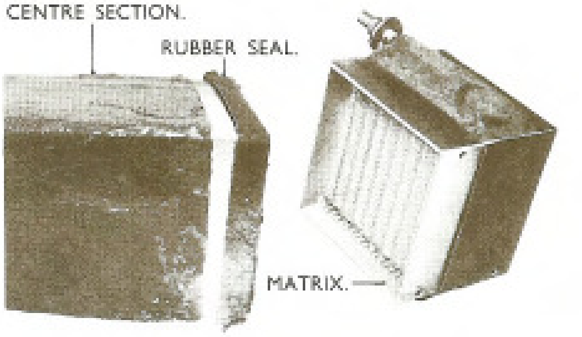

Fig. 3 - Heat Exchanger

The heat exchanger can now be detached. The exchanger has two connecting tubes protruding through the panel, one on top and one on the bottom. On the outside of the panel is a flanged, threaded bushing welded to the tube close to the exchanger. The inside of the panel has a large metal washer and nut threaded onto the bushing of each tube. The bushings pass through two grommets lining the holes in the panel. The bushing is aluminum and the securing nut is brass or bronze. These are often frozen together by corrosion and must be removed with care. A large, adjustable wrench can be used on the inside bronze nut, but if the bushing flange is not held securely, the connecting tube may be twisted off. This happened to me and I had to have a new tube heliarced to my heat exchanger. By using penetrating oil and a thin-jawed water-pump plier on the outside flange, I was able to loosen the bronze nut. I didn't want to destroy the rubber grommet, so I didn't use a torch to heat the joint. After the exchanger is off, remove the rubber grommets and set them aside for reuse.

Fan Housing Disassembly

The final disassembly is to separate the joint that encloses the fan mount casting. This should be done on a flat working surface. Again there may be a problem with frozen screws: the eight steel pan-head machine screws holding the overlapping aluminum ductwork to the circular aluminum casting. These screws were removed after liberal application of Liquid Wrench and heat from a portable propane torch. For some reason, the four screws holding the mounting brackets were very hard to remove and their heads were marred in several places before they came free.

Sections 3 and 5 have open-ended longitudinal slots at the overlapping joint and these allow the ducts to be pulled loose from the casting even when the screws are not completely removed. The top section (5) can thus be pulled free and additional penetrating oil applied to the screw threads. Before this section is fully removed, the fan motor wires should be pulled through the small rubber grommet in the top of the duct.

After both ducts are gone, the circular fan casting is accessible and the motor and fan can be taken off. The fan is held to the motor shaft by a single screw on the front hub. The electric motor is held by three nuts and bolts that are not hard to remove. Make a sketch of which side of the casting carries the body of the motor, it is easy to remount the motor with the casting reversed. The outside circular duct mounting surface is machined with differing diameters to compensate for the thickness of the inside duct and provide a level surface for the overlapping outside duct.

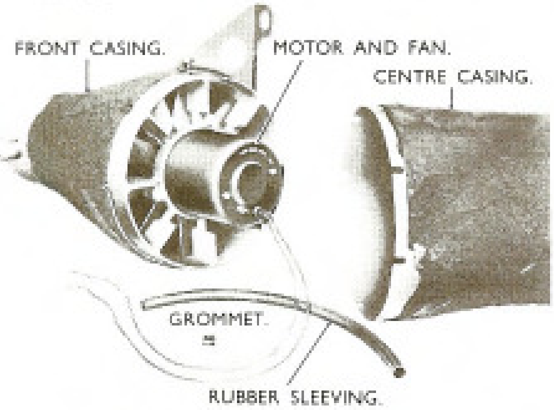

Fig. 4 - Fan, motor and casing

The aluminum fan casting can now be cleaned and the corrosion removed. I discovered much grease and dust on my fan blades. A soak in "Gunk," a wash in water, then a light buffing with a motor-driven wire brush cleaned it quite well.

I next took apart the control valve in the casting (3a). Two screws hold the flat, circular disk in a slotted brass shaft. After the screws are removed, the disk can be forced through the slot and removed. Caution, the edges of the disk are beveled and can cut the unwary. The shaft is removed from the casting by uncapping the outside end (rubber), pulling out the split pin, then pulling the shaft through the shoulder on the other side (don't lose the washer under the split pin).

The brass (or bronze) shaft comes in contact with the aluminum, so there is corrosion. The shaft in my heater (right) control was frozen closed and required considerable persuasion to remove.

Before the ductwork is cleaned, the pieces of insulation should be removed from the inside of Section 7. This insulation pad is about one-quarter inch thick and is lightly cemented to the inside surface. I used a sharp knife to separate the pad from the inside surface. It was very dirty and filled with dust. I kept the pieces to use for patterns when I replaced the insulation with fibreglass batting.

Cleaning the Hardware

I removed all the undercoating from the outside surfaces with solvent and "Gunk" and this takes time. The solvent action is slow, so I used an old, very dull wood chisel to skin chunks of the undercoating away so the solvent could penetrate more surface area, and this speeded up the removal.

Ductwork Repair

After freeing the ductwork sections from dirt and undercoating, I examined them closely. There were many holes and pits in the aluminum caused by the salt. After studying the problem, I found a method for repairing these damaged aluminum ducts.

I decided to use a ready-mixed body putty to fill the holes, but I needed something to anchor the filler. I applied small pieces of glass fibre tape over the holes on the inside of each duct. The holes were easy to find, as a light on the outside made them easily visible. I applied the tape firmly, as I did not intend to remove it. This took some time as there were many holes and some of them took several pieces of tape to cover. From the outside of the duct I applied some "Green Magic" spot putty, using a putty knife to smooth it. I also filled in all the pits that had not eaten all the way through. The spot putty does not require mixing and is squeezed from a large tube. It adhered well and dried in about an hour.

One step I forgot to mention was the use of phosphate jelly on the clean aluminum before I applied the tape and filled the holes. This product is put out by the makers of Naval Jelly and it was used to neutralize any remaining salt and stop further corrosion. I also used a pointed rotary file in my drill and routed out some of the holes and pits so the putty would have a good surface to stick to.

After the putty was dry, I used sandpaper to remove the excess and smooth the surface. The outside was next sprayed with Zinc Chromate aluminum primer using a spray can. This primer insures a good base for other paint or undercoating. The yellow-green color also hides the patches of green putty; unfortunately not exactly British Racing Green!

Air Scoop Restoration

The air scoop (Section 1) on the left side was almost completely destroyed by corrosion. After removing what remained, I found many holes in the top, and the bottom consisted of a slight residue, the center being completely nonexistent. The two sides were still present, which was fortunate, as from them I could determine the angle of the scoop. The top and bottom were riveted together, so I drilled them out and took the scoop apart.

As I mentioned, the bottom was beyond salvage except for the sides. I measured the remains and made a mechanical sketch so it could be formed from sheet aluminum. The top also had several holes and pits, but I decided to repair and reuse it because of the deep drawn shape and the round opening and raised collar, which would be difficult to duplicate.

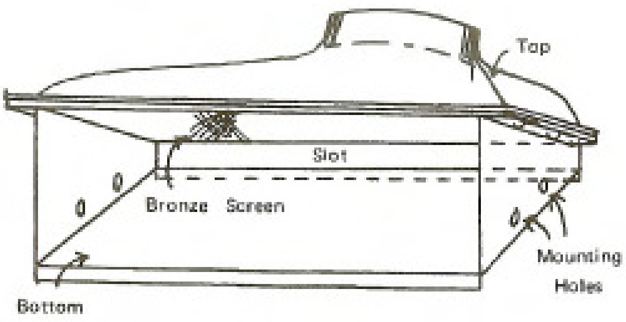

Fig. 5 - Air Scoop

I could find no sheet metal shop interested in making the air scoop, so I became a manufacturer. A replacement, based on my sketch, was cut from 18-gauge aluminum sheet and I used a vise to bend the corners and edges. This sketch is shown in Figure 5. Before using it, check the length dimension, as there have been changes in size; it is a half-inch shorter on the '56 S-1. The corrosion on the flanges used for riveting left the holes very weak, so I made a couple of thin reinforcement strips to strengthen the edges for reassembly. The two sections originally had a fine mesh screen between them, so I purchased a small piece of bronze window screen and cut it to fit. I then used a pop rivet tool to put the air scoop together.

The Valance Panels

After removing the demister system, I discovered that the valance panel was rusty. My radiator shell and grille were already off, so this was an ideal time to remove the panel for cleaning, rust removal, and repainting. With the wing, heating system, and radiator hardware gone, it was not difficult to remove the panel.

Several pieces of hardware must be disconnected before the panel can be removed. The bonnet latch control rod nuts are taken off so the rod can be disengaged from the latches. The vacuum control tubing from the control unit is disconnected. The window washer container comes out after the tubing is slipped from the top nipples. The electrical cable bundle is removed from the clips holding it to the panel. A grounding strap from the frame, held to a small stud by hex nuts, must be disconnected. The bottom support bracket enclosing the exhaust pipe must come off. Remove three bolts.

After these steps are complete, the bolts holding the panel to the radiator and scuttle can be removed and the panel lifted off. This is a cumbersome job and best done by two people. After it is off, it can be placed flat, engine-side up, on an elevated surface. A couple of carpenter's sawhorses are ideal as the panel does not need to be completely supported.

The condition of my panels required me to have complete access, so I removed all the hardware from the panel. I made a sketch of the placement of each piece of hardware so I could replace it correctly. The bonnet latch, rod, and guides are easy to replace, but the cable clip locations should be carefully noted as their mounting direction must be right to hold the cable bundle.

When the heater (right) side panel is removed, there are a couple of differences that should be noted. The two brake fluid reservoirs must be drained and removed. These are glass and difficult to replace, so handle them with care. When the rubber tubing is removed from the bottom nipples, be sure to wire or tape them upright to the engine to keep the master cylinders from being drained. Take care to keep the hoses uncontaminated — seal them with a plug or tape. On my S-1 the armored cable from the emergency brake was routed between some of the rubber vacuum control lines and I had to remove them to free the panel.

Panel Repairing

After all the hardware is off, including the rubber grommets, the panel can be cleaned. I used solvent to remove the undercoating from the wheel-side and it also removed the grease and oil from the engine-side. The size of the panel forced me to stand it upright in a large plastic chemical tray and I used a brush to apply the solvent. After the surfaces were clean, I used a wire brush to remove spots of rust, then a motor-driven disk sander to grind away the remaining spots and expose the rust patches. Following this, I used Naval Jelly to remove the rust pits and other corrosion. I used the disk sander again to grind away the rest of the oxidation and get down to bright steel.

When both sides were clean, I applied a coat of Rustoleum primer to each side. I cleaned up the bottom support bracket in the same way. I next applied a coat of black Rustoleum to the engine-side of the panel and support bracket. Before painting the panel, I straightened out a few bumps on the edges and knocked out a couple of dents. (Any place where metal is bared, it is well to etch the surface with phosphoric acid before priming).

(Part 2, How to Re-assemble, will appear in the Nov. issue)

FRONT LICENSE PLATE BRACKET FOR SILVER CLOUDS

A license plate bracket can be made for the front bumper of the Silver Cloud by using a Fiat 124 ('70-73 convertible--part #905140 @ $1.20 each) and by having your local metals dealer cut you a piece of aluminum (about 25¢-35¢/pound) to a 22" x 4¼" for the exact R-R size, or 19½" x 6¼" to accommodate a standard U.S. license plate. If you use the larger plate backing, the extra space can be further taken advantage of by affixing decals, badges, etc.

In using aluminum, be sure to prime the surface with a chromate primer before painting the desired color.

You will find that this bracket is generally easier to come by than the R-R replacement and considerably less expensive.

J. G. Fuque, Jr., Tenn.

SC-I or S-1 Heater/Demister System Repair

Bob Mendenhall, CA

(Part 2 continued from page 2107)

Ductwork Reassembly

If you separated Section 3 into two parts, put them back together. The control valve in 3a should be reinstalled. The shaft is pushed into the hole in the casting, the end with the raised key goes in the shoulder section. If the shaft does not turn freely, there may be internal corrosion to be removed. I used a fine-cut rat-tail file on the inside surface and was careful not to remove any metal and so enlarge the shaft hole. When the shaft is replaced, be sure to lubricate the surface so that it turns freely. I used light machine oil.

After the shaft turns freely, install a split pin and washer on the keyed end, then push it back into the casting from the shoulder end. This inside washer and pin must be installed first as it is almost impossible to reach down into the shoulder recess after the valve has been installed.

With the shaft in place, the valve disk can be replaced. The beveled disk may require pressure to insert it through the slot in the shaft. Be careful of the edges of the disk as they are sharp. When looking into the casting from the bottom opening, the sharp edge of the disk should be up. When the disk is rotated, the edge should be in contact with the inside surface, both top and bottom. On the demister side (left), the shoulder points right and the heater shoulder extends to the left.

Two brass screws fasten the valve to the shaft. I was unable to measure a difference between the mounting holes and the edge of the disk, but the valve closed off the passage tighter in one position than when it was mounted with the other edge out. This indicates that the shaft hole is not centered.

After the valve is secure, the washer and split pin can be installed on the outside of the shaft to hold the valve securely in position.

Sections 3a and 3b can now be riveted together if they were previously separated. A pop riveter works fine. The rivet length must not be too long as the valve action can be hindered by rivets extending too far on the inside. I had to bend two rivets out of the way and it was awkward to reach past the valve.

Sections 3 and 4 should now be joined. This requires installation of the fan motor in the casting and replacing the fan blade on the motor shaft. Use the sketch made during disassembly to mount the motor on the correct side of the casting. After the motor has been bolted into place, be sure to pull the motor leads through the rubber grommet in the top of the duct. If the grommet is damaged, it should be replaced.

Sheet metal screws (8) are used to hold the two sections together. They are screwed into the holes in the outside surface of the casting. The holes may be corroded, so be sure to try them in the holes before joining the sections. I used self-tapping machine screws to clear the threads before joining the sections.

To reassemble Sections 3 and 5, lay 5 on a flat surface, the curve inside you, and the square section on the right. This helps determine the location of the two mounting brackets which are held in place by the assembly screws. The screws can be inserted through the bracket holes and into the casting. All eight screws can be loosely started because the duct pieces have open slots on their edges and can slide under the screw heads. The outside surface has two levels so that the inside duct surface is level with the casting surface and the outside duct can be pulled down firmly against both surfaces. Be sure that the fan blade is toward the control valve

The valance panel hardware should next be replaced on the panel. Your sketch of the mounting locations should be used to assure that each piece is properly placed. If you have any problems, use the other panel for guidance; it is very similar. (to be continued in Jan. FL)

SC-I or S-1 Heater/Demister System Repair

(Part 3 - Cont'd from page 2121)

Remountlng the Ductwork

I think that it is easier to install the ductwork on the valance panel when the panel is still Iying flat. You won't have to straddle the front wheel and axle, and the duct does not have to be held in position while you fasten it to the panel.

The two rubber grommets lining the holes for the heat exchanger tubes should be replaced. Make sure that their edges are exposed equally on each side of the panel.

The exchanger should now be installed. Be certain to mount it on the correct side of the panel, on the wheel side. The aluminum tubes are inserted through the grommets, the flat washers placed over the tubes on the other side, and the bronze nuts started onto the threaded bushings surrounding the tubes. Before tightening the nuts, put some lubricant on the threads. Be sure to use the same technique in fastening the exchanger that was used in removing it. The bushing on the exchanger must be held in place as the fastening nut is tightened to avoid twisting the tube.

When the heat exchanger is in place, the rest of the system can be installed. The combined Sections 3-4-5 are next to be replaced. The square end of 5 fits over the outside of the exchanger-some edge warping may be necessary to position it, but the metal is soft and creates no problems. Don't force the heat exchanger out of position as the bushings are soft and can be bent.

The valve shaft shoulder will protrude through a large grommeted hole when the duct is correctly placed. This allows the two mounting bracket flanges to touch their mounting holes in the panel. These mounting holes are lined by rubber grommets (to quiet any rattles) but have a short metal sleeve through their centers so their fastening bolts can't be overly tightened.

With the lower ductwork in place, the joint between the exchanger and the duct can be sealed. I used two-inch aluminum self-sticking "duct" tape for this purpose. The clearance between the panel and the joint is about a quarter-inch, so the tape should be started on this inside surface so it doesn't have to be pulled through more than once. After the tape has been threaded through this opening, pull enough more so the end can come around the duct and back to the start. Pull the tape tight, starting with the loose end, so it covers the joint tightly. A long screwdriver may be used to make the inside stick to the duct. Now bring the tape around the outside down to the bottom to give a double layer on all but the inside surface. I did not feel that the inside surface needed a double thickness because it is well protected by the panel.

The air scoop assembly can be mounted at the bottom of the duct, but unless the panel is to be installed immediately, this assembly can be easily damaged. This section can be postponed until the panel is on the car, because the mounting bolts are accessible.

The panel should now be turned over for access to the inside (here's where the sawhorses are valuable). The valve control is now mounted. The control bracket is fastened to the casting shoulder that protrudes through the panel. This steel bracket that holds the actuator is held by three machine screws to the flat edge of the col lar.

The bracket holes are circular slots, which allow some adjustment of the bracket angle; it should be nearly horizontal when the panel is mounted. Next, the bell crank is fastened to the shaft by a single machine screw with the key slot to position it correctly.

The control actuator can now be mounted. The long wire goes through the hole in the bracket towards the shaft. Thread the large nut over the wire and screw it on the threaded sleeve that goes through the bracket. The thin wire is threaded into the rotating bushing on one leg of the bellcrank and the setscrew in the bushing is tightened lo firmly clamp the wire. The return spring should now be installed between the bracket hole near the control and the hole in the open leg of the bellcrank. The spring keeps the valve closed when the control wire is not in operation. Slip the short rubber coupling over the actuator nipple so it is joined to the vacuum line on the panel.

Replacing the Valance Panel

The valance panel should be checked to see that all the hardware is present. On the left panel the windscreen washer container should be mounted, and on the right, the two brake fluid reservoirs.

Panel replacement will generally require two people to position it so the four rear mounting bolts can be replaced. The front mounting bolts are anchored to the radiator and some adjustment may be necessary to line up the holes. If only one panel has been removed, the radiator is stable, but if both panels are off, some readjustment may be necessary.

The demister and heater control lines should now be connected to the tubes mounted on the scuttle. Next, the hoses between the engine and radiator should be connected to the heat exchangers and the jubilee clips tightened.

The top (Section 7) duct can now be installed. This is placed between the rear of the exchanger and the warm air inputs on each side of the scuttle. Remember that the right duct has the additional outlet for the rear seat. After the duct edges have been placed outside the exchanger, the round flange can be seated over the four studs and pressed against the rubber gasket around the air input. Use a thin washer under the nut and tighten down the duct. Now seal the joint at the heater with aluminum tape as was done on the front joint.

Other finishing details are beyond the scope of this article. The question of painting, undercoating, front wing mounting and radiator grille and shell replacement have been covered elsewhere.

I hope that the heater and demister systems in your car do not require the attention that mine did. But if they do, at least you know that someone else with little experience was able to bring these systems back into working condition.

Bob Mendenhall (CA)

S SERIES VACUUM VALVES

All S1 and most S2 and S3 coachbuilt cars use vacuum units to operate coolant taps in the pipes between the engine and heat exchange matrices.

The rubber diaphragms in these taps do fail in time and the result is not a simple heater problem, but a loss of some or all of the engine coolant. Spare diaphragms (part number UD 1233) are probably more important than extra fan belts or radiator hoses.

The procedure for replacing these diaphragms is outlined in the *Workshop Manual.*

Not mentioned is that "unsatisfactory operation of a vacuum unit" can include a weak return spring. The result of this condition is lack of a positive seal and heat when you do not want it. Recently, a unit with a spring pressure of 3¼ pounds was replaced with a new one (part

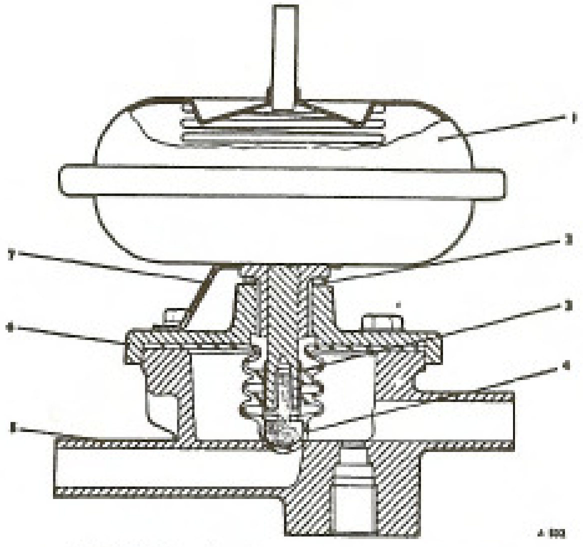

Fig. C11 Section view — vacuum operated tap

1. VACUUM UNIT
2. ADJUSTMENT WASHER
3. DISTANCE PIECE
4. DIAPHRAGM
5. BOTTOM HALF CASING
6. TOP HALF CASING
7. LOCKING PLATE

THROTTLE SUCTIONING VALVE

A part in the air-conditioning which can (and does) go bad in the Shadows is the throttle suctioning valve. The General Motors part number is 5910443 SP and a Chevrolet dealer can get it for you for about $35.00. You may then use the saving (some $295.00) to buy a part for your pre-war Rolls.

Sidney Greenspan, (Wash. D.C.)

Air Conditioning on the S.1 Bentley

by Michael Kapp

While I was in the process of searching for a LHD Bentley S.1 to purchase, I kept hearing from sellers that their air conditioning had been factory installed.

Here is a letter from the factory showing that there were only 42 LHD S.1 chassis which had complete air conditioning systems fitted by the factory.

Partial air conditioning from the factory was much more common and, according to Hermann Albers, Dave Clark, and others, consisted of the following:

1. A pressurized cooling system with shrouded radiator.
2. A heavy-duty water pump identifiable by a grease fitting on top.
3. A six belt pulley.
4. A compressor mount on the offisde of the engine in front of the carburetors.
5. Insulation between the headliner and the roof.

In addition, there also could have been:

6. A condenser installed in front of the radiator.
7. An expansion tank below and behind the front bumper.
8. An on-off switch cut out of the facia directly beneath the ignition switch.

I hope this helps clarify the concept of factory air. The car I purchased (B330LEG) had partial factory air.

Michael Kapp is a member of the Southern California Region and drives B330LEG, a 1956 S.1 saloon.

Rolls-Royce Motor Cars

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Mr Michael Kapp
President
Warner Special Products
111 North Hollywood Way
Burbank
California 91505
USA

17 March 1987

Dear Mr Kapp

Following on from my letter to you dated 17 February.

We have a total of 462 record cards for S1 Bentley LHD motor cars. Forty-two of this total are recorded as being fitted with air conditioning by the factory; in case it is of any assistance to you, I give below the chassis numbers concerned:

B 263 LCM	B 208 LFA	B 439 LFD
B 75 LEK	B 210 LFA	B 491 LFD
B 77 LEK	B 292 LFA	B 517 LFD
B 97 LEK	B 380 LFA	B 569 LFD
B 191 LEK	B 626 LFA	B 579 LFD
B 311 LEK	B 632 LFA	B 50 LGC
B 313 LEK	B 634 LFA	B 86 LGC
B 413 LEK	B 177 LFD	B 92 LGC
B 415 LEK	B 175 LFD	B 98 LGC
B 423 LEK	B 207 LFD	B 57 LGD
B 599 LEK	B 273 LFD	B 79 LGD
B 625 LEK	B 275 LFD	B 93 LGD
B 146 LFA	B 311 LFD	B 103 LGD
B 180 LFA	B 321 LFD	B 721 LGD

I hope this information will be useful to you.

Yours sincerely

Paddy

Paddy Owens
Parts Distribution Manager
Extension 3428

Wholly owned subsidiary of Vickers PLC
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AIR CONDITIONING MODIFICATIONS, S-SERIES CARS

By John McCombe, Ohio

S-I Cars

Some of the late series S-I cars were fitted with factory air conditioning. Numerous modifications to the S-I system were fitted in order to bring these units up to U.S. standards. A thermostat was added in the evaporator to shut down the compressor once the temperature reached freezing to keep the evaporator from icing up and restricting air flow. Main front-to-rear hoses were replaced, the originals had one inside the other and leaked. In some cases evaporator units were replaced completely.

Properly serviced, these units can provide adequate refrigeration. I have encountered a number of cars in which none of this work was ever done and have found that many of these systems are totally unreliable. Our solution is as follows: Replace the original Tecumseh compressor and clutch with current York model fitted with an Eaton Clutch of appropriate diameter and belt width. Buy a compressor with a 10-inch capacity for max. output. (It is possible to purchase a rebuilt Tecumseh compressor, however the old style clutch is generally unavailable. Konner's R-R has several rebuilt clutches for those who insist.) It is, of course, necessary to modify the compressor bracket to accommodate the new-style compressor.

Replace the main hoses running the length of the body if you find the old style hose (appearance of a single hose about 2" O.D. that splits out into two pieces at front and rear). You will need about 14' of 5/8" A/C hose and 12' of the 3/8" size.

Replace the old Danfoss expansion valve (by now probably bad) with a Parker #2002 universal valve or one interchangeable with the Parker model. (We just stumbled on this out of desperation. Original valves are no longer available and cost in the area of $75.) To do all this requires a number of new fittings, we use universal number 719/1144 through 1146, one each.

If there is no thermostat in the evaporator, install some universal model. It is convenient to mount the control knob up on the rear parcel shelf inside the car. This also amounts to installing a manual thermostat for temperature control of the car interior. Wire this into the hot line operating the compressor.

Have the system evacuated and recharged by a competent air-conditioning mechanic.

As a final word, to identify factory installed units in S-I cars, one can find a switch fitted with a knob similar to the heater control knobs located under the ignition key. The cover for the evaporator unit in the boot generally carries a metal tag identifying what is behind as a product of R-R. If a unit doesn't work and is not of R-R make, rely on your A/C man for advice.

S-II Cars

The first S-II cars to come to the U.S. were fitted with air conditioning integral with the heating system. None of these, to my knowledge, were left operable. One may find the evaporator units still under the RF fender as a part of the heating system, but this unit was considered under capacity for use in the U.S. and units of U.S. manufacture were subsequently fitted in the trunk. These early cars are fitted with the Tecumseh compressor, and the above instructions for replacement do apply.

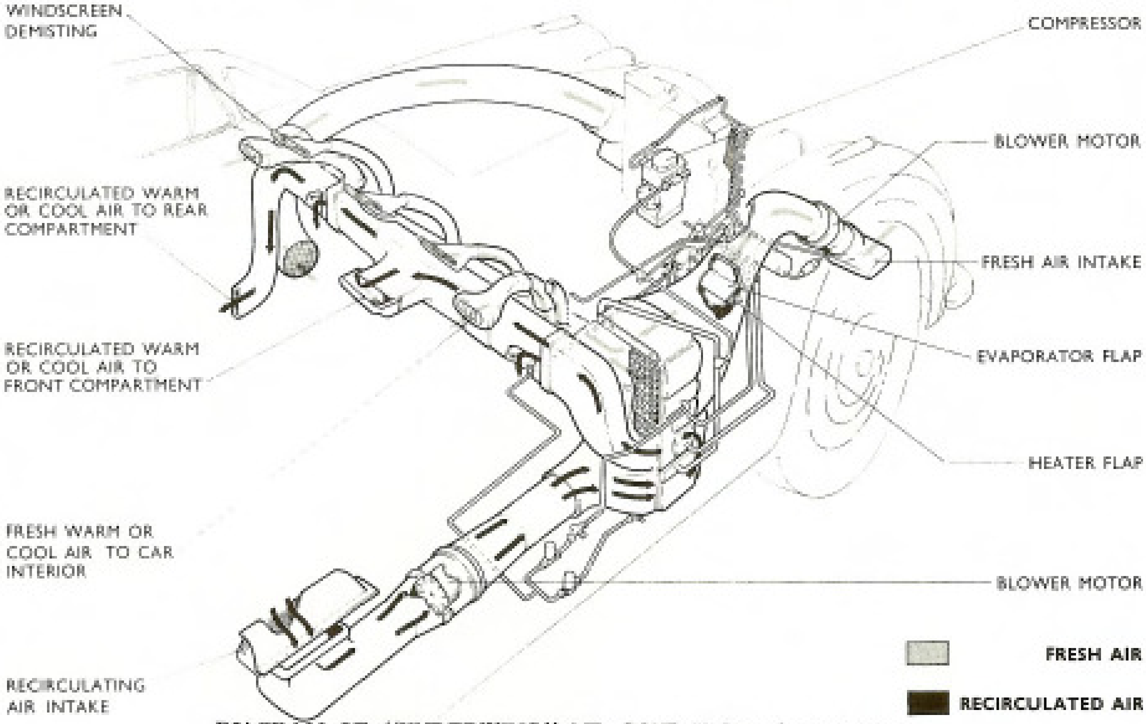


DIAGRAM OF "UNDERWING" AIR-CONDITIONING SYSTEM

1952 SD LSHD58 Park Ward d.h.c. and owners Herbert and Louise Keppler, Atlantic-Yankee Fall Foliage Meet at Avaloch, Mass., Oct. 1969.

The cars fitted with U.S. made equipment can be serviced by any competent specialist, and parts should present no great problem.

Thermostat Notes

The thermostat in the car is now designed to open at 88° F. Current thinking is that it is not necessary to fit a cooler thermostat during hot weather, that once the thermostat opens, it's open, and that during the summer the temperature is going above 88° F in any event, so what difference does it make which thermostat you carry? Of special note is that there are some owners who remove their thermostats altogether during the hot summer months. I have observed that this will keep the temperature down in some cars. Important, however, is that if the thermostat is removed, it is necessary to install a plate drilled with about a 1/8" hole in place of the thermostat bypass gasket. The thermostat works mechanically so that when it is closed the bypass is open, and when it is open the bypass is closed. To preserve proper flow when no thermostat is installed, it is necessary to fit something to block most of the bypass flow.

Editor's Note: R-R Inc. suggests the Amston Co., att. H. Meckl, 2213 Steinway St., Long Island City, N.Y., for installing or changing air-conditioning systems.

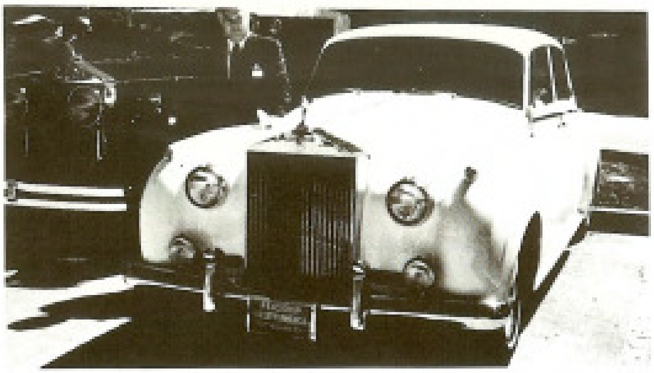
PRECAUTION IN COASTING "S" CARS

Do not coast or be towed long distances with the rear wheels on the ground in an S-type car. The rear oil pump turns causing partial application of the clutches with subsequent damage. Short distance towing or coasting should not cause a problem. John McCombe, Ohio

TRANSMISSION FLUID LOW, "S" CARS

Should an owner ever feel a vibration up through the accelerator pedal, this is a sign of low transmission fluid in the S-type cars. The next symptom is that the car will suddenly downshift to a lower gear, then the fluid level is really low. John McCombe, Ohio

NEW EXCALIBUR SERIES II AUTOMOBILES. These cars, while not R-R related, merit mention here. These classic replicas of Mercedes-Benz SS use Corvette components. A catalog, in design, color, and typography of the period, describes them. Write SS Automobiles, Inc., 4001 North Wilson Dr., Milwaukee, Wis. 53211.



1961 long-wheelbase Silver Cloud II LLCB11 saloon with owner Lionel Beakbane, Treas. of the S.E. Region at their annual meet, Tampa, Fla.

AIR-CONDITIONING CHECKS, S-Series Cars
by Adrian West, Vermont

Early S-series cars apparently came through with either Factory Air (not too satisfactory in the U.S.) or Partial Air. Partial air means the factory has done the dirty work, put in most of the plumbing and the condenser in front of the radiator.

After a few years, the fittings may work loose, then the system will not hold a charge. The places to look are all fittings in the engine compartment, the seals on the compressor motor, the fittings under the radiator, and the fittings in the trunk. These are checked by ANY competent air-conditioning man with a special torch. Obviously, all should be tight and not leaking. Another point where a Freon leak may be found is a little capped-off fitting on the right side of the car, just to the immediate rear of the radiator and against the wheel-well. This fitting is found on the Partial Air cars and does nothing with U.S. air systems.

To check if the system needs recharging, look to the sight glass. This is found in the line generally between the silica gel water trap and the receiver (RR-built receivers are rugged, made of boiler plate). Slide the protecting cover back, and when the system is running, if you can see bubbles in the glass, you need more Freon. The water trap and receiver are under the right front of the car in many Partial Air installations.

Above all, don't get talked into an expensive overhaul. The air conditioning is simple and can be repaired by any good refrigeration man. The Silver Shadows have GM compressors, so can be recharged and parts fitted in any appropriate GM repair shop.

1965 SC III LSEV277, owned by J. C. Armstrong, Texas, who drove to the '69 Vancouver Meet, winning the longest-distance trophy, post-war cars.

1959 Silver Cloud I sedan LSLG36 in the garden of its owner, Edgar F. Maurer, M.D., Calif.

G. Changstrom's '56 B. S1 Hooper saloon at So. Calif. Palm Springs Meet. From Allan Tweddle

S1 VACUUM WATER TAP LEAKS
by John S. McCombe

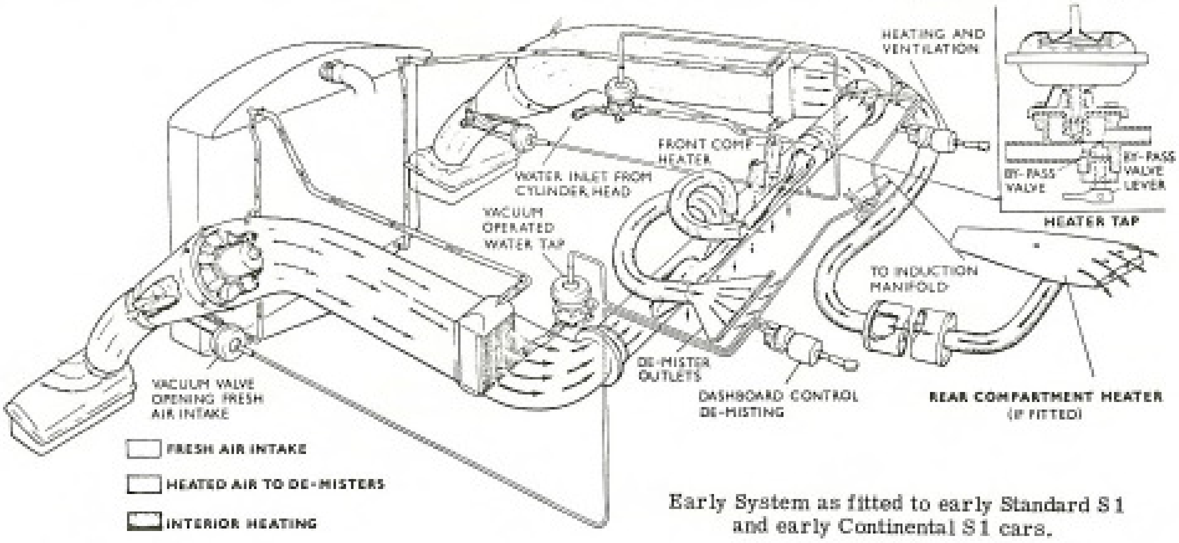
A source of water loss in S1 series cars and some later coachbuilt models is from the heater and defroster water tap units. This is due to the deterioration of a rubber diaphragm which is a part of the tapassembly. To detail the function of the system:

The control knob in the car when pulled out to the first position "opens a vacuum" to the fresh air flap vacuum unit. This overcomes a return spring tension that normally keeps the flap in the shut position. This permits outside air to enter the car. If the heating system is set for summer use, air enters the car at outside ambient temperature for ventilation. If the system is set for winter, there is always a flow of coolant through the heating matrix, and so the outside air coming into the car and passing through the matrix enters the car heated. Details for setting heater and defroster for seasonal use are found in the owner's manual.

Pulled to the second position, the knob continues to "supply vacuum" to open the fresh air flap. It additionally "supplies vacuum" to a vacuum unit which mechanically raises a water tap diaphragm nipple permitting an additional flow of water in the heating matrix if the system is set for winter and is already getting some water flow. At the summer setting, it establishes a water flow to warm the car interior.

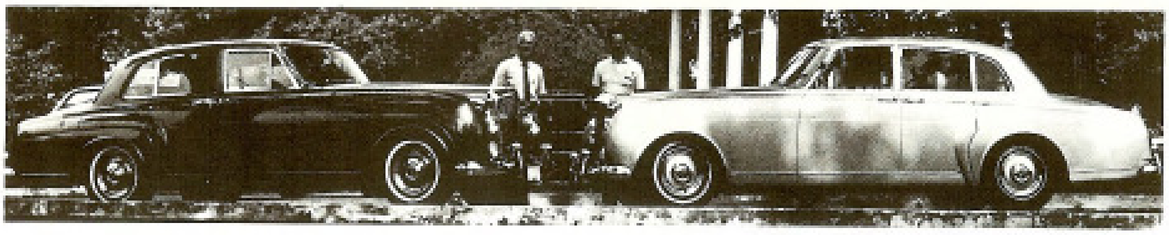
The water tap diaphragm is a source of water leak and can be replaced as a unit rather than replacing the whole tapassembly. A recommendation to all owners with this system is that this diaphragm be kept among one's spares.

To Replace: 1. Drain cooling system. 2. Disconnect associated hoses. 3. Remove unit from car (obvious). 4. Observe for reassembly position of lock plate. 5. Remove six cover screws and split assembly. 6. Unscrew diaphragm from vacuum unit shaft removing distance piece from recess in top of diaphragm. 7. Clean crud and sediment from body, etc. In the event of early cars



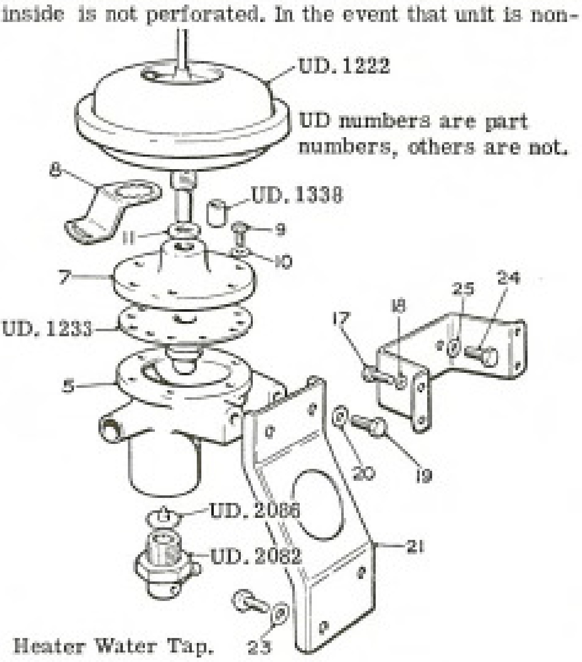
Early System as fitted to early Standard S1 and early Continental S1 cars.

The only two Bentleys of this Mulliner design in the U.S. Left, 1957 B332LEG, owned by C. S. Shoup, Tenn., and right, 1957 B214LEG owned by member Dominic Cappelli, North Carolina. Photo from the meet of the Mid-South Region, Abingdon, Virginia, May 9-10, 1970. Photo by Patterson, Abingdon. From C. S. Shoup



1958 Silver Cloud I SED179 Freestone and Webb special drophead coupe built for the 1957 Earls-court Show, owned by Monty Thomas, at Tampa.

with seasonal water flow valve on bottom of water tap (the type shown in diagram) this can be removed for cleaning, however, extreme care should be exercised here as body casting is brittle and can be easily broken. This is a good time to free this valve, which often can become frozen in position and is less accessible when mounted in the car. 8. Fit distance piece to new diaphragm and screw into shaft. 9. While unit is apart, draw vacuum on hose fitting on top of vacuum unit to assure shaft rises properly and that diaphragm sealed inside is not perforated. In the event that unit is non-



Heater Water Tap.

functional, that entire unit must be replaced, as there is no way to fit a new diaphragm here. 10. Rest nipple of newly installed diaphragm on water opening in base of tap body. It should be necessary to compress top cover about 1/10'' to close gap between it and the body. This assures proper positioning of diaphragm, and this gap can be adjusted if necessary (and it probably won't be) by fitting proper thickness adjusting washer as shown in diagram.

Note that there are separate similar systems for the heater and the defroster, employing separate air intakes and heating matrices, one coming up under each front fender.

As a final word, let's go back to the fresh air flaps, these are a source of trouble. The steel shaft that holds the flap binds in the aluminum housing through which it passes. The flap vacuum valve is located on the inside of the fender valance under the bonnet at the front of the car. This valve opens the flap through a bell-crank arrangement. A return spring closes the flap. If the flaps are not opening or possibly not closing fully, be sure that the vacuum valve is operating and that the flap spindle is free. This can usually be done in place by putting oil on the spindle under the hood and under the rubber boot on the outside of the air duct under the fender. In many cases, however, it is necessary to remove the entire unit for freeing up and lubrication. Again, CAUTION, these break, too. . .

SILVER CLOUD BRAKE FLUID LEAKS

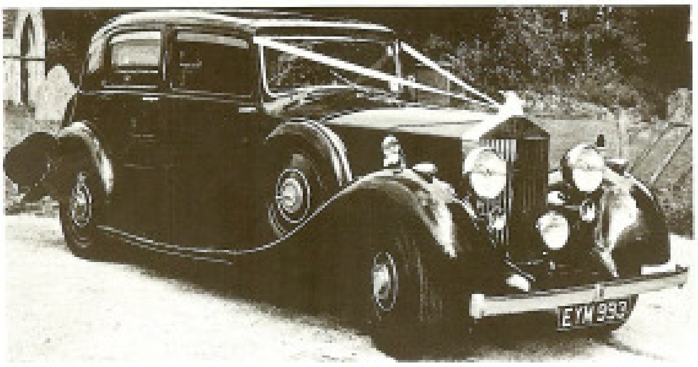
Brake fluid leaks around the bottom hose connections on the reservoirs can be cured easily with a pair of gaskets cut from an old bicycle inner-tube. I have found this beats cork or anything else on several Clouds I - III. H. C. Snyder, Neb.

S2 AND S3 AIR FILTERS, PAPER VS. MESH

Paper air filters are available from R-R for Clouds II and III, and we have found several paper types that would very nicely replace the Cloud I screen type. At least out this way, with our great plains dust, these are far more efficient. H. C. Snyder, Neb.

Comment by John S. McCombe; Yes, and all original S2 cars were fitted with the paper filter. In general, it has been recommended that these paper filters be disposed of in favor of a washable mesh type and, in general, this has been done. However, in areas of high dust problem, the paper filter is considered superior.

1938 25/30 GGR68 Hooper sedan owned by Capt. G. Wasserzieher of Texas. He bought it in 1963 while stationed in England and used it for his wedding. The picture was taken then.



SILVER CLOUD II and III "UPPER AIR" CONTROLS
by John S. McCombe

Air Control Flaps

A common complaint of drivers of S II and S III cars is failure of "upper air" system. It may not produce air temperatures called for by the switch or may not fully close in the "off" position, allowing air to leak into the car at all times.

Before going further, I have encountered owners who don't understand their heating systems, so let's begin with some instruction. In S II cars prior to chassis under number SYD138 in the D series of cars (LSYD, LSZD), there is a single water tap providing water to both the "upper" and "lower" systems. The water temperature is controlled by the "lower" system, warm in its first "on" position and hot in its second and third "on" positions. So in order to obtain the highest temperature from the "upper" system, the "lower" system must be in its second or third position. It should also be noted that when the "lower" switch is in the "off" position, only the warm water flow can be had. There is no way to beat the system as it exists.

(The drawing which we wrongly included on p. 1262 does apply to this early system. Glad we found a use for it! . . . Ed.)

As a further note, to turn off the water flow altogether in the "early" cars it is necessary to turn either the upper or lower switch to the "off" position and the other fully anticlockwise for a period of some 30 seconds, when it also can be turned "off." Simply shutting both switches "off" does not shut off the water tap. This information is worth nothing for summer use of the car, when one does not want any flow of hot water.

Cars of later chassis numbers have two heater matrices fitted, and so the above directions do not apply. These systems work independently of each other. There is a matrix for the upper system as well as one for the lower system, with water control through separate water taps. When either system is shut off the water flow is as well fully shut off, so is not necessary to go anticlockwise with either switch to be sure all water flow has ceased.

Now, for the "upper" system: Air is controlled by positioning two air flaps, one leading directly into the car from outside, the other directing air through the heater matrix (core). The mixture created by these flaps controls air temperature to the "upper" system. These flaps are located in the ducting coming from the air intake in the front of the RF fender. The motors controlling the flaps can be observed under the hood on the fender valance near the firewall.

Common Failures

Corroded Spindles: Flap spindles corrode and freeze in position. It is generally necessary to disconnect them from motor linkage, to apply a penetrating oil and to free them by applying external force with vise-grips or what have you. The outer end of the flap spindle is reached under the fender and is covered by a small rubber cap (part number UD6038, Cover, dust).

Actuator Motor Failure: No spares are available for reconditioning motors. In some cases it is possible to take motor apart, clean, and re-assemble. An enthusiast can handle this without difficulty. (Replacement part number is UD6069, Actuator.)

Misalignment of actuator motor linkage to flaps also creates a problem. If this is the case and all else is overating, the symptom is generally an air leak through the system in the "off" position, when no air should enter the car. If an "amateur" has been tinkering with the mechanism, you may look here. More on proper alignment below.

An uncommon but possible failure would be that the lower flap has parted from its spindle, creating a situation in which air constantly enters the car, generally hot air if the rest of the system (water tap) is turned on. Repair here requires an incision through the bottom of the air ducting forward of the spindle location. Sometimes the old flap can be used. Sometimes it is necessary to replace the flap (part number UD8111). The incision is best covered with a new piece, aluminum, or sometimes the old flap, cut larger than the incision, screwed down with sheet metal screws and covered with an undercoating material. This makes a neat and invisible finish.

Switch Failure, Upper System: I have encountered a failure of the switch in which a screw securing the knob shaft comes loose, permitting the shaft to pull right out. In the event of this failure, never try to turn the knob while it is part way out. The interior of this switch contains a series of discs which must be turned together, otherwise it is nearly impossible to figure out their original positions relative to one another. This switch costs over $70. In the early cars the upper blower operates in its "low" blower speed any time the system is turned on. Pulling out on the knob bypasses the blower resistance and operates the blower in its high speed. Later on "ram" air effect is used to obtain interior air flow with the switch having two "pull" positions for low and high blower speeds. Sometimes the knob shaft siezes. In some cases it is possible to remove and free it, sometimes we find that nothing will free the shaft up, which requires either a new switch or an external switch to cover this function (depending on how pure you want to be).

FRESH AIR
Upper Switch. 1st Position Anti-clockwise

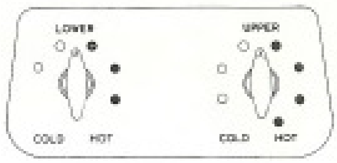
WARM AIR
Upper Switch. 1st or 2nd Position Clockwise
Lower Switch. 1st or 2nd Position Clockwise

VERY WARM
Upper Switch. 2nd or 3rd Position Clockwise
Lower Switch. 2nd or 3rd Position Clockwise

VERY HOT
Upper Switch. 4th Position Clockwise
Lower Switch. 3rd Position Clockwise

COOL
Upper Switch. 2nd Position Anti-clockwise
Lower Switch. 1st Position Anti-clockwise

COLD
Upper Switch. 3rd Position Anti-clockwise
Lower Switch. 1st Position Anti-clockwise



VERY COLD
Upper Switch. 3rd Position Anti-clockwise
Lower Switch. 2nd Position Anti-clockwise

POSITION OF SWITCHES FOR CONDITIONS OF HUMIDITY
Upper Switch. 3rd Position Anti-clockwise
Lower Switch. 2nd or 3rd Position Clockwise

Switch positions, heating and cooling. From SC II Handbook, 1st Ed.

A possible but uncommon complaint with regard to the dual water tap system is that the positioning of the water hose from the left-hand head to the water tap places the hose in such a way that power steering oil can weep down on the hose. We have had complaints of an apparent sluggishness in water flow and have found this hose to have been so affected as to swell inside, restricting the water flow and causing poor heating. This hose number is UR5567, rather an odd shape that should be replaced with original equipment.

Setting Flap Linkages

Now, for proper setting of flap linkages, critical to proper function of the system:

1. Turn ignition on, turn "upper" switch to off position and wait a full 30 seconds for all motor functions to cease.

2. Observe fresh air duct actuator motor, upper of the two on the valance. The "crank" secured to the gearshaft protruding from the motor should point roughly at the number "1" stamped on the side of the motor. The link going to the flap spindle should parallel the crank. Loosen the pinch bolt attaching to the spindle. Looking through the fender at the spindle, turn spindle fully anticlockwise. This shuts the fresh-air flap. Secure pinch bolt tightly.

3. Crank on motor controlling hot air flap should point at the number "3" stamped on motor, and the linkage going to the lower flap should parallel the crank on its way to the flap spindle. Loosen pinch bolt at flap spindle. Again, looking through the fender at the spindle, turn this spindle clockwise to its fully closed position and then secure pinch bolt.

4. If you find that the cranks on the motor gear shafts are not pointing at the numbers noted above, we assume you have made this correction.

5. Assuming that all else is in working order and that no one has switched any of the wires to the actuator motors, the flap system should be properly functioning. Going through the various positions on the switch will be observed to permit mostly outside air to enter in the 1st positions, only air through the bottom flap in the hottest position.

6. Finally, check the control of water flow. Dealing with the early S II models again, one water tap controls all water for the upper and lower systems. It will be found on the front of the right-hand fender valance, under the hood, down low. And it consists of a mechanical water tap operated by an actuator motor, the same as operates the flaps, and again through linkage. It is possible this linkage is improperly adjusted. With both the upper and lower systems fully off (see above), having turned one of the switches fully counter-clockwise, etc., remove the water tap to be sure that it is in actuality shut fully off and reconnect to the actuator in that position. Assure that the actuator is operating. Sometimes the fan belts develop enough slack so they can swing out and damage the motor unit. (It pays to keep belts properly tensioned.)

Identifying the System: "Early" or "Late"

The second water tap, one that controls the water to the "upper" system only, is located on the LH valance, opposite the one previously described. The tap on the RH valance now controls only water to the "lower" recirculating heater system. To readily identify which system one may have, the early cars have a heater inlet in the kickpad, just forward of the driver door. These cars do not have a sliding door over the cubby box in the front doors. The later cars have the sliding door and a grillwork under and on the outside of the front passenger seat.

It should be noted that these instructions apply to standard cars. Many of the coachbuilt cars have a different, vacuum operated system, and some of the late S III coachbuilt models employ variations on the electrical system. Special cases require special instructions.

Service and Parts

Available through authorized R-R dealers. The actuator motor is a Lucas produced item, their part number 78329. Larry Davidson, Konner's Rolls-Royce, Columbus, Ohio 43213, has had experience with "upper" system switches that have had the knob pulled out and can possibly bail you out. Try to find the screw and a little insulator that falls off the end of the knob shaft at the back of the switch, mail all to him for an estimate.

Leland Short's (Va) LWB Cloud, LLCC95 at Dearborn

THERMOSTATS FOR POST-WAR CARS

With the advent of the SC-III the company also introduced a 190° F thermostat, part number UE 30193. UE30193 is wax-filled and "cracks" open at the actual temperature stated on the thermostat.

The early thermostat (tall type) was gas-filled. There was some delay in the opening (over the temperature stated on the thermostat (154° F, 162° F, 172° F, 185° F) because the pressure in the cooling system retarded the action of the thermostat.

S-I cars *without factory air-conditioning* did not have a pressurized radiator unless ordered with the future intention of air being installed. S-I cars with factory air did have a pressurized cooling system in two stages. The first type has a metal cap with the relief valve built into the cap. Later cars had the relief valve under the metal cover on top of the radiator.

Rolls-Royce does in fact say that the UE 30193 190° F thermostat *can* be used in all S series cars. Here are two arguments against such use: 1. When cars get their cooling systems rusted up they tend to run hotter than when they were new. This problem we all know about. 2. Why put in a thermostat which does not open until 190° F in a non-pressurized cooling system. It does not make sense to run 22° F below boiling. For these reasons, install the earlier-type thermostats in older cars, i.e., early S-I's, Dawns, Silver Wraiths and Bentley counterparts. They are available as 162° F and 172° F.

Now the V-8 cars. The V-8 does tend to run quite warm, and some state that the installation of a lower temperature thermostat is actually a waste since the car is always running warmer than the thermostat. This is true as far as it goes, but about 50% of the V-8's do not hold pressure, and the use of a 190° F thermostat is asking for trouble. Lack of pressure generally comes from bad seal under radiator cap, bad relief valve or valve gasket, solder around relief valve housing assembly leaking, head gasket leak, hose clamp loose, leaking core and leaking heater core to mention only a few.

Use the earlier thermostat in the sixes where there is any question, and use the UE 30193 thermostat in the V-8s only when the system will hold pressure.

Hermann Albers (Indiana)

Something's wrong. from D.G.M. Scott, B.C.

MORE ON HEATING AND DEMISTING SYSTEMS IN S II/S III CARS:

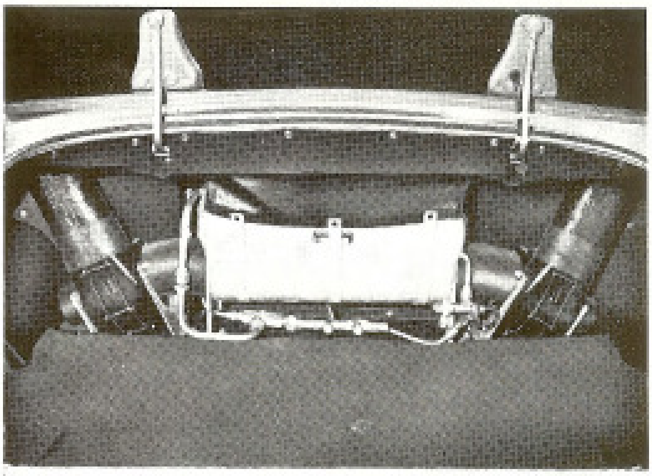
This seems to be the winter for problems, and in spite of best efforts to set up heating and demisting water tap and flap electrical actuators according to factory original specs, we have found additional problems, mainly lack of adequate heat temperature coming into the cars. With everything else in proper order we must suspect a water flow restriction of one kind or another. Here are some of the places to look: *Hoses*—old hoses can appear to be healthy but can in fact deteriorate on their interiors. *Heater cores*—we have found restriction here. Due the extreme difficulty in removing heater cores (start by removing wing and door) is best to have these cleaned in place by competant radiator shops. We circulated via a small pump a cleaning solution through plugged cores and emptied out a lot of accumulation with excellent result. Finally, we found one S-II with the *head gaskets* on backwards, blocking four water passages into each head. Detected by gasket protruding into pushrod passage from the rear on the RH of the engine and to the front on the LH of the engine. It is possible to fit gaskets to cover water passages, so caution must be exercised here.

Stop-leak Anti-Freeze: R-R recommends not to mix with other types but to drain and flush cooling system before a change to this material.

John McCombe, O.

Cool Comfort

Rolls-Royce High-capacity Car Refrigeration



Compact assembly in the boot comprises: evaporator, expansion valve and the two electric blower units. The covering panel has been removed

WHEN you are living in a climate of comfortable temperature and humidity, it is almost impossible realistically to imagine the miseries of excessive heat—or cold. The fact that you have spent time in the Tropics or Polar regions brings little more reality to the recollections of temperature extremes.

Thus to observers in Crewe, Cheshire, on a cool, wet morning, blazing sun, red baked sand and temperatures of 110 deg F—even 120, as endured in parts of Texas—seemed as remote as the Hollywood lenses through which most of us have alone seen them. Yet Texas is aware of Rolls-Royce, if not of Crewe, where the cars are made, and Texans, together with the inhabitants of other hot, prosperous areas of the world now order their cars with full air conditioning equipment installed; that is, with refrigeration as well as heat and fresh air.

Eighteen months ago Rolls-Royce and Bentley announced the availability of refrigeration for their export cars; in the interim, continued study has been made of the requirements. Existing American systems, except for certain examples made in Texas, were found to be inadequate in capacity. Either they produced insufficient temperature drop, or took much too long about it—mainly both.

Sensing that most motorists are more interested in results than technicalities and theory, Rolls-Royce describe their new system which has an airflow capacity of 400 cu ft min, as being equivalent in cooling to about 50 ordinary domestic-type refrigerators. Everyone is familiar with the size and weight of the "works" in a home refrigerator.

To achieve 50 times the cooling in a small space, with a reasonable weight and acceptable power demands, has been a major and expensive task. Two to three tons of ice per day would be needed to provide a car with the same amount of internal cooling. This refrigeration system has the added advantage of removing excess moisture, and so avoiding misting up.

Quite apart from the need to cater for extreme heat, the time has come when car windows need to be kept shut at high cruising speeds if draughts, buffeting, noise and dust are to be excluded. Full air conditioning is then necessary to keep the car interior fresh and comfortable.

The extreme conditions to be catered for are found when a car has been parked in the sun through midday—at an airport perhaps—and the owner wishes to drive off at once. Interior temperatures of 127 deg F were recorded during tests of such occasions by Rolls-Royce engineers. A worthwhile cooling blast is required at once, and a tolerable interior temperature within a minute or two. The comfortable steady temperature in hot sunshine is judged to be 20 to 30 deg F below the outside shade temperature.

In parts of America, it seems, the law permits a car to be left parked with the engine running. To drive the refrigeration unit, Rolls-Royce and Bentley cars are provided with a fast idling speed of 900-1,000 r.p.m. The cars can be left safely without fear of overheating for a shopping session or business call, and the car interior is then cool on the owner's return.

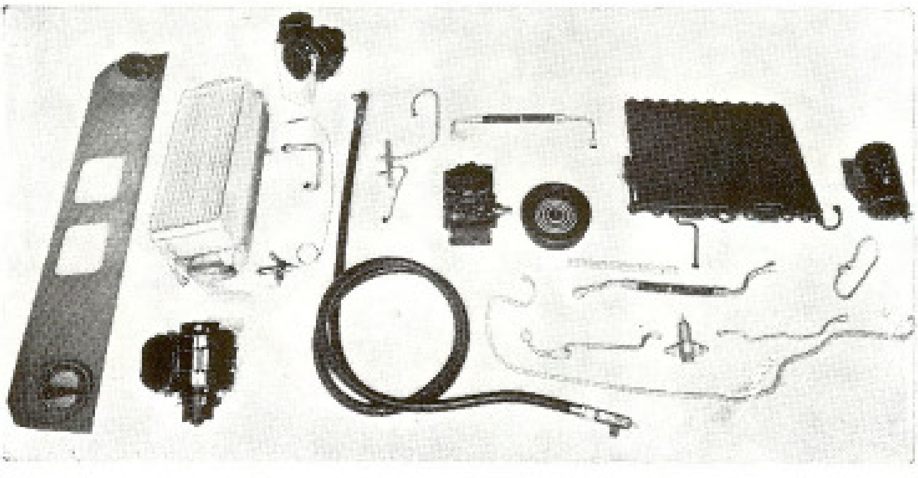
Installation and Units

The paragraphs which follow will best be read in conjunction with the perspective diagram. The refrigeration system is known as the vapour compression cycle, and uses Freon as the gaseous (and liquid) refrigerant.

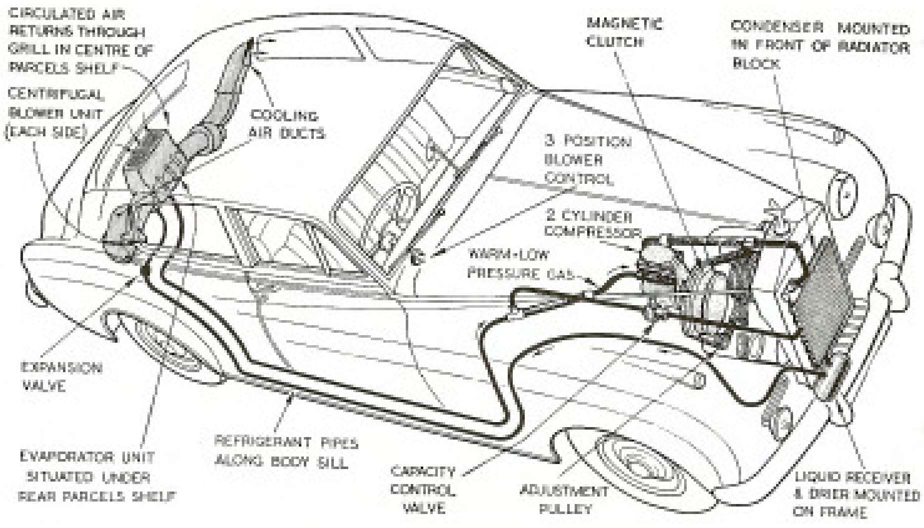
The two-cylinder compressor, driven through a magnetic clutch by belts from a bank of pulleys behind the fan, pumps the Freon gas to a high pressure, raising its temperature. The gas under pressure passes into the condenser, mounted ahead of the radiator block, which brings the temperature down to somewhere near that of the outside air, at the same time changing the refrigerant gas into liquid form, after which it collects in a reservoir beneath the condenser. This is, of course, the stage when the heat from the interior of the car is finally dispelled to atmosphere.

Next the cool, compressed liquid is led back to an expansion valve mounted beneath the evaporator in the boot of the car. As the liquid passes through the expansion valve its pressure is reduced and, consequently, its temperature also. As, cold, it flows through the evaporator tubes it again picks up heat from the air drawn from the car interior and this changes it back into its gaseous form. From here it is pumped back to the compressor and the cycle starts over again. The high pressure side of the system operates at 150-130 lb sq in and the low pressure at about a quarter that figure.

Two Smiths electric centrifugal blowers draw the warm air through a central grille, behind the back seat, directly into the evaporator and expel it again through two circular jets at the ex-



Units of the system, left to right, include: rear shelf with ports, evaporator, electric blowers, piping, valves, pump, clutch and condenser



Layout of the latest refrigeration system. The outlets of the cooling ducts have been modified as seen in the photograph at the foot of the facing page

treme edges of the shelf behind the back seat. In its passage through the evaporator the air loses heat to the refrigerant which, as explained, is changed back into the gaseous form.

High and low pressure pipes between the front and rear group of units in the system are of particularly interesting construction. They are, in fact, concentric, the high-pressure copper tube being inside and the Neoprene-lined, natural rubber pipe surrounding it. Thus the pipe takes the form of a heat exchanger. It has been specially developed by Dunlop. The evaporator is compact, and beautifully made in aluminium with brazed joints by Marston Excelsior, Ltd.

The big cooling capacity needed to reduce temperature in a hot car quickly is excessive for normal demands, and so part of the capacity may be dispensed with in cruising conditions. Therefore in addition to the driver's control on the instrument panel, which simply gives three fan speeds, there is an automatic device. This takes the form of a capacity control valve which allows some of the partially condensed gas taken from a point half-way down the condenser, to be fed back into the return pipeline just before the entry to the compressor. In this way the compressor draws part of its charge from the evaporator and part from the condenser via the capacity control valve. The control valve opens when the suction side of the compressor reaches a predetermined minimum depression; thus the evaporator is never allowed to become too cool and it also looks after the dispelling of ice, should it form in the evaporator fins.

To assist the refrigerator in its work, the underneath of the car is more extensively heat insulated from the exhaust system than on standard models, specially tinted glass is fitted in the windows, and the car roof is insulated to reduce absorption of heat from the sun. A sun vizor can also be supplied.

Because the condenser has to be mounted in front of the normal radiator block, the car's cooling system has to be modified. These changes take the form of pressurizing the system, and fitting a cowl round the fan.

Owners will naturally ask about the effect of the refrigerant in the event of an accident or fire. Freon is not toxic and is non-inflammable. Any liquid heated in a confined space can expand and blow up, and to take care of this possibility a plug, inserted in the system, fuses at 175 deg F and squirts the liquid along the underneath of the car to assist in damping down any fire, by releasing a cloud of non-inflammable gas.

Very great care indeed is taken in assembling and testing the system. The refrigerant has a remarkable propensity for finding leak points, particularly in welds where normal compression testing procedures have failed to reveal a hole. In addition, all moisture must be excluded from the system, because water might form ice and choke the expansion valve and, by reacting with Freon, could form hydrochloric acid, which would result in severe corrosion.

DATA

Power absorption: 3 to 4 B.H.P. Weight of complete equipment: 150 lb. Air flow capacity: 400 cu ft per min. Refrigerant: Dichlorodifluoromethane (Freon). Engine idling speed: 900 to 1,000 r.p.m. Compressor: 2-cylinder piston type, driven by magnetic clutch. Cost: R-R Silver Cloud and S Series Bentley £385 plus £192 10s P.T., total £577 10s, special coachbuilt bodies £550 plus £275 P.T., total £825.

Air ducting for the standard Silver Cloud and Bentley S Series cars is relatively simple, but on the larger models and the coachbuilt cars a much more elaborate system is required to take the cooling air to the front of the car. This accounts for the considerable difference in price for this installation.

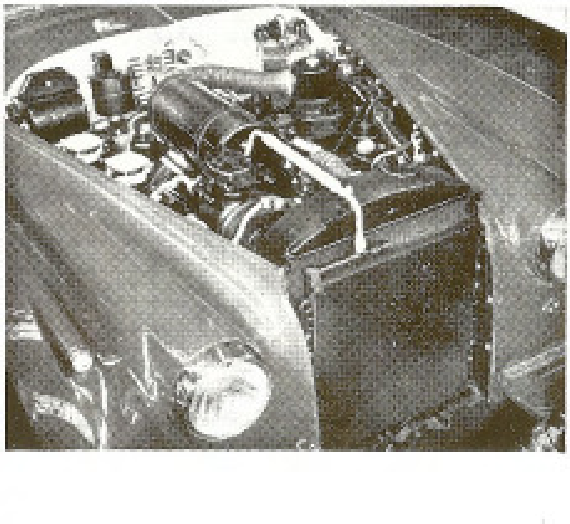
This Rolls-Royce refrigeration unit is now available on the home market as well as overseas and, from our own experience on the road and during simulated tropical conditions indoors, we can confirm that it appears to be most effective. There is quite considerable whistle and whirr when the fans are working at maximum speed, but this is reduced progressively at the lower speed settings.

The jet of cold air at each side is quite powerful. The occupants of the front seats scarcely hear the fans and cannot feel the jets; back seat occupants can detect the air jets on neck and hair if they lean back in a corner of the car.

It was surprising how little change occurred in the inside temperature of the car when the doors were opened briefly in the experimental hot room to allow people to get in and out. Yet the temperature difference inside the car and out was more than 30 deg F. Naturally the unit in the boot between the wheel arches takes up a proportion of the luggage space, but there is still a fair amount of accommodation by European standards.

Rolls-Royce development of car refrigeration will continue with the aims of improving efficiency, reducing the cost and size of the units and eventually, perhaps, dispersing the components into unused corners of the car—for example in the wings behind the front wheels—so that no boot space is lost.

The compressor-pump is belt driven and has a magnetic clutch. Incidentally, note the reservoirs for the car's two independent hydraulic systems



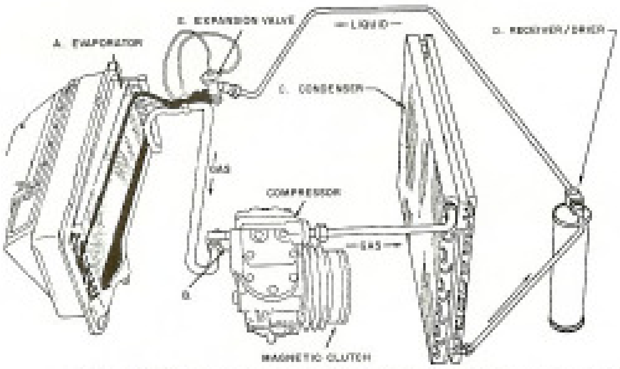


Figure I Basic components and flows in an automotive air-conditioning system.

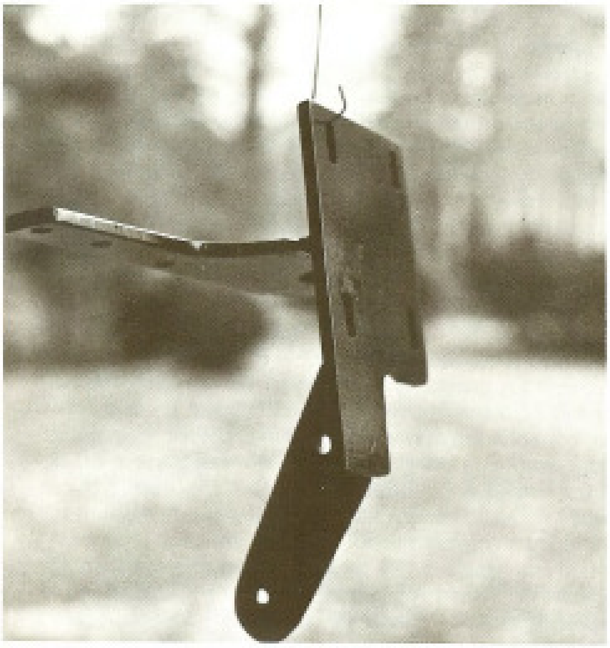
AIR-CONDITIONING AN S1 OR SILVER CLOUD I

John W. de Campi

Want to air-condition your S1 or Silver Cloud I? It's really not all that difficult but it is time consuming if you do the job right. I reckon it cost me $448.04 to cool BC67AF with an attractive and high capacity unit with trunk-mounted evaporator. Had I taken it to a competent installer whom I could trust to do the job right he would have charged well over $1000. and he would have earned every penny—remember, I said it was time consuming. Instead, it was my spare-time project during the past winter.

Before getting into the details of unit selection and installation, it seems worthwhile to discuss the principles of automotive air-conditioning (see Fig. I). In its simplest form, an auto air-conditioner consists of six major components: compressor, clutch, condenser, receiver-drier, expansion valve, and evaporator, plus the necessary hoses to conduct refrigerant. When the thermostat senses that the car's interior is too warm, it energizes the clutch circuit; the clutch engages; and the compressor turns, thereby compressing the refrigerant gas (DuPont "Freon" 12). The hot gas from the compressor enters the condenser which is in front of the radiator. Here the ambient air-flow carries off some of the heat, and the

Figure IV The completed compressor bracket.



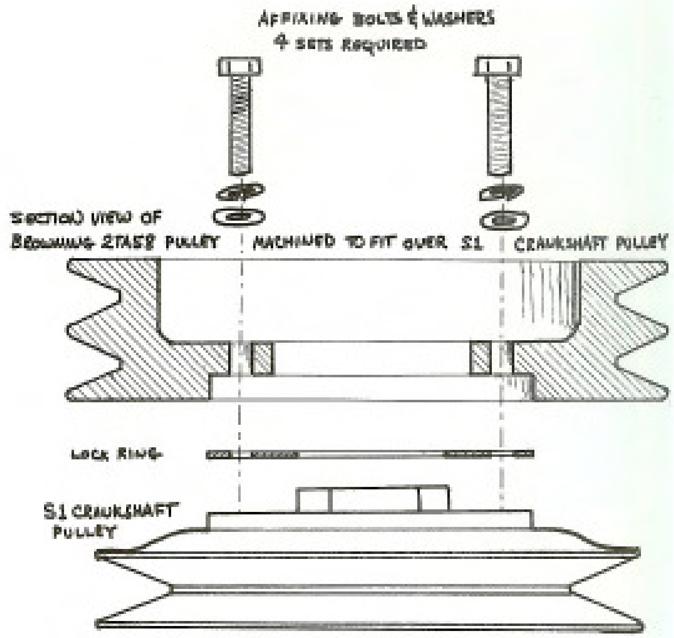
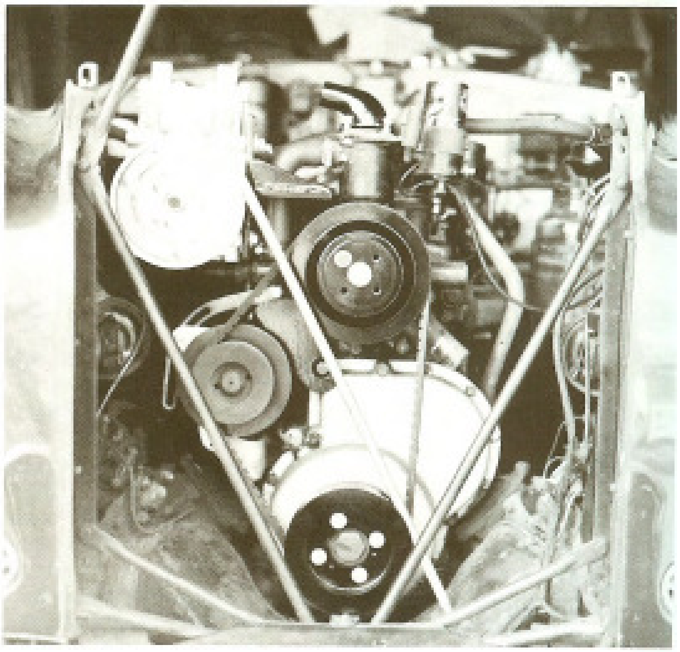


FIGURE II Scheme for fitting compressor drive pulley to existing S1 crankshaft pulley

pressurized gas condenses into a liquid. The liquid flows to the receiver-drier which performs two basic functions: it acts as a reservoir for the liquid and removes any traces of moisture (which would render the system inoperative by freezing in the expansion valve). The receiver-drier usually has a sight-glass on top; and when bubbles show in the liquid refrigerant, the system is under-charged and needs more Freon 12. The liquid Freon now flows to the expansion valve at the inlet to the evaporator. The expansion valve senses the tempera- 1471

Figure V Before cutting the holes (7-10 on Fig III) in the bracket to mount the compressor, the pulleys must be aligned so the belts will run true. Place the compressor in approximately the correct position and have someone hold it (or wedge it in place with scrap lumber) while you carefully align the pulleys with a ½" round bar. When the location is exactly right, mark the location of the compressor on the bracket. Then you can locate and cut the elongated holes.



ture on the surface of the evaporator and maintains it at just above freezing. Should the surface temperature fall below freezing, ice would form on the surface of the evaporator and block the air-flow. As the liquid Freon passes through the expansion valve into the evaporator, the pressure drops and the liquid boils. When any liquid boils, it absorbs heat in the process. That heat comes from the air surrounding the evaporator and yields the cooling effect we want. Finally, the refrigerant, which is now a gas again, flows back to the compressor for the cycle to repeat itself.

If you decide to cool your pride-and-joy the first task is to select a unit from the many that are on the market. You have two basic choices: a trunk-mounted evaporator or an under-dash unit. The under-dash unit has the advantages of not consuming any trunk space and of blowing the cool air from the front rather than the back. It has the disadvantages of looking out of place in a R-R product, taking up leg room, and getting in the way of your chassis lubrication pedal. A trunk-mounted unit will normally provide more cooling capacity because it will generally have a much larger evaporator. Almost any unit will keep a car cool: the difference is how quickly the car will cool down after sitting in the hot sun for an hour or so. All things considered, I would certainly recommend a trunk unit, but you will find the following generally applicable to either.

The unit I chose was the Frigiquip "Hallmark" trunk unit and the cost was $255. plus $20. freight. It has been satisfactory in all respects and if you decide to purchase one you can write: Mr. M. Katen, Sales Manager, Frigiquip Corp., 3805 N. W. 36th, Box 12279, Oklahoma City, Okla. 73112 and ask for the same components supplied to me. An alternative trunk unit would be the ARA "President" (ARA Manufacturing Co., 602 Fountain Parkway, Box 870, Grand Prairie, Tex. 75050). If you have a Frigiquip or ARA dealer nearby, you should probably deal with him. Should you choose some other unit or buy components and build-up your own unit, there are several things to keep in mind: Select a condenser that is no larger than 19" high (or it won't fit). Use a York compressor because it is aluminum and about 10 pounds lighter that the Tecumseh, Frigidaire, or Chrysler compressor. Lightness is important because sagging front springs are a chronic problem on air-conditioned S1 cars. Avoid clutches that are over 6 inches in diameter—there is barely room for a 6 inch. Finally, select a unit where the receiver-drier is mounted separately from the condenser, if it is attached to the condenser, you cannot see the sight glass when the grill shell is back in place.

Now we come to the problem of installing the unit on the car. The following describes a scheme that worked well on my S1 Continental, and it should work equally well on any S1 or Silver Cloud I (Note: cars with power steering will require some modifications to the system described here). It will *not* work on a Silver Wraith, Silver Dawn, R type or Mark VI, although many of the concepts may be applicable. There are three basic engineering problems to be overcome: devising a pulley system to drive the compressor, mounting the compressor, and getting the fan to clear the compressor.

Rolls-Royce solved the pulley problem in a most complex way—they installed a heavy-duty water pump fitted with a multi-sheave pulley. Then they drove the pump pulley with several belts from the crankshaft pulley and drove the compressor with several more belts using the pump pulley as an idler. I am sure that system worked well enough, but it seems inordinately complicated and costly. The cost to convert the pump and pulleys would be over $400. Don't even consider trying this system without the heavy-duty pump, because you will destroy a regular pump in short order with the added load. I decided on a simpler system whereby you attach a two sheave pulley to the existing crankshaft pulley and drive the compressor directly from the new pulley (see Fig. II). Start by removing the grill and radiator and buying a Browning 2TA58 pulley (Browning Corp., Maysville, Ky.; your local Browning dealer will be listed in the yellow pages under "Power Transmission Equipment"). Measure the protruding center of your existing crankshaft pulley with a micrometer or dial caliper—it will measure about 3¼". Alternatively, you can remove the crank pulley and take it to your machinist who can measure it for you. You will find a lock ring bolted to the crank pulley and you may have to file it down so it is the same size or slightly smaller than the raised hub of the pulley. Machine out a cavity, from one side of the new pulley, ¼" deep and just large enough around to be a snug fit on the hub of the crank pulley. Then from the other side of the pulley remove as much metal as possible so as to lighten the weight, leaving about ⅜" thickness in the center (fig. II shows a cross-section view of the finished pulley). Drill two ¼" holes in the new pulley to align with the threaded holes in the crank pulley (used to hold the lock ring). Since two bolts would not be enough to hold the new pulley, drill and tap (¼ NF) two more holes in the crank pulley and corresponding ¼" holes in the new pulley. Now you can bolt the new pulley in place with four ¼" NF x 1" bolts. (Note: throughout this discussion, I am leaving out obvious tasks like painting the pulley.)

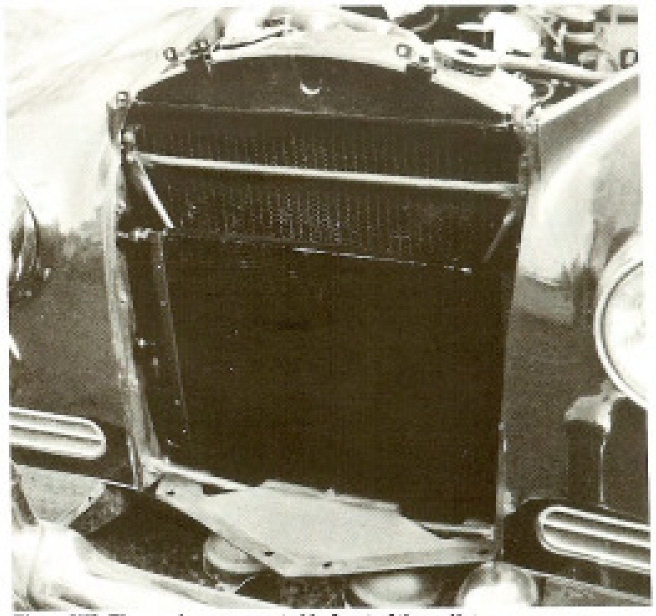


Figure VII The condenser mounted in front of the radiator.

Now that the pulley is finished, you can turn your attention to the compressor bracket. Figure III is a drawing of the templates used to make the bracket. Take these templates to a good welder who can make a bracket for you. It is essential to align the compressor clutch pulley with the new crankshaft pulley before drilling the compressor mounting holes in the bracket. Use a ½" round bar (see Fig. V) to align the pulleys. When the bracket is finished you can mount the compressor and fit a pair of matched (*must* be matched) A53 belts (Gates