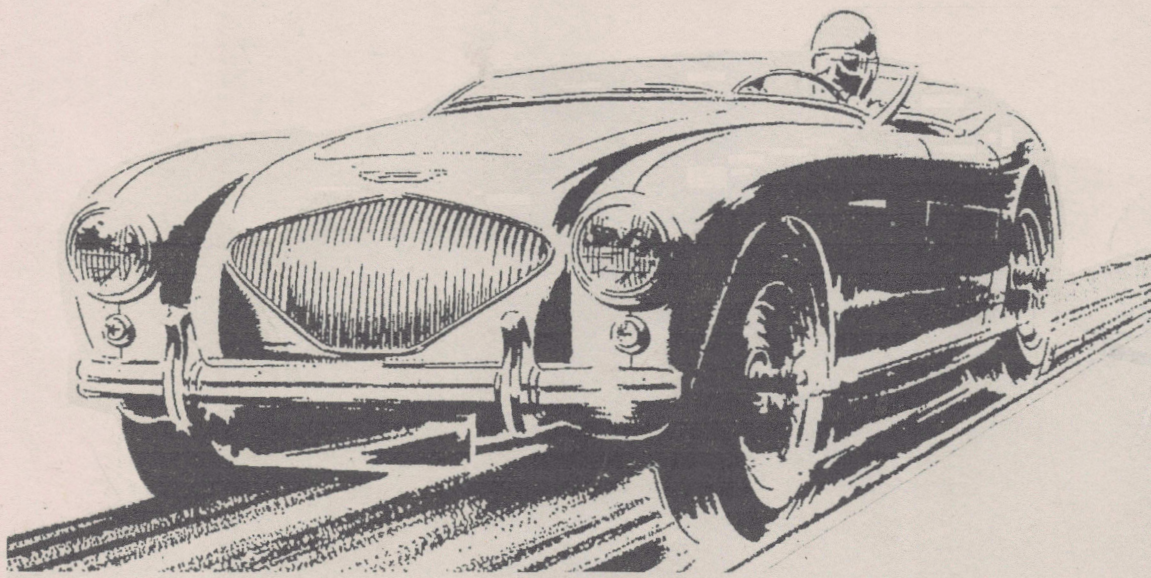


# *Austin Healey*

## RESTORATION

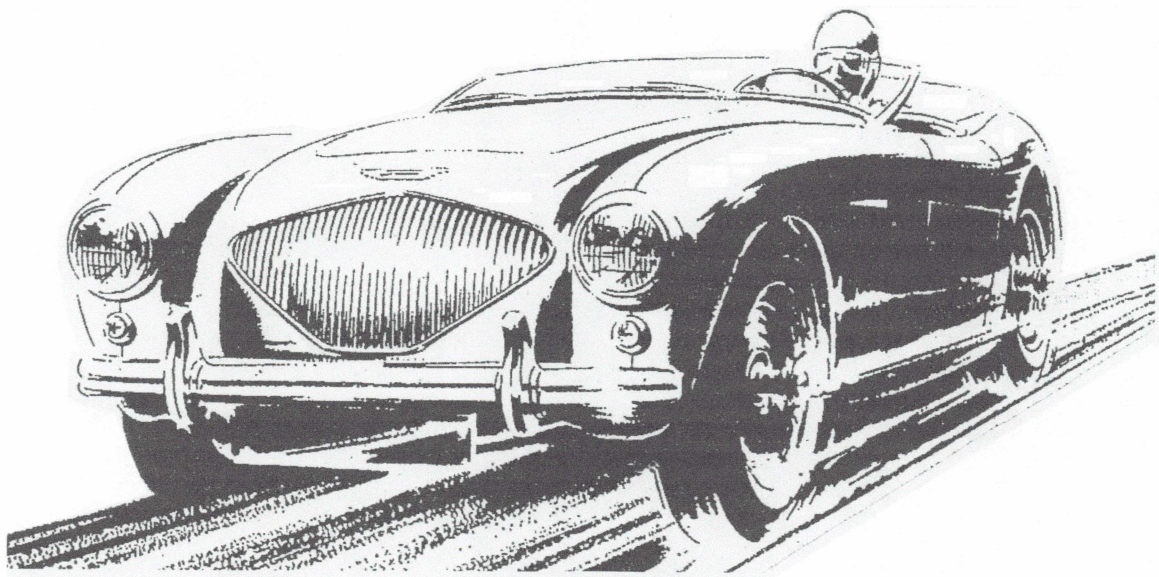


by Richard Chrysler  
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*Austin Healey*

RESTORATION



# ***RESTORATION***

## **FOREWORD**

All our cars after years of use, abuse and exposure to the elements, gradually deteriorate to a point where if something is not done, they become unsightly and indeed dangerous.

All too often, a car is termed "RESTORED" while it actually has only been prettied up and painted. It may look good but unfortunately is still a tired old car under the surface.

To me, restoration means to systematically dismantle, inspect each and every part and rebuild or replace anything which is not in "as new" condition.

This is going to mean in effect that we must build a "new" car based on a number of parts or components that are forty or so years old but are still useable. I will base the text on the rebuild of an Austin Healey Hundred, though most of the process will apply to almost any classic sports car.

## **USE A SYSTEM**

A car is made up of virtually thousands of parts, each with a specific place to fit and a job to do. If we were to dive into this project headlong with no particular plan, we would soon be surrounded with a horrible pile of bits and pieces and not much of an idea as to their relation with each other.

The use of a camera, digital or conventional will prove to be a most effective and useful tool to record everything that is removed from the car. Take lots of pictures, from every conceivable angle. Making as many notes as possible will also be of great benefit. Don't try to fool yourself either - you can't remember how they go together months or sometimes years later! So here's what we're going to do.

## **DISMANTLING**

To briefly outline, we are going to dismantle the car in stages:

For safety's sake remove and store the battery(ies) in a cool dry place and keep them charged on a regular basis, ensuring they are properly topped up, etc.

Remove fuel from tank and dispose of it in a safe manner, then remove the tank from the car. This way if there is any chance of sparks from torches getting near the tank area, we are safe.

Remove the coolant and drain the cylinder block as well.

The softwears such as top, tonneau and interior parts, seats, carpets, trim panels, etc. should be removed to a cool dry place where there is no chance of mildew, mice, etc. damaging anything for the duration of the process.

Now is the time to get some zip lock freezer bags and collect each type of trim screw, washers, bolts, studs, etc. and store them each in a different bag - whether they are in good condition or not. Take a count of each item and note this on a small card and seal this card in the bag with the parts. Later you'll know what you need to renew.

Continue systematically dismantling the car and keep all small parts and hardware in those bags. Assemblies and sub-assemblies such as rear axle assy. or front suspension units should be removed in as complete a unit as possible. In this way, each unit can be dealt with individually at a later date, each being its own restoration project.

## **EVALUATION**

When the entire car is dismantled into these component parts and sub-assemblies, a careful inspection of the basic chassis assembly should take place. Check for evidence of rust, damage and stress cracks (especially around engine mounts and suspension mounting areas).

Now decide how you will go about stripping the old paint, under-coating and rust off the chassis. Two common methods are dip stripping; the best but the most expensive, and sand blasting; cheaper but leaves a rough surface and doesn't get into box sections.

At this time, it might be good to also strip the outer body panels and get an idea of what you really have under the layers of paint and filler. You might decide to start making a shopping list of panels if yours are very poor. The new reproduction panels are good and are reasonably priced, especially if you get them in straight from England. A typical price for a fender is about £400 or about \$1000.00 - certainly worth considering, but do keep in mind that a replacement panel will still need to be reworked somewhat to get a good fit, and this will add to the total price of the panel.

Personally it has been my experience that it's preferable to work with the cars original panels if at all possible as long as the repairs needed won't outweigh the cost of replacing them with new.

It might be worth mentioning now that you could watch for evidence of the original colour(s) of the car. It is well worth finishing the car in the correct colour scheme nowadays as this tends to greatly affect the market value of the finished product - something worth considering. This holds true throughout the car, be it paint or trim and upholstery materials.

Ensure the chassis structure is properly supported during the entire restoration project. This holds especially true for one that has to have structural parts replaced due to corrosion. On a Healey, the stripped chassis is best supported somewhere about 8" back from the gearbox bell housing opening on the two main frame rails. Then put additional stands fore and aft, just so the assembly won't fall but can actually rock back and forth on the centre supports. This will in effect let the chassis droop to front and back in order to reverse its tendency to fold up in the middle after 40 years. If your cars doors were a tight fit at the back edge to the door post/rear fender area, this will cure the problem. You'll likely find rot in the inner sills and or floors, which has allowed this sag to develop. Don't worry, the main frame may be quite all right and this sag will still



develop. You may want to temporarily bolt the body panels back on to verify that the chassis is properly supported and that panel-to-door gaps are even and true.

## THE CHASSIS

Any panels on the inner structure that need repair or replacement should be worked on at this time. Spot welding or MIG welding is the best here as there is minimal panel distortion, being very little heat build-up. Outriggers, floors, door posts and sills are usual replacement items.

Always work on one side of the car at a time, cutting out the rot and distortion, and carefully fitting up the new, tacking temporarily, checking and double-checking before final welding. In this manner, you can check dimensions, fit and details on the still intact opposite side, and constantly compare to the side being worked on.

When all necessary chassis panels have been fitted and welded in, the entire chassis assembly should be sandblasted or dipped, or thoroughly cleaned in some manner. Then this entire assembly should be vinyl washed and primed with epoxy primer. If you are sure that all repair work has been carried out and all the exterior body panels will indeed fit, the assembly can now be painted in its final colour.

A word about paint colours is needed here. As mentioned before, the chassis assembly must be painted in the same colour as the exterior panels so here is where you must decide what colour will be used. In order to get a good match with the exterior panels that won't be painted for some time yet, I work with my painter to determine the paint formula we will be using throughout the process. Always work with the same painter from beginning to end so continuity of colour will be assured. Spraying the chassis is highly recommended and of course is a must if you are dealing with a metallic finish.

Now, at this stage we should be sitting with a beautiful painted bare chassis assembly propped up on stands, with our major component assemblies still sitting "GRUNGY" and untouched across the shop, with rows of little packages of **fasteners and hardware** counted out and labelled in little bags. Take all these bags of hardware and make a list showing numbers, sizes, names - final use, etc. and then take all the good fasteners, the clean, undamaged ones and put them in one container. String the nuts, bolts, washers, clips, brackets, etc. on steel wire looped together and take all this to a good cadmium plater - look in your yellow pages for this. He will take all this hardware, pickle it to get it clean, and plate it with its original finish - zinc. You'll be amazed at how good everything will look - just like new.

## MAJOR COMPONENTS

The **rear axle assembly** should be stripped out, cleaned, painted gloss black and all seals, gaskets and if necessary, bearings should be renewed. Rear springs, mounts, bushings, interleaves, and anything else that might possibly wear or deteriorate over the years should be renewed. The brake lines and cylinders, linings, drums, hubs, return springs, bleed screws and hand brake linkages should all be reconditioned or replaced as necessary. Now with all this done and reassembled, wrap the whole thing in cloths or

blankets and with a helper fit the assembly back into position in the chassis. Be sure to leave the bump stop boxes off the chassis to allow adequate clearance and don't scratch that paint now! A little note here about those rear leaf springs; unless you have a spring shop with all the original specs - don't let them re-arch or recondition your springs or you'll probably get them back too stiff and the car will ride like a Mack Truck. If your springs are bad, new ones are available from the major parts supply houses for a reasonable price, with the correct setting and qualities.

The **front suspension units** can be tackled next. First, I usually strip the springs, spring pans and lower arms. Prime and paint them a gloss black and install new rubber bushings on the arms to frame links. The fastening links and nuts are zinc finished. Next take the stripped down swivel axle and the new king pins and bushings to an automotive machine shop. Have them check the stub axle for cracks, especially at the base of the stub. If cracks are detected they must be renewed. If everything is all right have them press out the old swivel bushings, press in the new ones, and then line ream them for an exact fit to the king pins. This operation shouldn't cost you more than \$80.00 or so. Now you can assemble them to the suspension arms and shock absorber arms. This procedure is adequately covered in the workshop manuals.

Now the **coil spring** must be fitted to this assembly. Get a couple of 3/8" diameter bolts about 8" long, threaded all the way up. Install these into two diagonally opposite spring pan/arm holes and run nuts up their lengths to gradually and evenly bring the spring pan up, compressing the spring till the pan is brought home tight against the lower arms. Now install the two diagonally opposite original bolts and tighten them up. Lastly remove the two long slave bolts and finally replace them with the remaining two original bolts and you're done!

Once you're onto this procedure, you can assemble an entire suspension side in about 40 minutes, and somebody else looking on will call you a PRO!

Next, the **steering components** should be carefully inspected for wear. Thoroughly cleaned, steering arms should have all new grease fittings and rubber boots installed. The steering and idler boxes should have new oil and dust seals installed and if there is any wear apparent, the bushings should be renewed. Regrease all steering arms and install components on car after painting all parts gloss black. Again, installation is quite straightforward and is fully described in the workshop manual. Carefully adjust the steering box with the setscrew and locknut so that there is 1" to 1 1/4" of free play at the outside diameter of the steering wheel before the steering components start to move. This will allow just enough slack for easy steering without going too loose.

The **front and rear splined hub assemblies** should be cleaned down and carefully checked for wear on the splines. Ideally the crests of the splines should have a smooth roundness. If they are worn sharp like a thread or show any other damage, they must be replaced. In practice it is found that the rear right spline will have the worst wear of all, so check this carefully.

Thoroughly wash out the **wheel bearings** with a suitable solvent and then check them for wear by spinning in your fingers. Feel and listen for roughness and check the rollers for discolouration or blemishes. If any of the above is apparent, then renew them. Replace the hub oil seals as well. Clean the entire hub assembly and parts. Keep track



of the hub spacer shims and when re-assembling, use clean, new wheel bearing grease. Prepack the inner and outer bearings with grease before assembly. This is done by putting about a 1" dia. blob of grease in the palm of your clean hand. Now push the grease into the bearing with rather a scooping motion until it is all gone from your hand. Rotate the bearing a couple of times with your fingers to evenly distribute the grease around the rollers. Then install carefully as per the manual's instructions.

The **brake pipes** can be installed now. Carefully examine the old ones as to how they fit on the car and note where all mounting clips are situated. These old pipes will be used as patterns for forming new ones. Do not stint on any part of the braking system as it is only a single type master cylinder system and your life depends on it!

If you wish you can take careful accurate measurements to determine overall lengths of each pipe. Take this information along with a note of what type of end fittings are required to a good automotive brake shop and they will cut and double flare the ends, supplying new fittings as well. Average price for this work is usually about \$75.00 for the whole set. Don't forget your clutch line as well. Bring your pipes back home and carefully form them exactly like the old ones and fit them to the car with either the original snap in spring clips, or new ones are readily available.

Another method, which works well, is to purchase one of the new "handy" brake pipe kits from England. These are made of a copper alloy but can also be purchased chrome plated. The kits can be installed very easily and come with new fittings as required. Cost of these kits is \$55.00 to \$70.00 range. You will however note that they are not steel - they won't rust but they won't win you a Concours award either - the choice is yours.

Moving along, replace all the **brake flexible hoses**, even if they look okay - again it's not worth the risk of saving a buck here. The **master cylinder** can be rebuilt if the bore is not scored or pitted. Once dismantled, it will need a thorough cleaning. If there is evidence of bore corrosion or damage, the cylinder can be sent out for resleeving, or you can buy new. If rebuilding the cylinder follow the kits instructions carefully. The only thing I might add here is that it is a good idea to smear rubber brake grease liberally over all parts before assembly, instead of coating the parts with brake fluid. Brake fluid will only attract moisture, which can cause seizing and rusting of the piston and bore, especially if your restoration project is going to take a while. This holds true for all the hydraulic brake parts throughout the car. The rubber grease I use is manufactured by P.B.R. and is a purple gooey jellylike substance. There are many other brands available at any automotive brake shop. This grease aids greatly in assembling all brake parts in general. It is fully compatible with brake fluid. Assemble all brake parts, mount and fit the cylinder and reservoir - oh yes, the master cylinder reservoir - that little tin can type of affair with the screw cap is to be carefully cleaned out and painted gloss black. Ensure that the tiny breather hole in the centre of the cap is clear and that a new rubber seal ring (supplied in the master cylinder kit) is installed inside the cap.

Now if you have double-checked that all brake parts are fitted and all connections are tight, fill the reservoir with new clean brake fluid and bleed out the system as per the workshop manuals instructions. There is a kit on the market which power bleeds the system quickly and easily with no pumping of the master cylinder. It uses air pressure from a tire (about 18-20 P.S.I.) and applies it to a remote supply of brake fluid attached

in turn to your master reservoir. This applies a constant pressure to the entire system and automatically tops up the reservoir from the remote reservoir as fluid is used up in the bleeding process. Then simply go around the car and open each bleed screw, one at a time, until all air is expelled. Remove the kit and you're finished! The whole process takes about 5 minutes and one person can do it without further assistance. Now just go around the car and readjust the brake shoes as required.

The **handbrake** can now be installed and adjusted after the rear brakes have been correctly adjusted. The handbrake ideally should lock the rear shoes by the fifth click of the ratchet on the handle. Grease the handbrake cable at the nipple provided and grease the pivot point on the linkage on the rear axle mounting bracket. If all this has been correctly done and the shoes won't lock the drums, you may have a stretched cable assembly. This is a common fault with old cables and new ones are readily available for about \$20.00.

The **wire harness and electrics** will be tackled next. Examine each electrical component - fuse block, relays, switches and so on for signs of wear, damage or corrosion and replace as required. Install these parts in their respective locations on the car. On an old car, the wiring is perhaps best replaced with a new harness - correct woven braided cloth covered harness coded to the original design of each series is now available. Sort out the new harness and you will find that it comes in a few separate pieces. Find the main part that travels through the middle of the firewall area. This forms somewhat of a trunk - like a tree - with the branches protruding out through the front of the car to the left and right, while the "roots" branch out beneath the dashboard area. Now comes some "fun". The main 'trunk' grommet must be fitted by passing the entire "root" system through that little grommet hole, one bit at a time. Take your time and it will fit through. It takes about five minutes and a few well-chosen curse words and suddenly you'll have it! Now stuff the "root" system through the firewall hole and run it up till you can fit the grommet. Now gently lay out the engine compartment "branches" and note by examining the colours and their relation to the components. Run them to the left and right sides as required and get some of those wire harness mounting clips and screws - if necessary, new clips are available. Start fitting the mounting clips and fastening down the harness. Trim the ends of the individual colour coded wires as necessary, twist the bare stranded ends and start fitting to the terminals of each component following the wiring diagram in the manual.

Now find the section of harness that runs down the frame rail to the rear of the car. Note that there are appropriately coloured male end type terminals, which fasten up to the main harness you just installed. Plug them in and start routing the cable under the car, mounting up as required. You will find that it branches a lead off to the fuel pump. The harness follows the frame rail past the rear axle area, climbs vertically up the trunk bulkhead and disappears through another grommet and into the boot area. Here it is kept in position by welded metal tabs. Another wire branches off to the fuel tank sending unit. Leave it loose for now. The harness again comes to a set of plugs for the harness section that runs across the back of the car. We'll leave all this out for now until the shroud and fuel tank have been fitted.

There are a couple of other sections of the harness we will also leave off for now. The overdrive section and the dipswitch section can go on later when their respective



components have been installed. One more section can be fitted and that's the one from the brake stop lamp override relay, across the front bonnet support bracing. These are easier installed now before the shroud goes back on. Also the stator tube harness travelling down the steering column can be fitted, run through the inner valance panel grommet and plugged into this main front harness section. The twin horn wiring can be installed now, as well as the brake switch wires.

The **dashboard** should be attended to at this point. The instruments should be examined and renewed or rebuilt as required. There are a number of instrument and gauge rebuilders who will rebuild your instruments for a reasonable charge and do an excellent job. All switches should also be carefully examined and renewed if not perfect. The panel itself should have no extra holes or dents, etc. and should be finished in gloss paint in accordance with your colour scheme. Chrome grab handle and other chrome bits, mounting screws, etc. should be examined and renewed as required. Remember every time you get in your car you will notice if it's not perfect, so do it right the first time!

When all has been made satisfactory, the wiring can be fastened into the components. I prefer to sit in the car on the driveshaft tunnel and with the dash still loose, lay it face down on my knees and fasten everything up to its back side. Then the dash can be brought upright and fitted into its mounts. This is far easier than lying on your back under the dash with a light trying to work over your head to do up some awkwardly placed mounting screws and wires.

The **wiper system** should be checked over, cleaned, regreased and tested before installation. Again, it is far easier to fit this assembly onto its motor mounts before the front shroud goes on, while you can still see what you are doing. White "LUBRIPLATE" grease is excellent for greasing this assembly and it will give years of trouble free silent service. We'll cover the fitting of the ferrules, nuts, gaskets, wiper arms and blades later, when we start installing hardware and trim bits.

The **fuel tank** should be thoroughly cleaned out and pressure tested for leaks, and then painted gloss black. A sloshing solution available at your local airport or aircraft supply is a good thing to use in your tank to eliminate chances of rust or scale build-up inside. A quart of this is about the right amount and will cost you about \$15.00. Be sure to remove the sending unit and tape over all openings securely before treating the tank. Make sure today's fuels containing ethanol will not affect the solution you purchase.

While the sending unit is out, check its float for leaks and carefully remove the cover from the sender itself. You'll find a feeler wire running up and down a small electrical coil. These units have been known to fail simply because of dirt or corrosion on these coil and finger surfaces. Gently clean them and a touch of electronic contact cleaner will also help here. Now put the unit back together and fit a new gasket (available) around the tank opening, carefully install the unit and tighten down the screws.

New rubber seals are probably required around the boot floor opening before the tank is installed in the car. This seal is about 5/16" thick and 1" wide. Contact cement this seal around the opening carefully and you should get a good watertight seal when the tank is set in.

Fuel tank straps are available new if yours are rusty or broken. Paint them black and fasten these in place and tighten down firmly against the tank. Now finally fasten up the sending unit wire from the harness and tighten the little brass nut on the terminal securely.

The **fuel pump** should be carefully checked over and tested before installation in the axle cavity. Make sure it's the correct one for your car. Check that the points set is clean and operating strongly and that the gauze filter assembly is clean and tightened correctly. Dirt and foreign material in the pump is the most common problem after a complete rebuild of a car and this filter may become clogged soon after the car is back on the road. Keep this in mind later on if you have fuel starvation problems. Fit the pump correctly in the mounts and fit a new steel line from the tank to the pump - again using the old line as a pattern. Don't forget to fit a grommet on the line where it passes into the boot from the axle area. Carefully tighten all connections to pump and tank. Don't over tighten - these are brass fittings and could strip.

Run a new line from the pump forward along the frame rail using the old line as a pattern. Use new clips and screws as required.

The **fresh air ducting** in the engine bay can now be installed along with the butterfly flap assembly on the firewall. Install the cable and mounting bracket for this under the dashboard and adjust the linkage so it will fully close when required. The duct will be held in place by the 4" dia. hose clamp you've had zinc plated, and the wrap over strap type steady bracket is painted body colour and affixed to the wheel arch.

## THE DRIVE TRAIN

The **engine/gearbox/overdrive assembly** is to be dealt with next: We won't go into the complexities of the engine or gearbox themselves, as they are dealt with at great length in many other articles and publications. I will state here however, that the engine is a very sturdy straightforward design, which is not prone to fail or have components break. It will simply get sloppy clearances and wear over a very long period of time, resulting in a gradual falling off of oil pressure and increase in oil consumption. The rebuild of these engines is a very straightforward task but I will outline a few spots that should be examined.

The most commonly overlooked spot is the rocker shaft assembly. The rocker arm bushes and the steel shaft will wear to the point where excess oil will accumulate in the rocker cover and be sucked out by the breather hose into the carburetor air filter and in turn be burned up in the combustion chamber - resulting in excess oil consumption and blue smoke at the tail pipe.

Another common problem especially with the four cylinder cars is having a hairline crack in the cylinder head, which can result in moisture or oil always appearing at the cylinder head to block joint. This of course, can be a result of a poor seal at the gasket surface too.

While here, I'll mention another common problem in good head gasket sealing and that is repeated over-tightening of the cylinder head nuts. This can result in literally pulling the stud slightly out of the block. This results in a small raised edge of cylinder block



metal all around the base of the stud. This should be carefully removed before new studs are installed.

Beyond these few points, a rebuild of this engine is quite straightforward. Do not take any short cuts in a rebuild and a quality job should be the result.

The **gearbox/overdrive** assembly should be thoroughly checked out and rebuilt as necessary. Again, this is a specialized area I won't delve into but I will mention a couple of areas that should be checked before final assembly to the engine.

First, if you have any signs of external leakage, new seals or gaskets are obviously in order. The BNI three speed series does not have a renewable seal at the front of the gearbox, but has a closely fitted reverse grooved oil flinging surface in the front cover plate which spins the oil back into the gearbox. If this is worn sloppy, due to poor bearings in the gearbox, you'll have to find a good used replacement cover plate. These are not available new at this time. There is a front seal now available that can be adapted to this front cover plate.

The clutch cross shaft and bushings can also wear badly and may require replacement. This shaft has grease nipples and the shaft should be thoroughly cleaned out and new grease fittings installed.

The **clutch, pressure plate and release bearing** should be replaced with new parts if they are showing signs of wear. Make sure the flywheel surface is smooth and clean or it may need resurfacing too. If in doubt, these parts can be checked out by a brake and clutch specialist. Check the yellow pages in your area. (In the Southern Ontario area, Industrial Brake on Gage Avenue North is an excellent shop with reasonable prices.) These shops can even rebuild your pressure plate if necessary.

While you're at it, thoroughly check out the condition of all the clutch linkage, watching for wear in the rods and links and slop in the brake and clutch pedal cross rod and its bushings. All these parts are available new. Again, replace all grease fittings with new ones.

Now let's assume we have a healthy engine, gearbox and overdrive assembly sitting in front of us assembled into one unit. Now we must check out all the parts that assemble onto this.

The **starter motor** should go into an auto electric shop to be thoroughly checked over, cleaned and new bearings, bushings and motor brushes should be installed.

The same should hold true for the **generator**. Checking these now will save you frustration later and will provide years of trouble free service. (In the Hamilton area "Eastern Auto Electric" on Barton St. in Hamilton, is highly recommended.) Expect \$40.00 to \$150.00 range per unit with \$75.00 being an average charge.

**Carburetors** should be cleaned and checked thoroughly. Rebuild kits can be obtained new and should be carefully installed. These include all the gaskets, washers, new needles and seats for the float chambers and new jets and needles for the carburetors. Make sure they are the correct needles for your particular car. Be sure to check the butterfly and cross shaft for slop and wear in the bushings where they pass through the body casting. Wear will allow excess air to enter through the side of the casting around

the worn bushings and will upset the air/fuel ratio entering the engine. If you find wear here, new bushings and shafts will have to be fitted and the bushings reamed for exact fit. (In Southern Ontario, see Blaine Hughes in Toronto. Expect \$12.00 to \$30 per carburetor to rebush the bodies and another \$25 to \$75 per carburetor kit. The needles will be about \$8.00 to \$12.00 each.)

The **exhaust manifold** should be thoroughly cleaned down and checked for cracks and broken studs in the exhaust pipe flange. These can be removed with heat. I've always found that taking them in to Speedy or Midas Muffler Shops is a good route. They do this job all the time and won't charge you much to do it. Don't let them install new studs unless they have the correct thread studs. Take them home and run a tap through the holes to clean up the threads and install the correct studs. They are available. I've never seen a high temperature paint that lasts on exhaust manifolds except for one available in black or powder grey from Bill Hirsch, 396 Littleton Avenue, Newark, New Jersey, 07103. A pint tin will last you through about fifteen cars! This manifold paint hardens with each warm-up of the exhaust manifold and gets tougher as you use it and it won't discolour. Originally the manifold was painted engine colour. If you do this, it will simply burn off to a straw brown colour.

The **intake manifold** assembly can be thoroughly cleaned down and checked for damaged studs or loose joints. The other engine parts such as breather pipe, tach drive casting, oil filter castings, water pump, and engine mounts should be checked over, cleaned and set aside at this point. The engine mounts should be replaced if not in perfect condition. A new filter and rubber seal ring can be installed in the oil filter assembly. Use all new joint gaskets to assemble the neck pieces of the filter housing.

Now paint this engine assembly along with all the small bolt on parts. Spray bombs from Moss Motors are the easiest to use. Excellent engine paint is also available in quart cans from Bill Hirsch, 396 Littleton Ave. Newark, N.J. U.S.A. 07103 - Austin Healey Engine Green. Because it is a metallic, it must be sprayed on, so get hold of a suitable compressor and spray gun - available at most rental places for a nominal fee. You'll need some reducers to thin the paint for spraying and you are ready. The following items will be painted this engine green colour:

- Engine Assembly including rocker cover down to oil pan and water pump to rear gearbox mounting plate.

- Gearbox/Overdrive Assembly (not on BN1)

- Starter Motor Body

- Generator

- Intake Manifold Assembly

- Oil Filter Assembly

- Engine Mounts

- Oil Dipstick - Handle Only

- Breather Pipe

- Tach Drive Unit

Make sure everything in this list is ready for painting. This Hirsch Engine Paint doesn't need a primer so go to it!



## ***Finished Engine Assembly and Installation***

With everything painted you can assemble the entire business, including the exhaust manifold. Now you can sling the assembly squarely over the engine unit, which will leave the gearbox tail shaft down at about a 45-degree angle. Hoist the assembly up to clear the front inner structure of the chassis and ease the tail shaft down through the firewall opening. You may want to leave off the left hand engine mount to give better clearance with the steering column. Move the car forward as you lower the power unit into position. Now get a piece of rope around the tail shaft and standing in the car, lift this up onto the frame 'X' member. Now you can let the engine down onto its mounting supports.

Holding the weight of the engine on the hoist, start the mounting bolts into their respective holes on each side. When all bolts are well started the weight can be let down onto the mounts and the bolts tightened down. Then working inside the car, fasten in the gearbox mounts - (new) and the stay rod under the gearbox into the eyelet in the frame again using new rubbers. Finally, the connections from the wire harness to the generator and overdrive solenoid can be connected. Don't forget to install the ground strap from the bell-housing flange to the frame and ensure it is in good condition and is tight.

The **drive shaft** should be cleaned and carefully examined for wear in the universals. Any wear felt should indicate replacement of the universal joints. Finally, paint the assembly gloss black and install new grease fittings. Grease the unit and install with the correct bolts and nuts with the strap type keepers. These will be peened over onto the flats of the nuts to lock them into position.

The **radiator** should go to a rad shop to be thoroughly cleaned, and pressure tested. Do not let them paint it however, as their black spray-on goop isn't the best for finish. Bring it home and spray on a smooth gloss black. The fan blades are painted red. These can now be installed in the car and all correct nuts, bolts, brackets and stay washers should be assembled in the correct manner. Install new top and bottom rad hoses with the correct type of clips. The thermostat should be rated at 160 degree F. and no warmer. Install a new fan belt and tighten the assembly via the adjustment link on the generator mount. Do not over tighten this belt, as it will put undue strain on the generator and water pump bearings. Grease the **water pump** as per the manuals instructions.

Assemble the new (high temperature flat black painted) **exhaust system** out on the floor with the correct strap type clamps. Install all new rubber exhaust mounts on the car chassis and using a new exhaust flange gasket and brass nuts; offer the whole exhaust system up to the car. Support the tail pipe up in its approximate position at the back of the car with a block or whatever and working from beneath the car, get the exhaust pipe flange onto the three manifold studs, and tighten up evenly with the brass nuts until it is tight. Now line up the mounts on the system with the rubber mounts on the body and fasten up in position. Make sure it's up as close to the body as possible without actually hitting the body and that there is no undue strain on any of the mounting rubbers.

Now you can go back up to the carburetors and install the **throttle linkages** - cleaned, inspected and painted black, and adjust as per the manuals instructions. Run a new flexible fuel line from the chassis fuel pipe to the carburetor delivery pipe. This was

originally the Smiths Petro-Flex. Excellent reproduction flex lines are now available. Do not over tighten the brass fittings; they strip easily.

To get this whole thing going, we're going to need some **batteries**. The four cylinder model was designed to use twin six volt batteries (available) mounted in series under the access hatch behind the seats. They sit in two small metal trays with holes over nuts welded to frame members. Threaded brass rods pass down through the battery flanges, through the holes in these trays and screw into these frame nuts, with a washer, rubber washer and nut bearing on the upper flange of the battery. Trays and hardware are painted black.

Remember, this electrical system is positive ground. Fasten cables with new terminals - one to the earth connection on the cut-off switch, and the other to the frame member, with new clips and screws, running up the right frame rail to the terminal on the solenoid.

## **BODY ASSEMBLY**

Now we've reached the stage where careful fitting of body panels will result in a car to be proud of. The panels should be all vinyl washed and epoxy primed. Paint the insides of all panels including mounting flanges with the final colour coats. The car will be assembled and adjusted for proper fit and the final outer paint job will be done when all this is finished.

The **front shroud** should be installed first. Run a good bead of caulking along the top of the firewall so when the shroud is installed an air and watertight seal will result. Carefully fit the shroud and get all mounting holes to line up. Now install 3/16" dia. pop rivets along the dashboard flange and scuttle edges. These also are installed on the steady brackets on the wheel arches. Now run the five countersunk screws into the flange to firewall edge and the nuts, bolts, washers to the brackets and frame irons at the base of the front shroud apron. Run in the countersunk screws with nuts and washers along the front edge of the bonnet opening and the two on each side of the bonnet opening to the support irons.

The **rear shroud** is fitted from behind the car by pushing it forward into its position, aligning the mounting holes and again installing 3/16" pop rivets along the shroud flanges to inner wings. Fit a couple of clamps to hold the bottom flange to the boot floor. Install caulking into this seam and fit 1/8" blind rivets along this flange. Run 1/8" blind rivets along the boot lid flange to its inner support. Again use of clamps will aid in this process. Run the setscrews into the top edge of the boot lid opening and it's done.

**Front and rear fenders** are best fitted using the commercially available mounting hardware kits that accurately reproduce and provide all the bits to correctly mount each fender completely for about the \$12.00 range per fender.

The **doors** are now fitted carefully with their countersunk Phillips head set screws (new available if old ones are damaged) and adjust them to give an even gap between front and rear fenders and rocker panels. Nominal gaps of 1/8" to 3/16" is about right.

The front valance, bonnet and boot lids are best left off the car until all painting is done; these have to be finished inside and out.

Make sure you are really happy with the fit of all the panels and that they flow from one to another smoothly. Now gather up the following parts that must be painted before installation: bonnet, boot lid, front valance and inner valance panels if not already done and fitted.

The entire chassis/body assembly must be thoroughly sealed and masked off so no dust, paint spray or anything can seep into your beautifully done work. This means sealing off the entire underside of the car, all holes, wheel arches, screw holes, anything that might let spray inside. Take your time and BE PATIENT this is very important.

We won't go into the prep and painting of the car; this has been dealt with at length before. Just don't cut corners here.

With the car painted, you can carefully remove all the masking and paper from the previous step. Now using soft blankets to protect paintwork, install the **bonnet**, bonnet rubbers, prop rod and adjust the release linkage carefully for a good fit and easy release.

Install the **boot lid** in the same manner with new seatings for the hinges and the handle. Install a new boot lid seal in the lid with contact cement. Install a new boot lid script. Install the three rubber buffers into the lower shroud lip. Adjust the lid assembly for a good fit. Leave the boot lid stay brace off until the boot is trimmed.

The **aluminum trim plates** for the doorways should be renewed if not perfect and can be now installed using new screws and colour keyed piping on the door post. Assemble the chrome latch and plate on the doorpost. Install the cleaned up lubricated latch plates in the doors and adjust the whole assembly to close smoothly and accurately. You should be able to push the door perfectly closed with steady hand pressure without slamming it. This holds true for bonnet and boot lid adjustments as well.

You can now gently loosen the fender bolts slightly and with the **fender beading** tabs taped over with electrical tape to prevent scratching paint, carefully ease the beading tabs down through the seam between fender and shroud until the bead just sits on top of the joint. Carefully tighten the mounting bolts again. When satisfied that the beading sits at the correct height at the seam, the tape can be removed from beneath the fender and the tabs can be bent tightly back over the fender flange to lock it into position. A large flat screwdriver helps here. Now finally run some caulking along the inside of the seam to keep moisture from creeping into the seam from below. Make sure your fender to body bolts and screws are good and tight to prevent working loose later.

The black plastic beading pieces that run beneath the headlamp and front side lamp in the seam between front shroud and fender must be trimmed to clear the fender bolts and are adjusted for height at the surface in the same manner as the metal beading. The difference here is of course that there are no tabs to bend back underneath. These strips are simply held in position by the compression of the bolts on the seam. Make sure the two panels line up on the surface and tighten these bolts securely.

On the BNI the **windscreen steady feet** must also be fitted at the same time as the front wing beading. You'll notice a relief in the front fender flange indicating where this

piece is fitted. There are small indentations in the ends of this piece to receive the ends of the beading.

The **windscreen base posts** are also installed at this time with the ends of the short piece of beading tucked under this casting. The mounting bolts for this part must be tightened within the car with the door open. These will always be seen with the door open, so make sure they are in excellent condition with no marks from sloppy wrenches, etc.

The **windscreen assembly** with renewed chrome and good glass can now be installed with a new shroud to windscreen frame seal. If the windscreen knurled nuts, screws or steady springs are worn or damaged, they can be bought new.

Proceed with the **front fender spears** - get them on the right way around - with the thicker part to the back of the car! Nuts and lock washers are accessible from inside the fender. It's easiest to lie on your back under the fender and reach straight up from the inside to access these spear fasteners.

The **front inner valance, outer valance and horns** should be installed before the grille goes on, while their fasteners are still accessible. Also install the **front "wings" badge** above the grille opening.

The **headlamp assemblies** should be inspected for rust, seized adjusters, perished rubber gaskets and frayed wires and sockets. These should be renewed as necessary. Install the lamp pots in their openings and plug them into their respective connectors in the main harness.

Proceed in the same manner with the **side lamp assemblies** and **tail lamp assemblies** and check everything for tightness and operation. If the lamps fail to flash correctly, check the flasher relay, bulbs, stop/direction indicator override relay and wiring in that order. Usually a stubborn brake stop lamp over ride relay box can be made well again by cleaning and setting points and air gaps.

The **wiper shafts** can carefully be put through their holes in the shroud and new gaskets, the ferrules and the chromed nuts can be fitted and tightened. Connect the motor to the wire harness and check for operation. Stop them at their extreme left stroke. Install the **wiper arms** and new blades and check the entire assembly for operation and ensure that they wipe and park in a suitable position.

**Bumpers and over riders** should be rechromed if necessary and assembled with new 'T' rubbers between over rider edges and the main bumper bar. The bumper mounting brackets should be stripped clean and painted gloss black. If yours are bent or damaged, they are available new. Mount these to the bumpers and carefully fit them to the car. The front bumper must maintain even clearance to the outer valance by ensuring the two little rubber buttons are installed on the valance. The rear bumper mounts pass through the rear shroud - don't forget to install new rubber grommets over the irons and fasten the mounts to the iron inside the boot area. Carefully adjust the position of the bumper assembly so the boot lid can close and adequately clear the over riders. Then tighten in the final position and adjust the bumper bar grommets so they are firmly against the rear shroud. The license lamp assembly should now be installed on the rear bumper and a new grommet will be fixed into the hole in the shroud where



the wire leads for the lamp will pass. Now you can install the license plate mounting bracket - painted black - onto the rear shroud with the two nuts, bolts and lock washers. I prefer to slip a thin piece of black rubber under this bracket against the painted surface so the paint doesn't crack.

The **aluminum cockpit trim rails** will probably be tarnished and scratched. These can be brought back like new with buffing and re-anodizing. This can be done by businesses found in the yellow pages that specialize in finished aluminum. Expect the car set to cost \$350. They will come back a beautiful satin finish that will last for years. Install these on the car with a thin bead of caulking under the lip, and new chromed countersunk Phillips head type screws

Road **wheels** should be chemically stripped or sandblasted. A thorough inspection is in order here. Check for loose or broken spokes, pitting, rust damage, collision damage and out of truth - both laterally and radially. More than 3/16" out of truth is unacceptable and the wheel should either be rebuilt - at \$80.00 to \$150.00 per wheel or replace with new ones - available from England for \$240.00 per wheel by the time you have paid for shipping and excise tax. This route is by far the better one, as I've never seen a rebuilt wheel last for more than a couple of years, if it's driven much. The correct wheel is a 4J x 15 Dunlop with 48 spokes. If 60 spoke wheels are to be fitted, shims will have to be fitted to the front hubs to bring the wheel about 3/16" outboard on the hub so the inner row of spokes will clear the outer diameter of the brake drum.

**Knockoff caps** can be either repaired and rechromed or bought new. Either way will cost about \$35.00 per knockoff.

The correct **tire** size is 5.90 x 15 in a bias ply tire – the Dunlop Roadspeed being the original tire fitted. These are now readily available. If you are interested in a radial tire, then the size to be fitted is 165-15. Of course suitable new tubes must always be fitted with a wire wheel.

The **assembled wheels and tires** are fitted to well greased hubs and cone surfaces and the knockoff cap is greased on the threads and run on hand tight. Then tighten securely with a proper copper hammer. Some are available with rawhide on one end and copper on the other. This combination will let your knockoff caps last unblemished for years. Recheck tightness here after the first fifty miles travelled, then you're okay.

This series has covered a number of areas not presently dealt with in other publications. My methods can probably be improved upon and I welcome any comments. The subject of trim and upholstery will be dealt with at a later date if there is enough interest shown. My purpose of this series was to shed a bit of light on a rather complicated and confusing aspect of our hobby, but one that will have to be faced if we are to preserve the cars we love so much.

Rich Chrysler 1/23/86

Updated 01/11/04

