

**CARBURETTERS,
FUEL SYSTEM,
AND EMISSION
SYSTEM**

NOTICE OF COPYRIGHT

All rights reserved. No part of this booklet may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage or retrieval system, without written permission from the author. No process described or shown in this booklet may be used or performed by any person other than the original purchaser for other than personal vehicles. Commercial or other use of processes, whether or not for profit, is expressly denied any person, persons, or enterprise without written permission from the author.

NOTICE

This manual or booklet is published for informational use only. Use of this information or repairs and/or modifications performed using information contained herein is solely at the risk of user.

This document authored by Leonard Renkenberger.

No part of this document may be stored without this *notice of copyright and disclaimer of use* attached

**MODIFICATIONS AND
REPLACEMENTS FOR THE
ZENITH - STROMBERG CD
CARBURETTORS ON TRIUMPH
TR-250 AND TR-6**

MODIFICATIONS TO MAKE YOUR ZENITH STROMBERGS WORK

NOTE: Federal law prohibits the modification of engine fuel and emission control systems. Therefore the following article is for informational purposes only for those persons wishing to use their cars on private property only. Otherwise, Big Brother will get us both.

The carbs on your TR-6 are basically a good design and reasonably dependable. The reason they don't work too well too long is due to the changes required to meet the dictates of the clean air freaks. The problems of being unable to adjust them revolve about the Big Brother Mandate to make cars non-adjustable.

"But", you say, "the late (72-76) cars are adjustable". "The better to fool you with my dear" to quote a big toothed guy from another fairy tale. The range of adjustment is not broad enough to be of much help on new carbs let alone ones with worn jets and needles. The reason true fixes are so hard is because the Brits really did their homework for once. No cheap and dirty fix was made to meet the emission requirements. At first glance you'd swear you could just take the adjustable jets and the air valves out of a TR-4 Stromberg. However, you'll find the jet doesn't screw in far enough and the air valve (or piston as I call them) is a different length. Some models, such as those on Mercedes even mount different.

First, you should be familiar with the carbs, or at least read up on everything you can find in back issues of the 6-PACK newsletters and in the manuals available. Haynes puts out one that will do as a guide as does Interauto. I believe both are available from The Roadster Factory, at parts stores, and from Motorbooks, Minneapolis, Minn.

What is proposed below is actually several options or combinations. Which one is best for you depends on your skills and budget and on whether you are looking for a minimum cost and labor fix or looking for the ultimate in adjustment. I'll go into the pros and cons of each at the end. Briefly the options are:

1. Modify your early or late carbs to use adjustable jets from TR-4 or Volvo 175 CD carbs.
2. Replace your carbs with TR4 or Volvo carbs.
3. Replace the needles and fixed jets within your carbs with new needles of the same type and remake the jets (new not available).
4. Replace your carbs with H6 or HS6 SU carbs from a TR-3, TR4, or Volvo.

Within these choices are several sub-options related to various needles and jets used on your carb or the used carbs you purchase.

1. Modify your carbs to adjustable jets.

For this modification you will need a set of pre-1968 Stromberg 175 CD carbs. These may be somewhat hard to find and the price will vary from free to \$50 or more. With the exception of the jet assembly (the only part we'll use), the condition is not important. You will also need new needles, (more on needle selection later) new .100" jets (the stock TR-4 jet) for the jet assembly, and a major rebuild kit for the TR-6 carb. Unless the TR-6 kit contains the 'O' rings for the jet orifice and the jet adjusting screw, you will also need a rebuild kit for a TR-4. The TR-6 kit I got from Beck-Arnley didn't have them but a kit someone gave me made by Techlit Co. (*350-487-1) has everything you'll need. Unfortunately, I can't tell you where to get the latter but I believe The Roadster Factory carries them. Another source for these 'O' rings and others is your local industrial bearing supplier listed in the yellow pages. However, you must insist on ones made of NITRILE or BUNA-NITRILE or other materials impervious to fuel including alcohol since some fuels and additives contain alcohol. Sizes are 114 and 011. If in doubt, spring for a TR-4 carb kit.

First, remove the air valve, diaphragm, and cover assembly chamber from the TR-4 carb and unscrew the entire jet assembly from the carb body. Disassemble the jet assembly for rebuilding later. See Illustration 1.

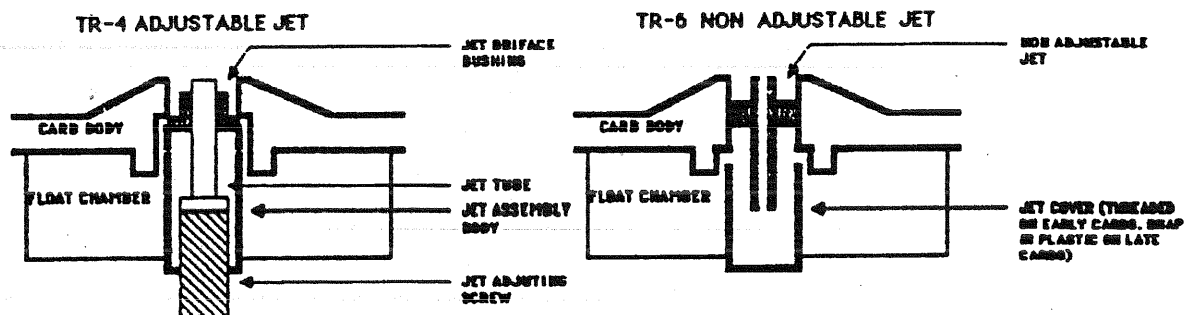


Illustration 1

Remove the air valve, diaphragm and cover assembly and the float chamber, float, etc. from your TR-6 carbs. Notice the void where the adjustable jet was in the TR-4 carb. The TR-6 carb has a pressed in fixed jet here which can not be moved up and down. Drive out this jet with a punch. In the adjustable TR-4 carb the jet moves in relation to the tapered needle to adjust fuel volume by closing or enlarging the jet opening around the needle. If you compare the carbs you'll see the threaded portion of the holes are identical. However, the depth of recess in the TR-6 carb body is about $5/16$ " less than in the TR-4 carb. This, coincidentally, is about the thickness of the TR-4 jet orifice bushing. We are going to remove this amount of material from the TR-6 carb body so that it will accept the adjustable TR-4 jet. Disassemble the TR-6 carbs as much as possible to facilitate the machining and to avoid damage.

You are now ready for the machine shop work.

To modify the carb body as shown in Illustration #2 you will need to find a machine shop with a vertical mill and having a $3/4$ " counterbore with a $3/8$ " pilot. (A tool to cut flat ends in holes). It is possible to do the job with a GOOD drill press if it does not have too much "run-out" (oscillation off true rotation). The $3/4$ " hole can also be deepened with an end milling cutter, a tool a machine shop is more likely to have.

Counter bore jet well with a bit bigger than the jet and centering washer , but small enough to not remove any threaded material (3/4" dia or less). Counter bore must be 0.290"-0.295" deeper than factory depth of jet well. Needle bore must stay at 0.375" for adjustable needles, and opened up to 0.400" for fixed needles.

Clamp the carb body on the work table upside down. The work surface and the bore must be perpendicular. The top of the body is true perpendicular to the bore. The .375" hole must be aligned with the pilot on the counterbore. Remove .290" to .295" from the flat face of the main bore. The chamfered edge is not relevant. If for any reason you want to experiment with fixed needles, the .375 hole should be enlarged to .400".

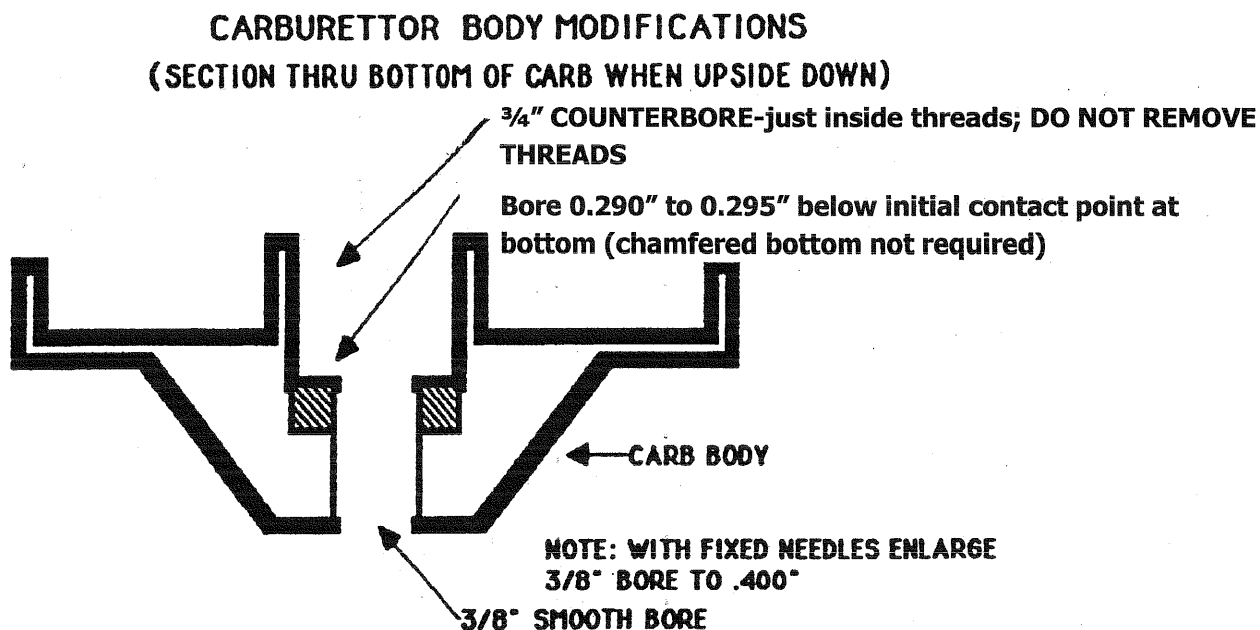


Illustration 2

If you are using the stock needle assembly, you merely need to slip in the rebuilt adjustable TR-4 jet assembly (see illustration 3) including the jet orifice bushing and its washer and you're in business except for adjustment. Start the adjustment by bringing the jet flush with the bridge and back down 3 turns. Follow the procedure in the TR-4 manuals for checking adjustment. Unless your carbs are in pretty fair condition (low miles and gaskets, etc. recently replaced) I'd at least replace the float needles (don't forget to adjust), the bowl gaskets from a TR-6 kit and the diaphragms from a TR-6. It is also advisable to replace the TR-4 jet (Roadster Factory has them) and the tiny 'O' ring jet seal in the base of the jet orifice bushing and the 'O' ring at the base of the adjustment screw. Obviously the more extensive the rebuild the better the carbs will work. Such things as cleaning the temperature compensator, etc. are very important. On high mile cars, even rebushing the bodies and installing new throttle shafts and seals may be needed.

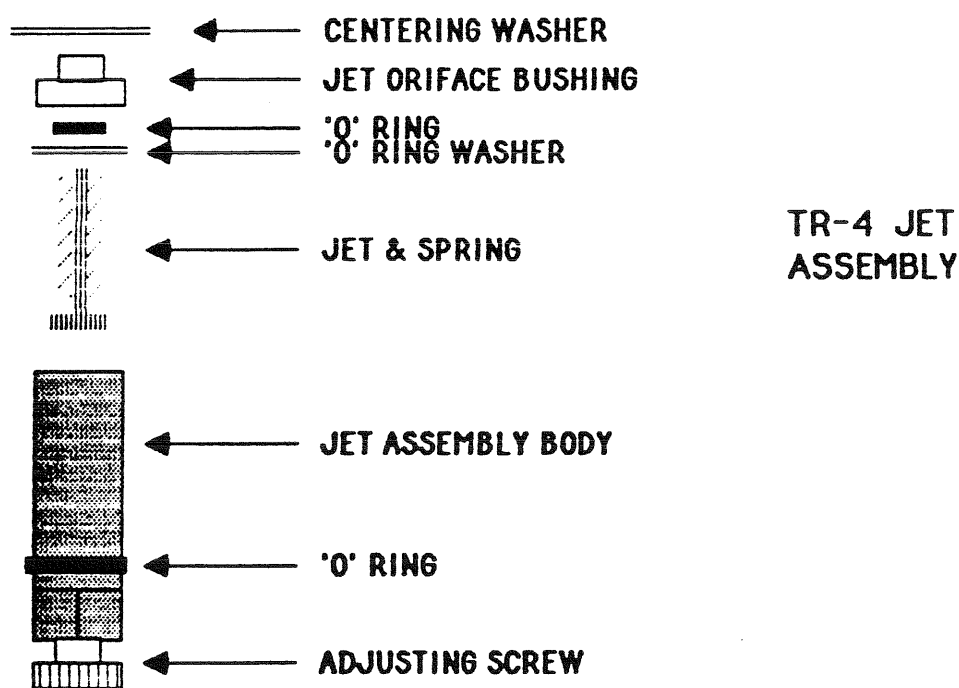


Illustration 3

Replace the TR-6 needles regardless. With the early non-adjustable type, install the flat shoulder of the needle flush with the face of the air valve. With the late type, adjust all the way down in the lean position as per the manuals.

Let's back up here and go into the needles a little bit. In the early non-adjustable carbs the needle was richer than in the late carbs. Emission standards were lower and not so hard to meet with an engine which had been designed many years before Rachel Carson ever thought about writing "Silent Spring" and when the price of oil was about \$10 a barrel. The later needles were a best attempt to meet the clean air standards without engine mods which would break a "little" outfit like British Leyland. Therefore you may want to consider using the early needles regardless of the model carbs you have. Personally, I recommend them but modifications are needed.

The early non-adjustable needle body has an outside diameter (O.D.) of .246" to fit a bore in the air valve of .250". The late needle incorporates the adjustment feature so the air valve bore must be larger to accomodate the extra parts involved. The O.D. of the later needle body is .309". With the early needle there is a small lock screw recessed deeply in the side of the air valve near the bottom which simply holds the needle in place. With the late needle what appears to be a lock screw is actually only a locating screw which fits into a slot in the needle body. This screw keeps the body from turning but allows the threaded inner adjusting screw to move the needle up and down a few turns. The adjusting screw is turned by a special tool having an allen head (hex head). This tool is available from The Roadster Factory. There is also an 'O' ring seal in this little mess because the bore must go all the way into the oil reservoir in order to have a way to turn the needle. So, if you can't keep oil in the tops of your carbs this is the problem and the 'O' ring should be replaced. Contrary to some articles I've seen in parts suppliers newsletters this whole assembly is not hard to get apart and install a new 'O' ring.

To use the early needle in the late air piston it is necessary to have a brass bushing put in the bottom to reduce the hole from .309" to .248" -.250". The hole for the locating screw should be drilled all the way through to the center bore and tapped to the same thread as the screw. You will need to put the needle adjusting screw with its 'O' ring back in to keep the oil from running down the needle.

If you're really into this thing and want to experiment with the older needles, of which there are literally hundreds of types, you will have to bush the air valve bore down to .123"-.125" to hold the .121"-.122" needle and increase the .375" bore in the carb body to .400" to allow for centering room for the jet on the fixed needle.

2. Replace your carbs with TR-4, Volvo, or other pre-1968 175CD Strombergs

TR-4s, Volvos, and some other cars including Jags used Strombergs for a short period. I think this was because S.U.s couldn't make the emission levels or due to the corporate infighting when British-Leyland and Standard-Triumph merged. Either way, since they weren't used long they are a little hard to find. When you do find them, they are usually cheap but many times have considerable wear on the throttle shafts and the body where the shaft goes through. The body can be bored out and have a bushing pressed in, however, and new shafts are available.

You can use these carbs in stock TR-4 form if you wish. However, the needles are set up for a 2.2 litre engine so, to oversimplify the problem, you'll be running too lean at higher RPMs. This is easily corrected by using TR-6 needles. It appears that the early TR-6 needles can be removed from the spring loaded piece in which they float and be placed directly in an unaltered TR-4 air valve. I have never actually done this but it is obviously the best bet. To use the floating adjustable or non-adjustable needles, however, you will have to have the needle bores in the TR-4 carb air valves reamed out to the proper size (.248"-.250" for early non-adjustable needles and

.310" for the adjustable needle). It should be noted that the TR-6 needles can not be adjusted in the TR-4 air valve and that the early needle has a richer profile over most of the range than the late needle. Set the flat shoulder of the needle, not the body, flush with the face of the air valve. The air valves and suction chambers are not interchangeable with the TR-6 carbs, nor is the diaphragm. The above is the only internal modification needed.

You should totally rebuild the TR-4 jet assembly and install it prior to removing the TR-4 needle if you are going to use the floating TR-6 needles. Run it all the way up to the bridge of the carb and center the jet on the needle. This is necessary because centering the jet on the floating TR-6 needle is difficult. An alternative here is to carefully place a piece of shim stock around the jet oriface bushing to hold it snugly centered in the bore of the carb body.

The TR-4 carbs will bolt right up to your manifold on exactly the same centers as the TR-6 carbs. This allows use of the TR-4 choke linkage between carbs as is. However the TR-4 used only one choke cable that ran through a rather convoluted course to the front carb. It came up through the choke lever and the end was clamped in a tab cast in the carb body just below the suction chamber. You can simply take one of the choke cable supports off the TR-6 carbs and mount it on the tab. Slip the end of the choke cable thru the choke lever and secure it with a clamp like the one used on the heater cable (Roadster Factory parts #609123, trunnion, cable and #559980, screw, securing). The only real work here is adapting the longer connecting shaft between the TR-4 carbs to the TR-6 lever. You can simply cut two pieces off the TR-4 shaft and braze them on the ends of the TR-6 shaft. However, the TR-4 carbs open in the opposite direction so you have a little manipulation to do here.

All other rebuilding and adjusting operations are straight TR-4 as per the manuals.

3. Replace the needles and jets in your carbs with new needles and remake the jets

Due to the floating nature of the needles, they apparently wear abnormally fast and also wear the jet. Actually, gasoline is abrasive and apparently the swirling action of the fuel laps them round and round resulting in rapid wear especially in the low speed area of the needle.

This option is at first glance pretty straight forward except for redoing the jet. However, the non-adjustable nature of the early needle makes it very tricky on those carbs. In theory at least, they must be set exactly as the originals. I've set the early needles all the way up per the competition manual and they've worked well for about 300,000 miles. On the other hand, the car is running about 11:1 compression and runs rich enough that it starts without choking if the temperature is over 25⁰ F. Gas mileage is about 24 MPG regardless of speed or traffic. Although it is difficult to gauge, try to set the early needle so the shoulder of the actual needle, not the needle body, is flush with the bottom of the air valve.

The jet is the difficult part, and if you have any doubts you can pull the following off, stop here and just give the carb a thorough rebuild. The jet upper diameter is .375" (3/8") and has a slight shoulder around its upper face. Use a punch which is very close to the diameter of the bore in the carb body (.375"), or better yet, a brass dowel with a squared off end to gently drive the jet down and out of the bore. Do not drive on the actual face with the jet orifice (see Illustration 4). Take the jet to a quality machine shop and tell them you want it reamed out to the inner diameter of the bottom and a brass sleeve or dowel inserted approximately the length of the present inner portion. This dowel must then be bored to EXACTLY .100" and the hole must be very accurately centered. A couple of thousandths oversize on the hole and you will have a mixture which is too rich. An alternate is to use some stainless steel tubing which I found being used in the medical and instrumentation fields. It is .120" outside diameter and .100" inside. This takes the

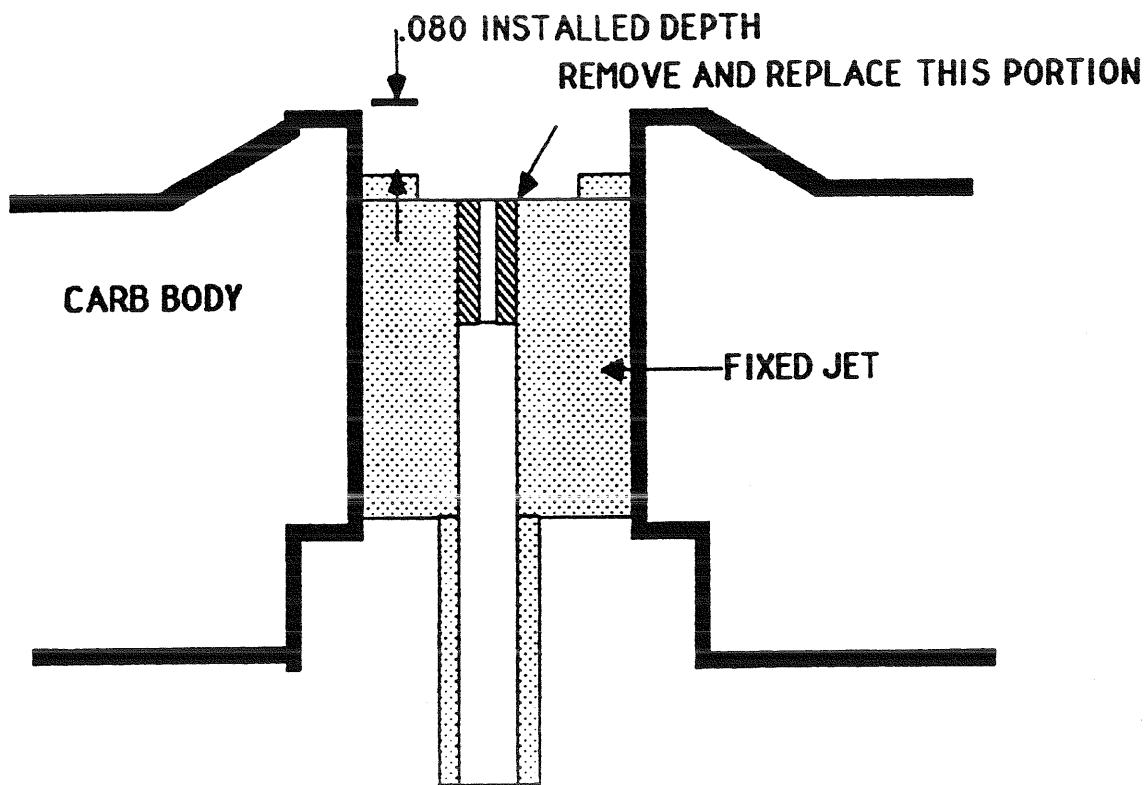
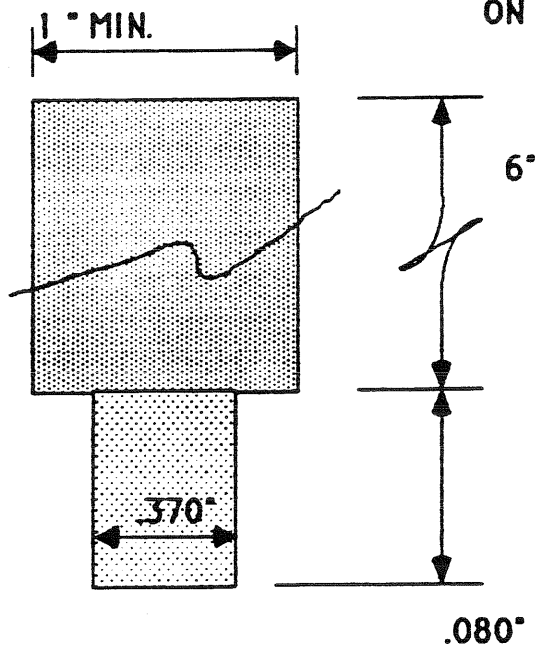


ILLUSTRATION 4

NOTE: VERTICAL
SCALE IS REDUCED
ON BOTH DRAWINGS



JET INSTALLATION TOOL

ILLUSTRATION 5

pressure off getting the hole precisely .100". How easy it is to find I don't know. You will need to make a tool as shown in Illustration 5 to install the jet. The installed depth to the upper shoulder of the jet is .080". Before removing the jet it might be advisable to have a machinist check the depth to the jet shoulder and have your tool made accordingly. To the best of my knowledge they are all the same but the Brits aren't known for consistency. To ease installation, place the jet overnight in your freezer to shrink it.

As with the other options, the more you do to rebuild the carb the better. This is especially true of the float needle, temperature compensator, and plugging the by pass valve.

4. Replace your carbs with SU H6 or HS6 carbs from a TR-3, TR-4, or Volvo

These carbs are everywhere. They (SUs, not HS6s) were virtually the only carbs used on British cars from the early 1930's. When you find them, they are usually cheap but many times have considerable wear on the throttle shafts and the body where the shaft goes through. The body can be bored out and have a bushing pressed in, however, and new shafts are available. Many people prefer them to Strombergs because they do not have the diaphragm in the suction chamber and are a little more basic (crude). Many sources offer them rebuilt exchange and in good working order. If you select this option, you might want to consider a rebuilt pair to start. You'll also need an SU shop manual.

You can use these carbs in stock form if you wish and many people do. However, the needles are set up for a 2.2 litre engine (2.0 for the Volvo). Even though they do have similar power curves, simply stated, you'll be running too lean at higher RPMs. This is easily corrected by using early TR-6 needles with the spring loaded body removed. The early TR-6 needles have an outside diameter (O.D.) of .121"-.122" and can be placed directly

In an unaltered SU suction piston (air valve in the Stromberg). This is obviously the best bet. Not so the late needle which has a larger OD. To use the floating adjustable or non-adjustable needles, you will have to have the needle bores in the SU carb pistons reamed out to the proper size (.248"-.250" for early non-adjustable needles and .310" for the adjustable needle). It also appears that to do this you will have to be damn careful or you'll go into the oil chamber. The only reason for using the floating needle would be because the SU jet is hard to center and still compress its crude cork gaskets enough to keep the jet from spinning and not adjusting. It should be noted that the early TR-6 needle has a richer profile over most of the range than the late needle. Set the flat shoulder of the needle, not the body, flush with the face of the suction piston. You may also have to experiment with piston return springs to prevent too rich or too lean of mixture on acceleration. There are hundreds of needles and many return springs around, so if your up to it you can play around with an infinite number of combinations.

Rebuild the SU by the manual being sure you soak the cork gaskets in CRC or other light oil for at least a day first.

For the throttle linkage, follow the instructions under the option for TR-4 Strombergs. The SU choke hookup is about as simple as anything can be, at least if your using TR-3 (and probably TR-4 carbs, but I don't have one to look at). One caution here though is that the choke return springs on SUs rarely pull the jet all the way up. So, you will need to not choke and grind away on the starter, run rich so it will start without choking, or get out and push the jet home each time you start the car.

Summary and recommendations

There you have it. No clear cut, bolt on miracles. Why didn't I mention Webers? Well, Webers are a logical choice if you want to spend the bucks. I'm not a purist but I'd bet a lot of you are, or will be when the cars get a little older, more valuable, and

competitive at car shows and the TRials. Even now the Strombergs available don't look quite like the originals. Getting Webers or new Strombergs and stashing the originals away in a warm dry place is also a possibility. However, I've tried to gear this to the guy or gal that is using his or her car frequently - not necessarily daily- and just wants it to run like a decent TR-6 should without spending a fortune.

Option 1, modifying your existing carbs, is my choice all around because the carbs look the same unless you put a mirror under the air cleaner. You can stop at just replacing the jet assembly with the TR-4 assembly if you like and finish the job later. The sub-option of early needles is my recommendation. - On the other hand, the late adjustable needles will enable you to make small mixture adjustments from above. You may have to do this because your carbs can now be set to optimum mixture. When the weather changes the mixture changes (cold air is denser therefore giving a leaner mixture). The new needles and TR-4 jets are almost a necessity if you are to get the full benefits - which should include more power. Counterboring the carb bodies costs me \$20 each in the Washington D.C. area where nobody can do anything mechanical and those that can charge accordingly.

I don't know if getting the TR-4 carbs will be too hard. It shouldn't be. That is the one thing I don't like about this option. It seems a shame to use just the jet assembly and toss the rest. Still, nobody seems to want TR-4s. I don't agree, I think they are real bargains. However, most people feel they are parts cars for TR-3s and TR-6s. Enough soul searching, let your conscience be your guide.

Rebuilding the entire carb will make a big difference by itself. Plug the by pass valve. Most of those tiny diaphragms are shot and they aren't in any of the kits. The temperature compensator and other improvements over the TR-4 Stromberg make a big difference which is another good thing about this option.

Option 2 has a couple of advantages - simpler carbs are easier to work on. This option probably has the third lowest end cost (either SUs or option 3 can be cheapest depending on the circumstances). If you are lucky and get a set of good carbs you will only have to put in the needles. You can also have someone do a straight forward rebuild on them and just use the TR-6 needles. If you don't do your own work, this will save some bucks but it will cost a bit to get the linkages fabricated and fitted.

There could still be some performance problems depending on weather (without the temperature compensator they slow way down in hot weather) and will require more frequent tuning. With the stock TR-4 needles, this is especially true.

Option 3 might be very attractive to you in part if you are not too skilled and have the later carbs. If you were only to change the needles, it requires a minimum of tools, skill, and money. You don't even have to take the carbs off. Also, you haven't really altered anything so the "screw-up factor" is eliminated. Many times this helps a lot where the needles have been backed out too far and no longer really adjust when turned, or where eliminating needle wear only is sufficient for a while. If you need to go further and are in an industrial area the machine work on the jets and the tool should probably cost \$20 and again is a fairly straight forward job. You don't have to go into the temperature compensator and all the confusing stuff on the sides of the carb. However, I can not overstress how close that .100" bore must be. For example some SU rebuild kits sold for MG TDs (1250 c.c. engine) in the '70s were the same ones the maker used for MGA (1500 to 1622 c.c.) and contained .100" jets instead of the .090" required for the TD. You could crank the jet all the way up and the TD usually still ran rich enough to foul plugs within a few low speed miles. That mere .010" was just far too much extra jet orifice area. Another thing to keep in mind is that The Roadster Factory may some day get new jets or have them made.

Option 4 gives you a whole new thing to learn. The SU may resemble the Stromberg in operation but working on them is a whole lot different. This has been tried by a few owners, and there was recently an article on TR-6 performance in one of those small struggling magazines on this and other TR-6 mods in which a shop in Florida claimed great things for their SU conversion. To the best of my knowledge, nobody has gone into changing the needles and the air piston springs and this is where you are most likely to run into trouble with this set up. I've told you how to take care of the needle problem, and to a degree, the spring from a TR-4 SU should work well since the amount of vacuum on the piston across most of the power range should be similar. Stiffer springs make the piston move slower, giving a richer mixture on acceleration. You can also play with the viscosity of the oil in the air piston damper- thicker oil make the piston move slower, thus giving a richer mixture on acceleration, and, conversely, thinner oil gives a leaner mixture. SUs are just about the simplest and most reliable carbs ever made. This simplicity does have a price, however. They can hardly be described as performance carbs and, as with the TR-4 Strombergs, they will run slower and rougher with increasing air temperatures and engine heat. Frequent adjustment is almost a given. The choke is one of the worst and the rubber washers on the float bowl mounting go hard, break, and leak if the car is rarely driven. There are many models and types in the 1 3/4" size - some with automatic chokes and other peculiarities so you need to know whence they came. If you are a novice and you want a carb that you can understand and work on this is your baby - just be sure they are off a TR-4. You may also notice your engine looks like something is missing since they are considerably smaller than the Strombergs. As with the TR-4 Strombergs, the linkage adjustment will add to the cost if you don't do it yourself.

ADDENDA TO ZENITH STROMBERG CARB MODIFICATIONS

ADDENDUM #1

Re. Option #3. New jets are available from Joe Curto, 230-22 58th Ave., Bayside, N.Y. 11364 at \$8 each.

ADDENDUM #2

PERTAINS TO ZENITH-STROMBERG SECTION ONLY

The replacement TR 4 jets now available from some (probably all) suppliers are, in my opinion, inferior and should be used only if the old jet is noticeably and severely worn. The replacement has a sharp top edge where the original has a chamfered edge. This sharp edge cuts the 'O' ring if the 'O' ring is placed between the oriface and the 'O' ring washer then the jet pushed thru (which is the proper way to insure 'O' ring seating). The replacement is two pieces, a shoulder and a tube, either pressed or cemented together. The tube is also .001" larger than very good stock old ones I have measured. In some instances the jet will bind in the jet oriface bushing making the jet non-adjustable. It is also possible for the shoulder to separate, again causing the jet to be unmoveable.

Obtain New Old Stock (NOS) needles or use good used ones initially (it is easy to change them and retune the carbs later). Replacement early TR 6 needles now available from most (all ?) suppliers are made by the same firm. I have used only one set (certainly not enough on which to base firm convictions) and feel the car does not perform as well as with reasonably good old needles. Again this can't be determined without some sophisticated test equipment so it is only my opinion.

Despite the above, the main objective, to have adjustable Strombergs, can be accomplished.

ADDENDUM # 3

The replacement of lean running emission system carburettors with adjustable carbs should increase power and smoothness but DECREASE gas mileage. To establish a normal cruising range for your car, it is advisable to fill the tank at not more than 200 miles for the first 1000 miles of operation.