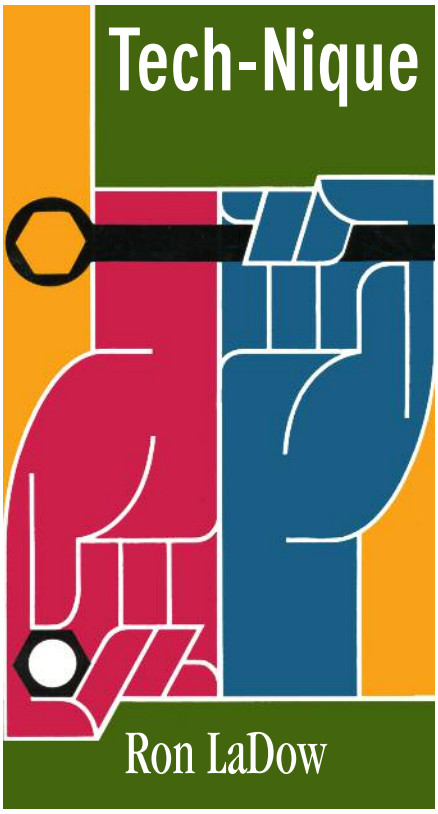
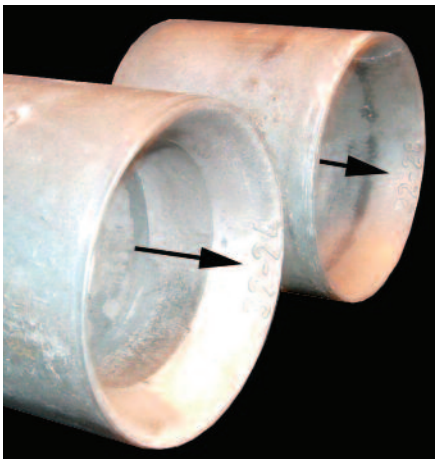


Rebuilding Zenith 32 NDIX Carburetors



Look at the 3 o'clock position on the two venturis. The one on the left reads "32-24"; on the right, "32-28". The last numbers denote the effective venturi (inside diameter) sizes.

In beverages, carburetors and other matters, we all have our favorites; I'm partial to Zenith carburetors. The 32NDIX (type NDIX, 32mm throttle bores) were fitted to more of our cars than any others. Whoever worked out, or lucked into, the transition circuitry in these things did us all a favor; no flat spots from idle to wide-open.

The type NDIX has also been in production longer than any of the stock 356 carbs (until 2005) and they are available at 36mm throttle bores to compliment our aftermarket big-bore kits.

Sooner or (mostly) later, they will need attention. But before you decide to rebuild them, make sure that's what they need and what you want.

"Zenith problems" are like any "carb problems": 90% of them are directly attributable to something other than the carbs. Carburetors are mechanical objects and subject to the same physical laws as other mechanisms. The parts are visible and open to inspection; there are no "magical" carb problems.

Real carb problems are limited in number and Zeniths might have these:

1. Fuel leaks
2. Incorrect adjustments, including float level.
3. Plugged passages.
4. Plugged jets.
5. Parts in the wrong place, damaged or missing.
6. You don't want to look at them any more; just plain ugly. They probably work OK, but they're pretty tired.

One, three and six require a rebuild. Five probably does. Two and four don't, just some tuning work. Fix even five of these and whatever is going on is not a carb problem.

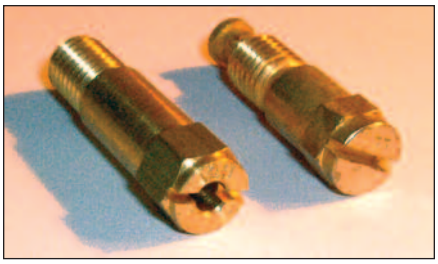
If a rebuild is in order, there's no reason a competent owner can't rebuild them. It requires little special tooling and no special skills. But some parts need careful attention, and there are other bits of knowledge that can make things easier. The general progression is the standard of:

Disassemble, clean, inspect, prepare and reassemble. And tune.

Identification

32NDIX Zeniths left the factory in three versions: N (Normal), S (Super) and C (356C). Normals had 24mm venturis, while both others had 28mm venturis. Assuming they haven't been altered, the size is cast inside the top of the venturi and is visible (left).

Jets carry over a lot. Check the manuals (factory or otherwise) or Precision Matters web site for details about what jets your carbs should have. All jets were machine-stamped when new; the number reflects the size in mm such that "130" equals a jet with a 1.3mm hole. Two numbers means tenths of a mm; "40" = .4mm.



Jets have Factory stamps that indicate the orifice size. #130 main jet on the left, #55 idle jet on the right. It's pretty rare to have the numbers arranged radially as on the main jet.

If the number is 'hand-scribed' or missing, the jet has been altered and whoever did so was kind enough to make that clear. Jet measurement and selection is covered later.

There are other differences in the carbs over the years and these can help you decide if yours are original.

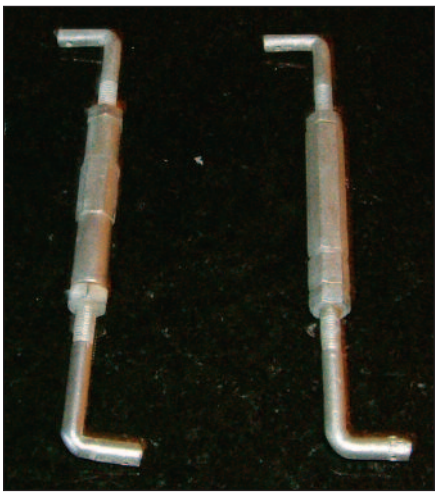
All OEM carbs are date-stamped, and factory-fitted carbs are typically within a month or so of each other:

22 64 = 22nd week of 1964. You could easily see 21 64 and 26 64 on original carbs.

On a raised, oblong boss, you'll typically find some stamped letters/numbers:

On carbs fitted to cars earlier than T6, you will commonly find P03L, P03R, or P02L, P02R indicating left and right. Carbs fitted to T6 cars tend to be numbered P0191 (left) and P019 (right). Other numbers, some seemingly random, have shown up from time to time so this is not exhaustive.

On carbs to approximately 1959 model year, the accelerator pump link is different from later carbs.



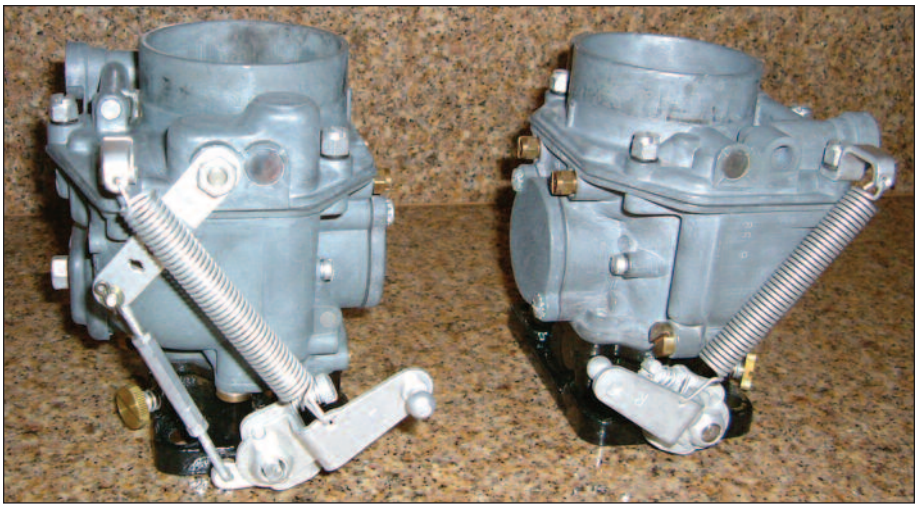
The earlier part (left) has additional machining, leaving the hex shape for only part of the length. The later is hex-shaped the entire length. The earlier part has the hex portion offset toward the right hand thread. The later version has a groove cut into the hex to indicate 'left hand threads'.

Also note the left hand lock nuts are thicker than the right hand parts. Finally, the hex and the lock nuts are 5.5mm across the flats; buy a couple of wrenches and save some money.

On later Cs, the right hand throttle stop screw is threaded into the throttle body, not the throttle lever.

Note the use of a carb top screw and the thick washer. All other throttle stops are slotted, knurled screws which thread into the throttle lever, not the throttle body.

Certain parts mountings and alignments are common to all Zeniths as fitted to 356s. Accelerator pump links and throttle springs are obvious visual clues; here's where they go:



The left hand threads on accelerator pump links go to the bottom. The upper ends of the links attach to the upper lever at the outermost hole. Note the lower end of the link points 'in', the upper end 'out'. Note also the location of the upper throttle spring clip; at idle, the throttle spring is at nearly 90° to the lever. Finally, the upper spring clip is parallel to the throttle shaft, not swiveled toward the spring.

Service

Before beginning, keep in mind that the newest of the factory-fitted carbs are now more than 40 years old; parts which are easy to find are not cheap and some are not so easy to find and even more "not cheap". Rule #1: Try not to lose or damage anything. On disassembly, pitch the paper gaskets, but don't let anything else get away. Be careful.

By now, most every carb has been rebuilt and/or modified. Rule #2: Do not believe what you have is what you want. Venturis and jets have migrated in great numbers over the years. And where they haven't migrated, they might have 'evolved'; keep an eye out for any modifications hiding among your jets or other parts.

Regarding "what you want", if your engine is stock, use stock parts. No one has better data on stock engines than the factory. Those of you commonly driving higher than 2-3,000' above sea level, check and follow the factory recommendations.

Street-cammed, 1,720cc, S and C engines near sea level do fine with 28mm venturis and "S" jetting, but a 55 idle jet helps. Compression ratios above 9.6:1 will need richer jetting, both idles and mains. I have no jetting data for aftermarket exhausts.

Allow enough time. Careful first-time rebuilders can budget a weekend and another Saturday to refit and tune, plus some in-between effort. Those with more experience will use less time, assuming in both cases it's quicker to do it once right rather than the alternative. Add what's required if you need machine shop services or a search for parts. For reasons listed below, get two Rebuild Kits per carb from two different OEM suppliers.

Disassembly is straightforward but to avoid twisting the throttle shaft, use some sort of pliers on the throttle shaft "keys" when removing the nuts. Each end of each throttle shaft has a key of some sort; see exploded view.

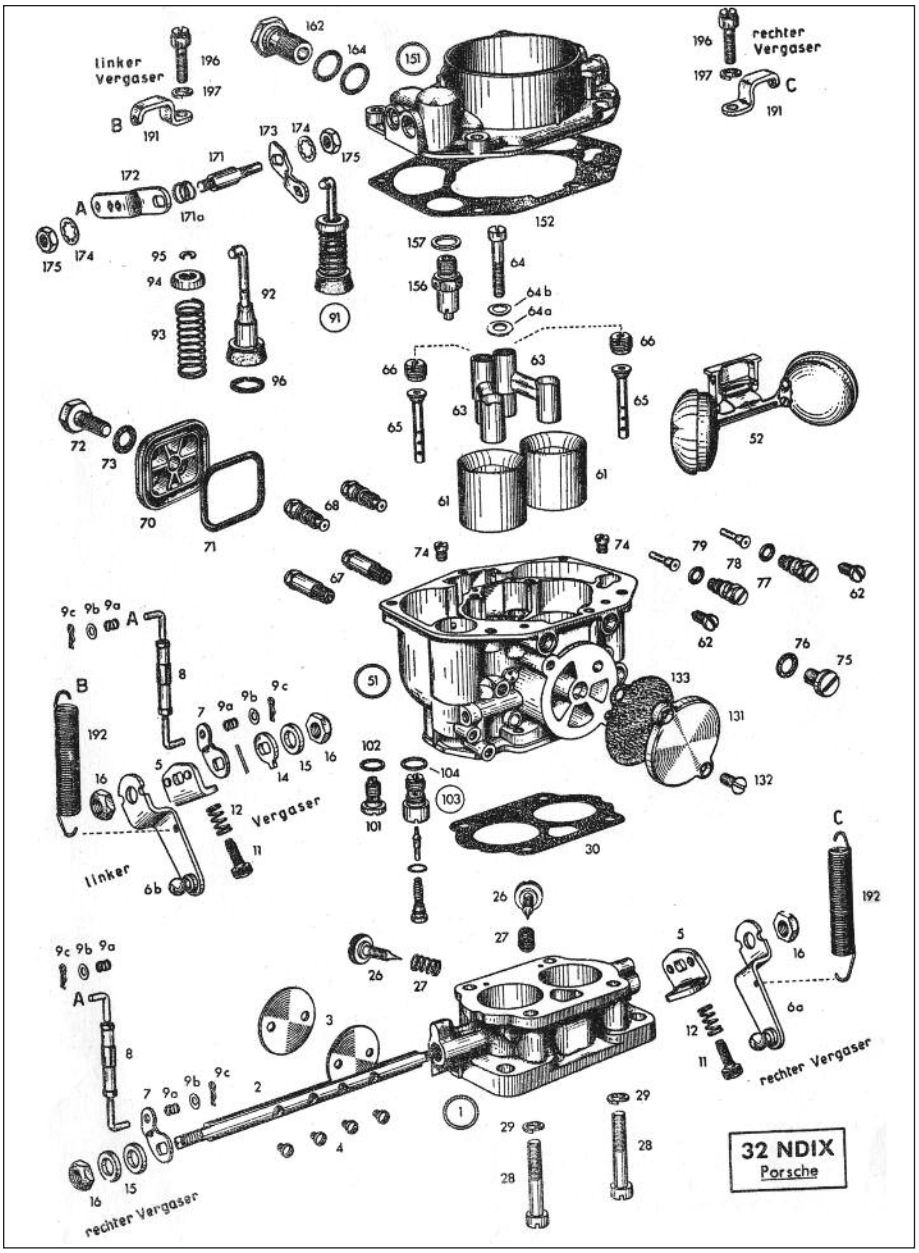
Use a socket wrench/nut driver instead of a screwdriver on the cover screws and the pump jets (8mm). Use a very wide screwdriver on the accelerator pump valves and the side plug (A Dzus driver, ground straight works well and has a surface large enough to take assistance from an adjustable wrench). Use sharp screwdrivers which fit the slots on the other screws/jets to remove them (this might be the time to replace some of your old "pry bars" with some new screwdrivers).

The auxiliary venturis come out after the throttle body is removed; use one of your old, dull screwdrivers through the venturi with the blade in the 'armpit' of the part. Tap on the handle with a small hammer or mallet. Even with this method, one will occasionally break and leave the stub in the carb body. A 5/16"-18 tap will remove every one of them.

You do not need to remove the venturis, just make sure they are what you want. Removing them requires a punch of a very specific diameter.

Rarely is there any reason to remove the upper pivot shaft of the accelerator pump linkage; if it turns, it's fine. Please do not remove the center plug from the accelerator pump exhaust valve and be careful if you are removing the venturi set screws, they are often difficult to remove and refit. See exploded views for identification of the parts mentioned above.

Even now, Zeniths don't commonly leak enough air around the throttle shafts to need help, nor do the butterflies gouge the throttle bores. Good material choices and generous dimensions



NDIX exploded view: See part #14; note a small tab pointing downwards. This tab gives you a 'key' on the left front throttle lever nut, the others are more obvious. Careful use of pliers here and the other locations will ease removal of the throttle shaft nuts (without twisting the shaft) and leave no marks. Upper A/P pivot shaft is part #171; leave that, #173, 174 and 175 alone. Accelerator pump exhaust valve is part #103; it is shown with its internal parts underneath. There is no reason take them out of the valve.

really make the difference and that means there's rarely a reason to remove the butterflies and/or shaft. Leave them be unless they show obvious damage. If you have obvious damage, finding a replacement throttle body probably costs less than a proper repair. Precision Matters fits sealed ball bearings as a permanent repair, other sources offer alternatives. Note that the throttle bodies are not date-stamped, so there's small reason to keep an original.

Cleaning

Cleaning is a matter of chemicals and mechanical processes. Various 'mild' cleaners (soaps such as Simple Green) do just fine if you let the body parts soak for more than a day (brass parts take only a couple of hours). Real "Carb Cleaner" is available, but it will still take a day or so of soaking, and it is nasty; impermeable gloves, long sleeves and eye protection are required!

Use the chemicals you wish, but scrub with whatever looks appropriate, water-wash and dry the parts. You really do need an air compressor; the passages need blowing-out. A fine-wire brush or a soft wire wheel cleans up brass parts nicely. Mechanical picking or scraping may be required; chose your weapons based on the metal and the surface you're cleaning.

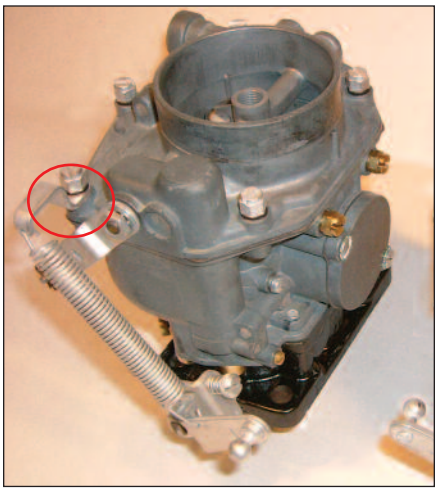
Preparation begins with a look at the clean parts, both the surfaces and the holes. You will find the gasket surfaces on the zinc castings are warped every time. Sand, mill or lathe-face the parts, taking off most of the high spots, but don't bother with total contact; there is a gasket and you don't want to remove more metal than you have to.

The most commonly stripped threads are at the cover screw holding the return spring. If you can repair them, you wouldn't be reading this article. Everyone else needs to find a source to repair them. The thread most commonly stripped (that top cover screw) is an obsolete French standard. Precision Matters fits 'un-strippable' steel inserts of the proper thread pitch to accept the stock screw. Others also offer effective fixes.

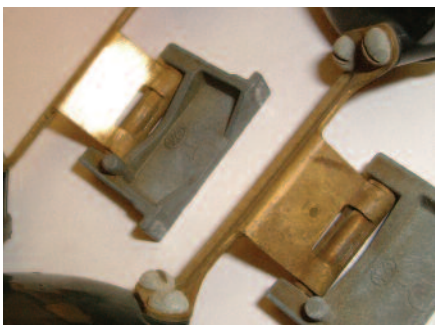
The other threads are current standards; any competent machine shop can repair them. The fuel inlet (banjo-bolt thread) is m12x1.25; there are two other m12 thread pitches.

You can poke at the various ports with soft wire, bamboo skewers and the like, but it's rare that anything is gained.

Floats are almost always good. Shake them and listen; liquid inside means they are 'sinks', not 'floats'. Or weigh them, but do not put them in hot



This screw and its threaded bore take the load of the throttle return spring. It is also an obsolete thread.



You can see the wear mark on the right hand part; the left hand was polished with the Dremel tool.

water and look for bubbles; if you get bubbles, you've ruined your floats. A 'scotch-brite' wheel in a Dremel smoothes the toggle surface on the floats and removes the wear from the valve tip so you won't get funny readings on the float level.

Parts and Warts

It is a good idea to confirm that the numbers on the jets bear some resemblance to the diameter of the holes in them. As mentioned earlier, jets can 'evolve' and the 'field marks' may or may not be accurate. That means either real cleverness with the tapered ends of those bamboo skewers and a caliper (push the skewer in, pull it out and measure the compressed part), or some jet pilots and/or drill shanks.

Plated or not, make sure the accelerator pump link is both complete and adjustable by finger (clean the threads).

The sealing around and through the jet cover (part #70) is problematic on earlier carbs; look at the threaded boss cast into the float bowl which accepts the jet cover screw.

Upper carb is "new", lower is "old".

Around 1962, the Zenith factory made things easier for us. Prior to that, the boss was sort of left out there hanging. After that, it got a stiffener which was a pretty complete fix for a common leak.

In the earlier ones, after the third or so rebuild, the thing got bent. This causes the bolt to tighten out-of-square to the sealing surface under the head of the bolt, which means a leak. The leak is directly from the float bowl and figures heavily in the belief that 'Zeniths leak'. The fix is to carefully clamp the carb body in a vise with smooth jaws, bending the boss back to some semblance of normal. No leak. Rarely, the cover itself has been deformed such that it won't leak with the bent boss, and will once the boss is straightened. You can gamble; I straighten the cover to match the straightened boss by much the same process (using spacers as required).

While we're looking around here, take a look at the area around the jet cavity; the "edge" where the O-ring seals. Occasionally, there will be a 'notch' or 'scratch' across the sealing area and the O-rings are not compliant enough to seal that condition. If you find such, just smooth it into the surrounding part of the sealing area with sand paper, removing the minimum amount of metal to do so.

Accelerator pumps

Check both accelerator pump valves; the inlet (part #101, above) rattles when shaken and the exhaust (part #103, above) shouldn't 'stick'; push on the center pin with a tooth-pick or the like and make sure it moves easily.

Plated or not, make sure the accelerator pump link is both complete and adjustable by finger (clean the threads).

Accelerator pump pistons also deserve a close look and some effort. Note there are at least two different lengths of accelerator pump pistons; counter-intuitively, the short one delivers too much fuel and it is not possible to make adjustments to get the correct amount.

Compare all the pump pistons, reject those obviously shorter than the others.

Also check the fit of the accelerator pump piston fitted to the lever with the cotter pin slid in; some 'ends' are too long and foul the carb top casting. Pick another or fix that one. Stretch the leather skirt on the accelerator pump piston with the end of a paper clip.

Rebuild kits

Why the factory cared about the fourth rebuild is a mystery to me, which brings up Rebuild Kits; you'd think the makers of the kits might care about this rebuild.

None of the kits currently available are complete and/or good. And it seems we simply do not represent a market big enough to get the makers of the kits to take any interest in correcting the problems. For an owner rebuilding a set of carbs, the best alternative is to buy two kits for each carb from two makers; shop the various vendors and ask. Per rule #1 (above), you also have left-over

parts. Inspect all parts before you use them; a couple deserve particular attention.

Look carefully at the aluminum sealing washers; many in the kits have 'dents' directly across the sealing surface. They will leak, so check others from the kits and the parts which you've saved. A good used one is better than a bad new one.

Looking good

Visual finish is either a matter of personal taste or budget, but it is part of preparation. All of the steel hardware was originally (clear) cadmium-plated; you can do the same or zinc-plate the parts. Or you can clean them and use them as-is. Whatever you choose, examine the cleaned parts for function and appearance; repair or replace as required.

There are four visible springs on each carb which should be plated. Buying new ones is probably cheaper than having a plater bake them (which is required if they are replated).

The cast-iron throttle bodies were originally painted in a semi-gloss black. It wasn't particularly fuel-proof; it's gone. Paint them, powder-coat them or leave them (clean) as is your pleasure. The throttle shafts were chrome-plated; on a really 'fresh' set the plating is just visible on the ends. You could pull the shaft and have it chrome-plated if you wish, etc.

Back together

Reassembly isn't daunting; look at the drawing you got with the rebuild kit and note what parts go where; washers matter. Most of it is intuitive, but some processes will save time and aggravation.

Fit the accelerator pump valves to the float bowl first (with good sealing washers). Please note that the side plug (part # 75, above) and the accelerator inlet valve (part #101, above) often try to impersonate each other, and they each will fit in the wrong hole. Don't let them; you're smarter than some pieces of brass.

The accelerator pump nozzles look like 'how in hell do you…'; stick a sharp scribe in the open end, align the flats with the top of the carb body and slip them in.

Make sure that the float bowl/throttle body gasket is installed correctly; you only need to look. Make sure the upper accelerator pump lever (part # 172) is 'keyed' to its shaft properly when you fit it.

It's easier to find and fix leaks before you put the carbs on the car. Leave the tops off, the floats and the accelerator pump pistons out. Pour solvent or gasoline in the float bowls until it's about 3/4" below the top. Using gas or a volatile solvent means you need to take precautions. This won't take but a couple of minutes, be careful.

Look but also wipe your finger under the jet cover, around the jet cover bolt, around (as you can) the accelerator pump valves, and under that tiny brass plug near the accelerator pump. Don't wait; gas will surface-migrate upwards and sideways easily, and you'll think the leak is coming from somewhere else.

You don't have to look for dampness on your finger, just sniff. If you can smell it, you have a 'weep', if you can see it, it's a 'leak'. Take it apart as required, look at and maybe swap parts, try again; fix it. It won't get better on its own.

You can also use the opportunity to push the selected accelerator pump pistons into the bores and make sure both nozzles deliver fuel. If neither do, suspect the piston or the outlet valve. Try stretching the leather piston skirt again or try another piston. Check for valve movement with a bamboo skewer; the center pin should open smoothly against a slight spring pressure.

If only one nozzle delivers a squirt, swap the jets first and then the nozzles; find the culprit and correct (clean) it.

If the carbs are to be adjusted on the car, leave the tops of the accelerator pump links loose, and leave the accelerator pump pistons on the bench until the float level is set.

Fitting the float valve to the carb top with a selected washer (or washer stack) sets the float level; the factory specifies .728" at the top of the meniscus, +/- .04". *The float level is THE most important adjustment on the carb and once set will stay there.* The level changes by about four times the washer thickness, such that a .01" washer change means a .04" float level change. There are at least three different float valves currently supplied and they vary in height by nearly .08" between the shortest and the longest; uncorrected that can yield a change in the float level of about 5/16".

The difference in the heights means they need a different washer/stack under the valve to get the correct float level. If you fit new valves, compare them to the used ones and adjust the stack as appropriate. You can commonly re-use the valves, which means you'll start with the washer/stack you have and go from there, but start with .06" washer/stack, minimum. Various washers come from wherever you find them; I've seen them cut from soda cans (.003"; someone was serious!). Fiber, aluminum, copper, whatever; just make sure they fit the jet and the recess in the carb top and won't leak.

Fit the idle mixture screws (with springs) by hand. Gently; no fresh grooves on your new mixture screws. After you try it two or three times, your fingers will tell you when they stop. If you 'groove' one, you have spares. Back each of them out 1-1/2 turns from the 'stop'.

Tuning

Tuning is covered elsewhere, but keep a couple of points in mind:

Float level controls air/fuel ratio over the entire speed range and really high levels can cause overflow and hydraulic lock in your engine; it is THE most important adjustment on carburetors. At least get it within the factory spec, and it's not hard to get closer.

It takes longer than you might imagine to fill the float bowls. It might be possible on the starter, but start the engine and give it a minute or so to stabilize the float level for reliable measurements.

After the float level is set, you can adjust the accelerator pump volumes; ~.3cc per nozzle for two full strokes. "Close" is fine here. Since you cleaned the threads, the turnbuckles will rotate under finger effort; shortening the link increases delivery. Ideally, you'll have a calibrated vial, but if so, you probably don't need my guidance. It's actually very easy to work around the lack of the vial; a plastic straw from the corner market does fine.

Plastic straw, .2" diameter, folded and taped. Mark 3/4"+ from bottom of the fold. Filled through the short end, the volume below the mark holds very close to the .3cc. spec. Instant calibrated vial.

Synchronization is more important at idle and just off-idle than it is at wide open throttle. Beyond throttle openings of, say, 90%, the throttle shaft limits flow more so than the butterflies, so any inequality doesn't matter. While you're at it, make sure the linkage delivers very close to full throttle (but no more), and get some lube on the various linkage pivots.

Final word

As mentioned above, nothing here takes more than dedication and care. If tuning the engine is a challenge, this is probably not your cup of tea. For those with only a bit more mechanical enthusiasm, rebuilding your Zeniths properly is a satisfying and rewarding effort.

Nothing any professional rebuilder does is beyond what an interested owner can do. You can rebuild your Zeniths, take pride in a job well done and enjoy that seamless performance.

Special thanks (to name a few alphabetically) Harry Beiker, Jim Breazeale, Alan Klingen, Lukes and Shorman, Dick Pike, Ab Tiedemann and probably many more. You don't learn this stuff in a vacuum.