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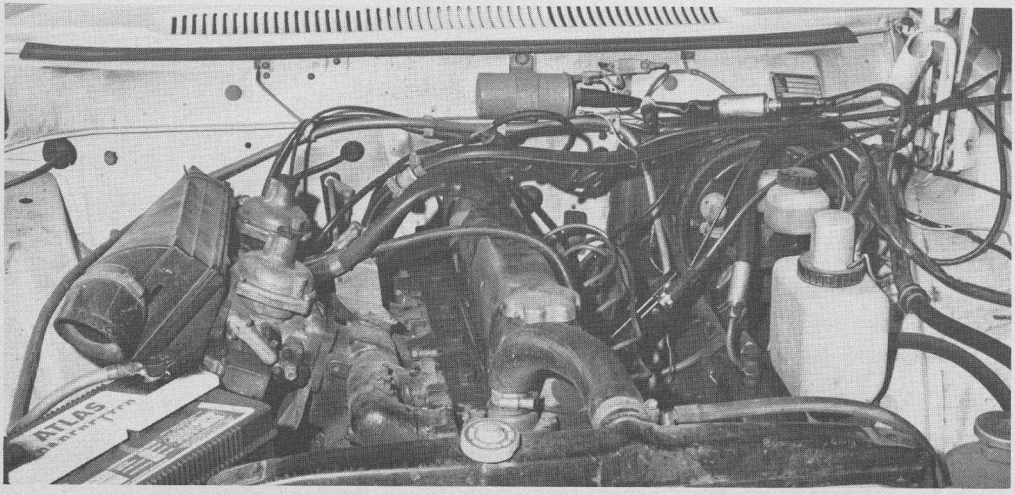
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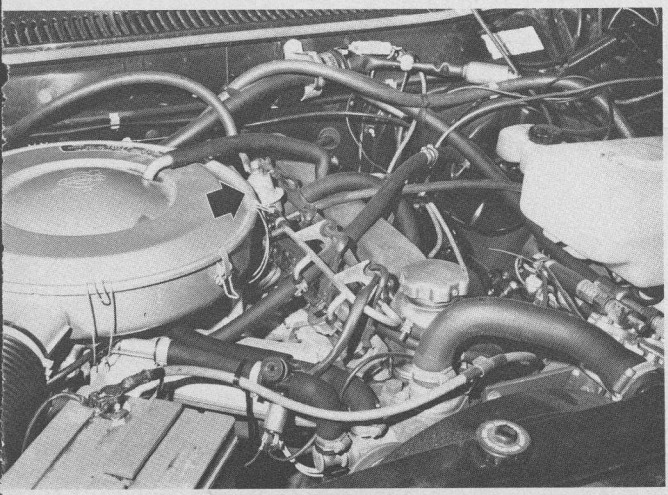


VOLVO 164

Volvo's 164 may be a paragon of civilized virtues, but regardless of model year, it's a lily that can stand some gilding.

By John Christy

Volvo has always been clever with their advertising and accurate in the bargain as well. There is, for instance, that pitch they make for the 164, their top of the line sedan. You know the one: "... a civilized car for an uncivilized world." They're absolutely right; even people with no particular axe to grind who have experienced the 164 tend to describe it in terms approaching hyperbole. "The Swedish Mercedes" is a common example and one gentleman who is addicted to luxury cars—and can afford them—actually laid on the ultimate accolade by referring to the 164 as "the poor man's Rolls-Royce." At $8000 per car the definition of "poor" might be moot, but in an era of $7000 domestic intermediates that price tag could also be considered one of the market's greater bargains.

The 164 arrived on the scene seven years ago in 1968. When Volvo upgraded the B18 engine to two liters, calling it the B20, they also ran up another engine using the same reciprocating components and added two cylinders to make a three-liter six known as the B30. Then they built a car around it and the 164 was born. The new car was introduced so quietly it didn't even make a small splash. It wasn't something that would appeal to the enthusiast and at something over $5000 it wasn't exactly cheap in 1968 terms. The cumulative effect was that it went unnoticed for years, even by the automotive press, ourselves included.

This we have since found regretable because the 164 was and is a very deceptive automobile indeed. In fact, it is so deceptive that unless you put it in a testing situation you aren't aware of its true potential. There are few of the usual bodily inputs that tell you that you are driving a car that performs. It is only when you make a visual check

The B30 engine for the 164 was originally equipped with a pair of Zenith-Stromberg CD carburetors but since 1973 injection has been standard. Arrow in photo of the injected version indicates the pressure regulator described in the text.

of the traffic dropping behind and the reading of the speedometer that you realize you are in distinct danger of breaking one or more provisions of the traffic code. Since the ride, handling and stopping are all equally unobtrusive, the deception is all the greater.

However just about any paragon, especially an automotive paragon, has to have a fault or two. In the case of the 164 part of the car's deceptiveness is the result of such a fault. What it amounts to is a feeling of numbness in response. The response is there all right but it sort of takes time to make itself felt, which tends to destroy some of the fun. In several of the Volvos we have driven in the last year or so there has also been a regretable tendency for the performance to peter out at the high end. True, this is more noticeable in the special versions such as the police model rather than the civilian version because the police version has an automatic transmission that shifts up at higher rpm, but it's there nonetheless.

Things like this tend to arouse the experimenter in us. The lack of a feeling of verve in handling can be handled by suspension options available to dealers through Volvo Western Distributing Inc., a point which makes sharpening up engine response all the more desirable. The question was, could we do it? To spread the chances we had three cars to work with, a carbureted 1969 version, a 1974 injected model and a 1975 model, also injected and equipped with a catalytic converter and electronic ignition. That the last was a police version makes no difference since it was equipped with a California legal engine—and still is. We had few doubts about doing good things with the '69 in spite of the fact that it had piled up a lot of mileage and the valves clattered a bit. The '74 was pretty sharp to begin with and the Bosch electronic timed injector doesn't give a lot of latitude to playing about. However we had had some spectacular successes a couple of years back *(Motor Trend,* April, 1973) with several 144 models which had the same type of injectors, so hope reigned. The '74 was also capable of digesting high test fuel which could help. It was the '75 that we had doubts about since the catalytic reactor causes oddball readings on the exhaust analyzer. They're clean but erratic which doesn't help analysis much.

We'll take the cars in order of age primarily for clarity because there isn't that much difference in the procedures even though the early ones are carbureted, injection being optional in 1972 and standard in '73. All were done at Geraghty Auto & Marine. The dyno figures apply to the Geraghty dynamometer only and should be taken as comparative numbers, not absolute figures.

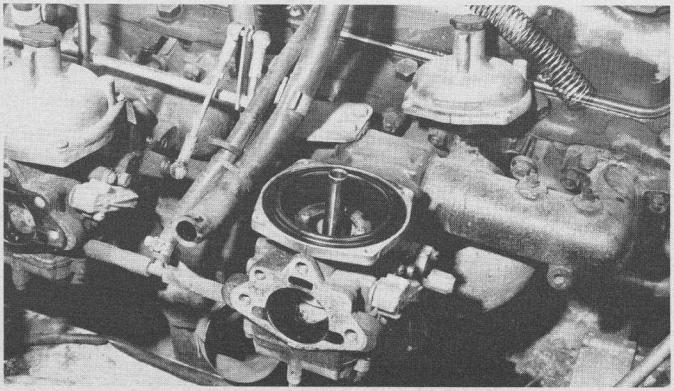
1969

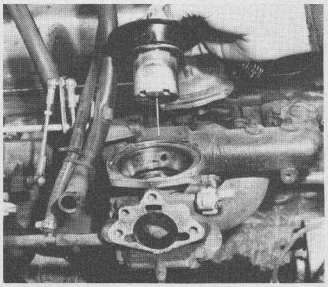
The venerable '69 model demonstrated one point we have made before. To be most effective, tuning procedures, especially those done as dynamometer-derived supertunes, are best done on cars in good mechanical shape. There will be improvement on those that are otherwise but the tuning process can, and often will, aggravate the apparent effect of any mechanical fault. When we picked up the car from one of our fellow Petersen employees it had a mild lope. Since the valves clattered a bit insistently we put it down to the need for adjustment and let it go at that along with obviously old spark plugs, both faults easily corrected.

The valves were set to factory specs and the plugs replaced, Champion L-81s replacing the standard Bosch W 200 T-35 units. The car was then placed on the rollers, even though the lope was still there. We suspected the mice had been at one or more exhaust valve edges but since it was the only '69 we had we went ahead anyway, something that would *not* have been done with a customer car. What we were after was procedural data, not absolute perfection in this case.

The only changes that have been made to the B30 engine over the years since its introduction are the injection and a slight drop in compression ratio, which the figures show. Had the older engine been fresher it likely would have shown more original power but it was still close to that shown by the other two, at least through the mid-range. Up to about 4000 rpm the power curve was nearly equal to the others (see chart) but then began to fall short. This power shortfall was primarily due to an excessively rich air/fuel ratio as it came off cruise and went into power, rather than the mouse-chewed valve. The ratio slid from a fairly fat but reasonable 12.6 to 1 down to a very rich 11.8 to 1. When you consider the stoichiometric (best combustible) ratio is just a shade over 14 to 1 and the best power ratio is a bit over 13 to 1 air to fuel, the ratios shown were rich indeed. This sort of thing happens with both SU and Stromberg-Zenith carburetors when the needles that control the mixture get out of position in the slides. If they have dropped down (out) of the vacuum operated slides (see photo) they produce a lean mixture. If they have moved up, into their sockets, and they are of the right configuration to start with, the mixture goes rich. The last was the case here. Not only was the mixture too fat for power, it was also producing a fair amount of pollution—8.5 percent carbon monoxide and 1000 parts per million in hydrocarbons.

The ignition showed a bit too much advance to start with but then came on quite slowly, not reaching peak advance until nearly 4000 rpm, another reason for the drop in power over that figure. It was removed and placed on the Sun strobe machine where the breaker plate was removed. The secondary spring (see photo) was replaced with a lighter one. This last is a





The Zenith-Stromberg carburetor is easily field-stripped on the car. What you are after is the diaphragm and slide assembly which carries the enrichment needle. It normally is rich enough in stock form but it must be perfectly adjusted for depth.

non standard item made for a kit developed in 1973 for the Volvo 142-144 B20 engine. It is available either from Geraghty (4062 Verdugo Road, Los Angeles, CA 90065) or Axis Research and Development, (P.O. Box 76113, Los Angeles, CA 90076). The price, we understand, is $1.50 including postage and handling. This item keeps the advance stock at both initial and peak but brings the peak advance in at 3000 to 3200 rpm.

The carburetors were field-stripped to the slides and all that needed to be done was to reset the enrichment needles to their proper level with the shoulder even with the surface of the slide. No reshaping, skinning down or other modification was needed, a testimony to the logical choice in needle shape made originally by Volvo. In some cases where the Zenith-Stromberg CD type carburetors have been used the needles can use a bit of judicious thinning down but not in this case—the original over-richness being an indicator.

The car was placed back on the rollers and, after a warm-up, a run was made. The emissions had gone down to 2.4 percent CO and 900 ppm in HC, just about legality for a 1969 Volvo. The cruise air/fuel ratio was now a logical 13.7 to 1 and power phase showed 12.8 to 1—still a tad fat for best power but close. The power readings showed the results, as can be seen on the chart. What isn't shown on the chart was that the 80 hp at 4500 wasn't peak. Power was still climbing but we shut it down in deference to the dog-eared exhaust valve which we subsequently discovered was in number one cylinder. With all the cylinders up to snuff, an educated estimate is that power readings would probably be up from five to 10 horsepower, bottom to top; over 90 hp should be available at the rear wheels from a carbureted 164 in good physical shape.

1974

The 1974 model was just prime for supertuning, showing 3450 miles on the clock. We suspected going in that this one might be also a bit fat in the air/fuel department. The average urban-suburban mileage one can expect from a 164-E is about 18 mpg and change, four examples we've run on our loop giving that figure within tenths. This one had been delivering more on the order of 16 mpg.

Put on the rollers it showed 3.9 percent CO at idle which was indeed fat although it dropped to 1.6 percent at cruise with a 14.2 to 1 air/fuel ratio. Under power it again showed rich with 12.2 to 1. It had seemed livelier than

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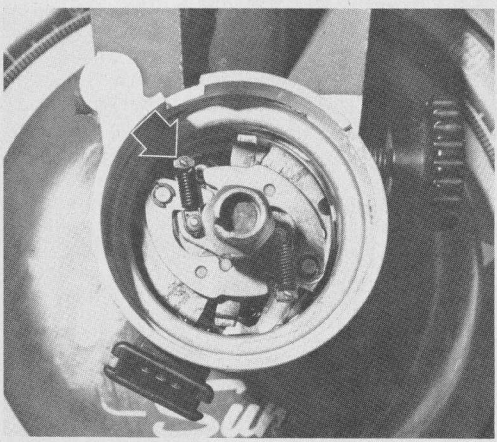
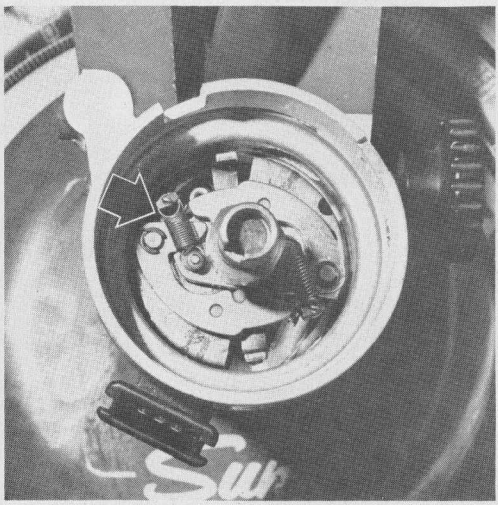
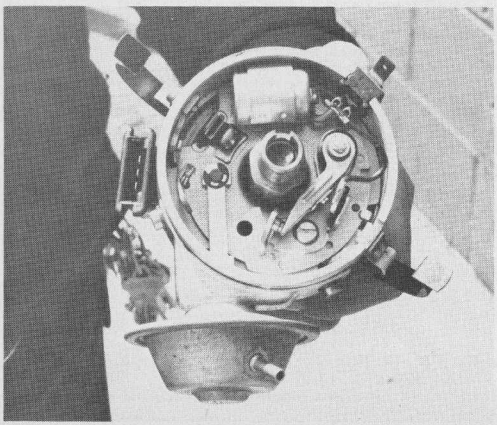
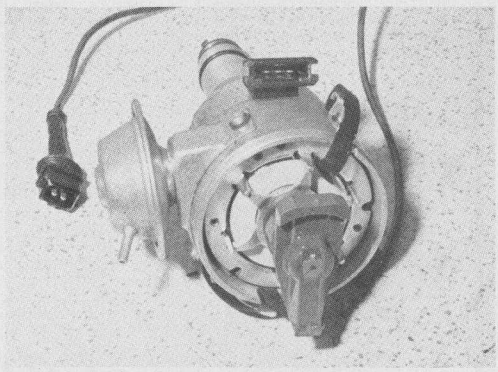




Except for injector trigger plug, the distributors are alike through 1974 and the same secondary advance weight spring (arrows) is used. The same lightweight replacement spring (right photo, arrow) is used for all models including 1975.





The only real difference between 1975 electronic ignition and earlier igniters is the pointless magnetic trigger system. Internally they have the same advance bits.

most on the street but it was a bit numb both at the bottom coming off the line and again at the top end. The ignition pattern was almost exactly the same as the 1969 model, being a bit too much advanced at initial timing and with only a three degree vacuum retard, all of which was probably responsible for the mid-range sprightliness. However, 12 degrees initial is two too many by the book and doesn't really offset a slow curve although a lot of tuners-by-ear think that cranking on a bit more static advance is an answer to something. All *that* procedure does is make things a bit quicker at the bottom and gives too much advance at the top, especially in view of today's watered-down octane ratings.

The mechanics of the distributor of the '74 hadn't changed a bit from that of the '69 and it was given the same treatment with the same type of secondary spring with the same results. The only difference between the two distributors is the provision for the injector connection and *that* item you don't want to mess with. You just disconnect the plug, take out the distributor, field-strip it down to the weights, install the spring and then set the points on a strobe machine at your local garage. This last is really the only way to set points and get the dwell right according to the book. You can, in a pinch, use a feeler gauge at .015 of an inch or even four folds of a fresh dollar bill but to be really right, have the man in the garage do it on a strobe.

The fatness in air/fuel ratios was obviously due to some sort of mis-setting on the injector. The Volvo injector has two adjustments, one on the electronic computer that takes the signals from the engine and translates them into orders to the injector. Its purpose is to determine the precise air/fuel mixture for every driving situation and it makes its decisions from coolant temperature, engine speed, air temperature and pressure and throttle position. There is a setting on the rear of the NOx that governs the initial richness and the richness of the curve it produces. The best thing to do with this is to leave it at the factory setting or adjust it using an exhaust gas analyzer. If the idle is set right the rest of the curve will be about as close as you can expect. The other adjustment is on the pressure regulator that sits on the fuel-feed loop that supplies the individual injectors.

RPM	STOCK	TUNED
	1969	
2000	26	32
2500	39	43
3000	48	54
3500	56	62
4000	60	72
4500	NA	80
	1974	
2000	32	33
2500	39	42
3000	49	54
3500	59	67
4000	72	79
4500	71	90
5000	NA	91
5500	NA	88
	1975	
2000	30	NA
2500	36	NA
3000	47	51
3500	58	60
4000	64	69
4500	77	80
5000	72	84
5500	60	82

Note: Premium fuel used in 1969, 1974 models. Unleaded fuel for 1975 model.

There is a bolt and lock nut on top of this regulator that adjusts the pressure and therefore delivery. Untutored messing about with this one will also result in poor mileage and other problems, but it can be reset to advantage. What we and Geraghty have found is that instead of trying to make fine adjustments, the best setting is to turn the bolt all the way down *gently* after loosening the lock nut and then back it out exactly two and a half turns. Don't bottom it hard but just go down to the point of light resistance and then back it out the two and half turns and cinch down the locknut. If you feel that you lack the sensitivity, have a Volvo or authorized fuel injection man do it for you.

In the case of our '74 we found that the computer adjustment was a shade on the fat side, in fact a bit more than a shade and it was readjusted to give a nice clean 14.4 to 1 air/fuel ratio at cruise. Under full load, full power the exhaust analyzer showed that it had been giving a rich 12.2 to 1 air/fuel ratio which, of course, tended not only to hurt top end horsepower but contributed to that lower-than-average fuel mileage as well. The change in the computer adjustment brought this to a more reasonable 12.8 to 1 ratio. Something around 13 or 13.1 to 1 might have been crisper but the setting on the computer is somewhat analogous to cranking in initial lead on a distributor. If you crank in an adjustment on the low end it will stay with you all the way up the line which is why you don't just go blindly cranking the adjustment knob around. Use an analyzer.

We also found that the pressure adjustment was down more than somewhat over the usual injected Volvo that had been seen in the shop. As a matter of fact, someone who knew what he was doing had run it down to almost exactly the two and a half turns up from bottom that we had found right. This also probably helped provide that mid-range spirit that this car had displayed since the pressure has more than a bit to do with the quickness of the response.

With all these good things, minor though they might seem, taken care of, the car went back on the dynamometer with the figures seen on the chart. Now 90 horses lived where just a shade over 70 had resided before and 91 was seen at 5000 rpm, a point

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where power had started to fall off before. On the street the effect was almost dramatic if one were used to 164s. While there was still just a hint of hesitation off the line, the ensuing numb feeling was gone. When the throttle was punched and held down the car charged right up to the shift points and then pinned us back in the seat when it upshifted. That extra 20-odd horsepower at the rear wheels made itself readily apparent. What was even more pleasant, the throttle response was measurably quickened. It would probably have been quicker still had the vacuum retard and exhaust gas recirculation control been blocked but in California you don't want to do that number, at least not if you want to use chunks of your money for your own purposes rather than those of the state. In any event we weren't even tempted because the response and driveability were so good in legal trim. There was no miracle about it; the potential was there and all it required were some minor adjustments to bring it out. It was a worthwhile trip and also a lesson in the folly of trying to adjust a 164E by eye and ear. It had been *almost* right but those petty misadjustments had blanketed the two extreme ends of the spectrum and exacted a two miles per gallon penalty into the bargain.

1975

This one was the one we had some minor doubts about but proceeded on the premise that it was the same as the '74 except for the catalyst and the electronic ignition system which is a bit more complicated to field strip. The fact that car had perforce to ingest a diet of no-lead fuel which, despite propaganda to the contrary, just does not have the suds packed by premium leaded fuel, didn't help to reduce apprehensions.

The first thing we noticed was that the injector computer box wasn't in its usual place under the passenger's seat as it has been in the earlier models. It has been moved up under the cowl to the right of the glove box behind the cowl paneling board. The reason for this is readily apparent when you look under the car. The catalytic reactor is just about directly under the former computer position and, regardless of what catalyst proponents have to say, these things give off a bunch of heat. Since extremes of temperature affect solid state devices adversely the black box has been relocated. There is an access port to the control knob so it can be reached, however, just below and to the right of the glove compartment.

The next thing that came to attention is that the catalytic reactor really works on idle, particularly when the engine and the reactor have heated up. Even before the reactor had a chance to heat up the exhaust readings showed only 0.4 percent CO and a mere 70 ppm of HC. When the system warmed up we couldn't even get the meters to move off zero.

Fortunately, for our purposes at least, catalytic reactors tend to be er-

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ratic in real-world situations. If you pour the coal to them on the power circuit before they can really heat up you can get air/fuel ratio readings although the cruise readings are about as useless as hot idle readouts. The power circuit showed rich at 12.1 to 1 air/fuel ratio at 3000 rpm and slightly leaner but still fat at 4500 rpm with a readout of 12.4 to 1. The obvious conclusion, though masked by the catalyst, was that it had to be fat all along the curve. We let things cool down until we could get a reading past the catalyst and slightly leaned the computer control—but only slightly. We also found that the pressure regulator had been turned down until it was only two turns off the bottom so it was reset at the standard two and a half turns up. Put another way, we actually set it exactly as had been the '74 car though there was no way to check it for sure. A number of catalyst equipped cars have a removeable tap ahead of the reactor for exhaust analysis purposes but the Volvo 164 isn't one of them. However, due to the exact similarity between the '74 and '75 engine specs there should be no differences in the tuning.

Though the distributor and ignition system on the '75 is electronic, the advance and retard mechanisms are mechanically operated in exactly the same manner as is the standard ignition in the '69 through '74. Due to the precise nature of the beast, though, it is more precisely put together. Circlips instead of snap rings and screws hold the magnetic triggering plate and outer shaft system together. The fit is also extremely tight in some cases; in this case it amounted to a press fit. We could look down inside and see the springs below the trigger plate assembly but we were loathe to use force to push things apart when we had no spare. The springs are exactly like those in the '74 model and the standard mechanical advance curve is also exactly similar with 22 degress mechanical advance at 2000 rpm, 28 degrees at 3000 and a slow rise to a touch over 30 degrees on up the line. The only out for this particular case alone and only for a dyno run was to crank the ignition forward to simulate a faster curve. As mentioned earlier, it isn't procedure we can recommend but if we did it we could get an indicative check run provided we shut things down at the point of diminishing returns and then reset the initial back to its standard 10 degrees mechanical. We did just that, setting the initial advance to 14 degrees, letting the vacuum retard keep things in order as long as it could. Then we put the car on the rollers.

We didn't want to run a full curve and we also didn't expect much at the bottom end because changing the *position* of an advance curve is no substitute for changing the *shape* of the curve which is what helps the bottom and middle range. The results you see on the chart are therefore only indicative, not in any way an absolute or even good comparative figures. What they do indicate is that the fuel situation was right, i.e. that the setting that works on the '74 is also the one that works on the '75. They also indicate that the change in the shape of the ignition curve that works in all previous 164s is the one that works in the '75. Our advice at the moment is that anyone interested get the spring and then take the distributor to an ignition or auto electric shop and have it installed and the distributor strobed.

The conclusion is that the trip is well worth the trouble on any 164. Just be sure that it is in good mechanical shape first.■