



VOLVO'S FAMILY PROTECTION PLAN



This is a book for people who make decisions with facts, not emotions. It's a book for people who aren't fooled by fancy language, who want to know all they can about a product before they buy it.

Since you're considering investing a considerable amount of money in a Volvo we think you're entitled to get straight facts on what you'll get for your investment.

We want you to know all about our cars, so we've prepared this book to help you get smarter about Volvos.

But we're pretty smart too. We know that the more you know about Volvos, the more you're likely to buy one.



1974 is Volvo's 50th anniversary. Since two men decided to launch a Swedish automobile industry half a century ago, Volvo has grown to be Scandinavia's largest industrial concern and a manufacturer of buses, trucks, marine and aircraft engines and agricultural and industrial equipment.

But it wasn't until 1955, almost 20 years ago, that the first Volvo arrived in America. Now there are about 400,000 registered here.

1974 also marks our eighth anniversary of the 144 4-door sedan. In 1967 we introduced the 2-door 142 and a year later we brought over the 145 station wagon. The 164E, Volvo's top of the line model, was introduced here in 1969.

Unencumbered by the artificial demands of frequent model changes, Volvo has had a long time to improve these cars. So you have every right to expect a solid, reliable automobile when you buy a Volvo. Here is why we're sure you won't be disappointed.

At Volvo, engineers outnumber stylists by a considerable margin. It's always been that way and it says a lot about the company and its products. It's one of the reasons for this book. It's certainly a major reason for the reputation Volvo has for building strong automobiles. And it explains why Volvos have shown the results of so much attention to detail.

This consideration towards detailed engineering really forms the character of a Volvo, just as the major engineering features form its personality. We hope that your decision to own a Volvo will be based far more on your evaluation of its personality and character than on its looks. So while we concentrate on Volvo's major engineering features, we also will point out some of these details for you.

We'll call them Character Builders.



A car gets its personality and character from the company that builds it. To evaluate the car, therefore, it makes sense to know something about its manufacturer. Here are some facts to consider.

When you buy a Volvo, part of what you get is rolling proof of the company's commitment to advanced engineering. The seat you sit in was hailed eight years ago as the most advanced in the industry. It's been improved for 1974. The tires you ride on are radials which Detroit is beginning to include as standard.

The brakes you stop with are four-wheel discs found on only two domestic cars. This brake system has a twin-circuit hydraulic system that provides a greater measure of protection than the law requires. The engine that moves you has fuel injection for good overall perform-

ance despite the restrictions of exhaust emission control. The seatbelts you wear were standard equipment on Volvos years before the law required them.

In fact, here's a list of safety features in a Volvo. As you read it, keep in mind that Volvo had introduced them before 1967 and before any safety requirements became law.

- Three-point safety belts
- Rigid passenger compartment
- Impact absorbing body sections
- Three-wheel split brake system
- Rear brake pressure relief valves
- Collapsible steering column
- Interior crash padding
- Four-wheel disc brakes
- Safety door locks
- Rear window defroster

Volvo has proof of another commitment too . . . a commitment to America. The company will be the first imported car firm to manufacture automobiles in this country. Work

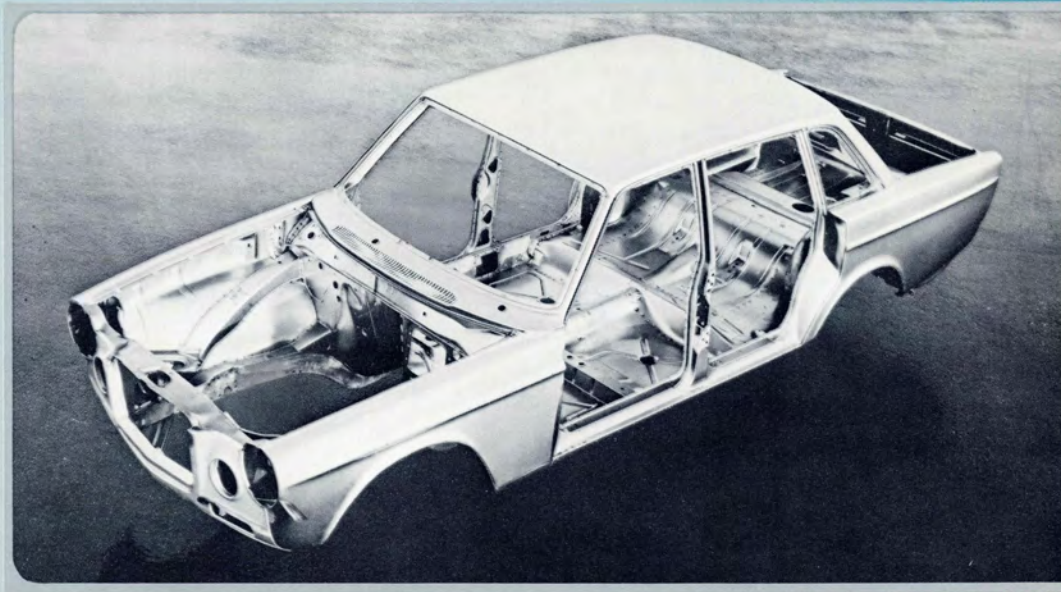
on the plant in Virginia starts in 1974 with production capability to reach 100,000 by 1980. Already, Volvo has more than 425 dealers in America, backed by a multi-million dollar investment in offices, warehouses and parts. This too will grow.

For 1974 you have six Volvo models to select from. Each has its specific advantages and features which are fully covered in our other brochures. But there is one thing common to all Volvos . . . a very small list of options. In sharp contrast to Detroit, a sun roof is the only factory-installed option you can order on the 164E. Standard, for example, is power-assisted steering, power brakes, leather-faced seats, air conditioning and your choice of automatic transmission or four-speed manual with overdrive. All other Volvos also have much more standard equipment than you may expect, so remember that when you compare prices.



SAFETY BODY

The fully-welded Volvo safety body combines six box profiles to form a protective cage around the passengers. Side struts running the length of the car and the large panel sections are designed to provide lightweight torsional strength and to absorb energy in a collision.



When Volvo first introduced the 144, our engineers were proud of how tough they had designed the body. They talked about the advantages of unitized construction which combines the body and frame into a single unit to retain maximum structural strength for the life of the car. They talked about the crash energy absorption they designed into the front and rear ends of the car. They talked about the structural strength of the passenger compartment. On paper, they said, each of the six steel pillars surrounding the passenger compartment would support the weight of a Volvo. We proved it out by stacking six Volvos on top of each other.

And they talked about the thousands of individual spot welds that bonded the whole car together into one solid, rattle-free unit.

Character Builder

Today's Volvos have fewer welds than older models. A weaker body? Not on your life. Those vanished welds have been replaced with larger panels. The result is a lighter, yet stronger body that fits better and has far fewer joints susceptible to rust and cracks.

Volvo's restless engineers have made plenty of other body improvements, too. For 1974, for example, vent windows have disappeared from all Volvos. The result: Better visibility and improved theft protection.

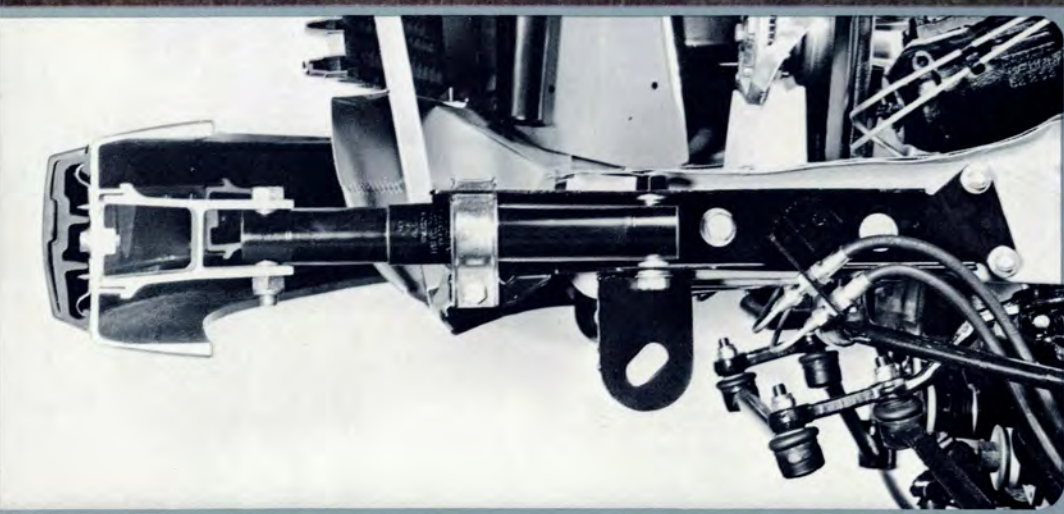
But there's a good reason why Volvo kept vent windows for as long as it did. The engineers wouldn't get rid of them until they were satisfied they had perfected a ventilation system that made vent windows unnecessary.

Also for 1974, welded steel door window frames have replaced aluminum ones. The result: More strength. And passengers are further protected against a side impact by steel tubes welded into the doors.

Speaking of impacts, tests have verified that you can drive a Volvo head on into a concrete wall at speeds up to 30 miles an hour without deforming the passenger compartment. The front end will be crushed to be sure, but the part of the car you sit in will remain intact.

The very first Volvo 144 had tough rust resistant bumpers fitted with full-length rubber strips. The bumpers are much stronger now, but the wide rubber strips remain, still doing their job of preventing the minor dents and scrapes that make so many other cars look battle weary long before their parking lot wars are over.

This year, Volvo bumpers are heavier, backed up by five mile-per-hour shock absorbers filled with an ingenious substance something like jelly. It turns to liquid when compressed and back into jelly after the impact.



GAS TANK

This view of a special cutaway model shows the new gas tank below the trunk's floor, protected from a rearward collision. This change also permitted improving the location for the rear muffler and a redesigned pan-hard rod, just forward of the gas tank.

FRONT BUMPER

Not only the grille but the engine, steering and suspension components as well are protected behind the front bumper. The brace for the bumper's impact absorber also accommodates a tow hook.

REAR BUMPER

The rear bumper can be pushed well forward before it contacts the body. As with the bumper in front, its impact absorbers will take the force of a five mile-an-hour collision.



SPARE TIRE

The station wagon's spare tire, a reinforced 175SR15 radial, is tucked away in a well. Its protective cover and the lid for the under-floor compartment are removeable. Another well, on the right side, holds the reservoir for the electric rear window washer.



CARGO AREA

You can fold down the wagon's rear seat from either side. A new locking mechanism makes this operation easier and, when the seat is up for passengers, more secure. The rear compartment is over six feet long and will hold an extraordinary amount of cargo because of its nearly vertical sides and rear door.

TRUNK

Like the 145, the sedan's luggage space is box-like and tall to store suitcases with the handles up. The spare tire rests in a well and you can use this space on the right side for an accessory gas can. As an example of how Volvo engineers take advantage of waste space, another gas can can be attached into the spare's wheel.



You're bound to notice it anyway, so here is a good place to point out a fault built into every Volvo. Perhaps it proves something about the company's philosophy of building cars. It's the high lip on the trunk. Makes it less convenient to load or unload heavy objects. Nevertheless, that piece of steel increases the structural strength of the Volvo body. It wasn't there in the first prototypes. Volvo engineers put it there, and have left it there ever since, because their tests told them to.

Now 21.5 cubic feet of trunk space doesn't mean much until you see what will fit into a space that size. So we have a picture. Identical wheel wells are located on either side of the floor inside the rear fenders. You can use the extra well to carry tools or a special accessory gas tank. Then there's two gas operated cylinders that make lifting the trunk lid a cinch.

The same is true with Volvo's station wagon. There's a single, more powerful gas cylinder to help lift the tailgate (along with a safety catch), and separate wells for the spare tire and the fluid container for the rear window washer. The 145 also has an underfloor compartment for hiding valuables.

Until 1974, Volvos carried their gas tanks under their trunks. Now all new Volvos have a redesigned gas tank located up behind the rear axle, closer to the center of the car.

When it's full, the tank holds 15.8 gallons of gas and 1.3 gallons of air. Yes, air. You see, Volvo has hidden a little tank inside the big tank. Its job is to accommodate the expansion of gasoline that occurs on a hot day. This little tank is the unseen heart of Volvo's evaporation control system.

Character Builder

The first time you put gas in your car yourself, you'll notice a metal frame on the inside of the gas filler door. Volvo put it there as a handy, loss-proof holder for your gas cap.

All this attention to building a safe, strong body wouldn't be worth so much if Volvo didn't also do a first-class job of protecting it from the ravages of rust.

Most auto manufacturers have learned to do a pretty good job of preventing rust on the outside. Some good primer and a little decent paint takes care of that. But rust from the inside . . . that's a different story. Inside rust prevention really separates the men from the boys.

Volvo starts at the beginning — with the metal itself. Sections most susceptible to rust are made of special hot galvanized steel. It's expensive, but it really resists rust.

Phosphating is the next step. Every Volvo body is dunked in an acid bath. Acid cleans the metal, then etches it all over so the paint has a rough surface to grab on to.

With all the metal nicely phosphated, Volvo bodies take another bath. This one is in a special rust proofing primer paint. Charged with 250 volts of electricity, the entire body acts like a magnet, drawing the paint particles into every last nook and cranny of every last piece of steel. The process is called electro-dipping.



But that's not all. To finish the job right, Volvo undercoats all its cars with two different compounds. One's a permanent sealing wax, the other the black waterproof stuff which often costs extra on other cars. This combination of primer and undercoating adds to superior rust resistance. It's an important contributor to Volvo's reputation for durability.

Character Builder

To protect against corrosion, Volvo engineers have devised a simple system of vents to direct a steady flow of air through the rocker panels. Volvo has cut apart hundreds of damaged cars it gets from its insurance company in Sweden to prove the system's effectiveness.

Did you ever stop to figure out how much time you spend in your automobile? Well, it works out to about 12 solid days a year for an average American driver. Looking at it another way, that's 36 eight-hour working days. That's a lot of hours . . . especially if it means putting up with little inconveniences and discomforts.

The list of interior improvements is short for 1974 because a completely new dashboard was introduced last year, along with a totally redesigned heating, ventilating and air conditioning system. While simple and safe, the old dashboard did have some noticeable imperfections — for example, no face level ventilation, the radio was too far away from the driver and the glove compartment had to be sacrificed to make room for the air conditioning.

Character Builder

The new glove compartment door now does double duty as a snack shelf complete with indentations to hold two cups.

Now all gauges and indicator lights are directly in front of you. The switches and controls you don't use often are on the center console. It's even equipped with extra switch positions for fog lights or other accessories you may want to add.



DASHBOARD

A model of applied engineering, the Volvo dashboard was designed for operating convenience and safety. Fully padded and glare-free, it features grouped instrument and controls layout for simplified reading and use.

INSTRUMENTATION

The combined instrument has rheostat controlled illumination from the top. The tachometer is standard on the 164E and 142/144 GL models, optional on others. Mileage is recorded to 999,999 and supplemented by a trip odometer with the reset button just below.

STEERING COLUMN LEVERS

Just behind the steering wheel are fingertip-operated levers for the windshield wiper/washer and overdrive. Another lever, on the left side, combines the lane changing/turn signal and high beam operations.



The four adjustable vents in the dashboard are the most visible parts of Volvo's new temperature control system. In addition to those four, there are six more outlets to spread fresh, hot or cold air evenly throughout the car.

Two defrost the windshield, two more warm or cool the front passengers and two more run back along the drive shaft tunnel to the floor of the rear passenger compartment.

Fresh air enters the car through an intake grille in the high pressure area at the base of the windshield. Then it moves behind the dashboard into the central control unit with two powerful blowers. These blowers, which you control with a switch on the console, have three speeds — high at 3800 rpm, middle at 3100 rpm and low at 1900 rpm. The high speed, for maximum heating or cooling, circulates air through the car at the rate of 318 cubic feet per minute, a big improvement over Volvo's previous system.

You can adjust all four dashboard outlets from fully open to closed and also angle them in any direction. In fact, by aiming the outside ones at the side windows, you'll discover they become side window defoggers whenever you need them. The key to an effective flow-through ventilation system is getting rid of the air inside the car fast enough. Before abandoning vent windows, Volvo engineers perfected exit vents which they put in the low pressure area at the base of the sedan's rear window. These vents are controlled by a set of simple one-way flap valves. When you prevent fresh air from entering the car, the flaps close automatically.

If you want air conditioning, you'll find it factory installed as standard equipment on the 164E. It's optional at extra cost on the 140 Series models, but take comfort in knowing you'll be buying the same components that Volvo puts into the 164E.

Well, just how effective is all this air conditioning and heating? The best way we know how to answer that question is with a quick set of facts from factory tests: Whether the inside temperature of your Volvo is a freezing 0 degrees or a stifling 125 degrees,

you can change it to a comfortable 72 degrees inside of 15 minutes. We hope you will try to compare that performance with any other car you think you might buy.

And keep in mind that Volvo air conditioning doesn't just mean cold air. On a damp, muggy day you can use the system to remove moisture from the incoming air. Just press the air conditioning switch and adjust the temperature control dial.

Character Builder

New for 1974 on all Volvos is a little yellow light on the dashboard that comes on to warn you that one of the low beams, tail lights or stop lights isn't working.

But how do you know that the warning light is working? Because it goes on each time you switch on the ignition, then goes right out again when the engine starts. This quick, automatic system also checks the oil pressure, alternator charge, parking brake and foot brake warning lights all at the same time. Lights up your dashboard like a Christmas tree.



CONSOLE

Whether or not the air conditioning is in operation (top right switch), temperature is selected by turning the left dial. Heated or cooled air can be directed mostly to the front and rear floors or totally towards the windshield. Pressing the recirculation button shuts off about 85% of the outside air for faster cooling.

DASH VENTS

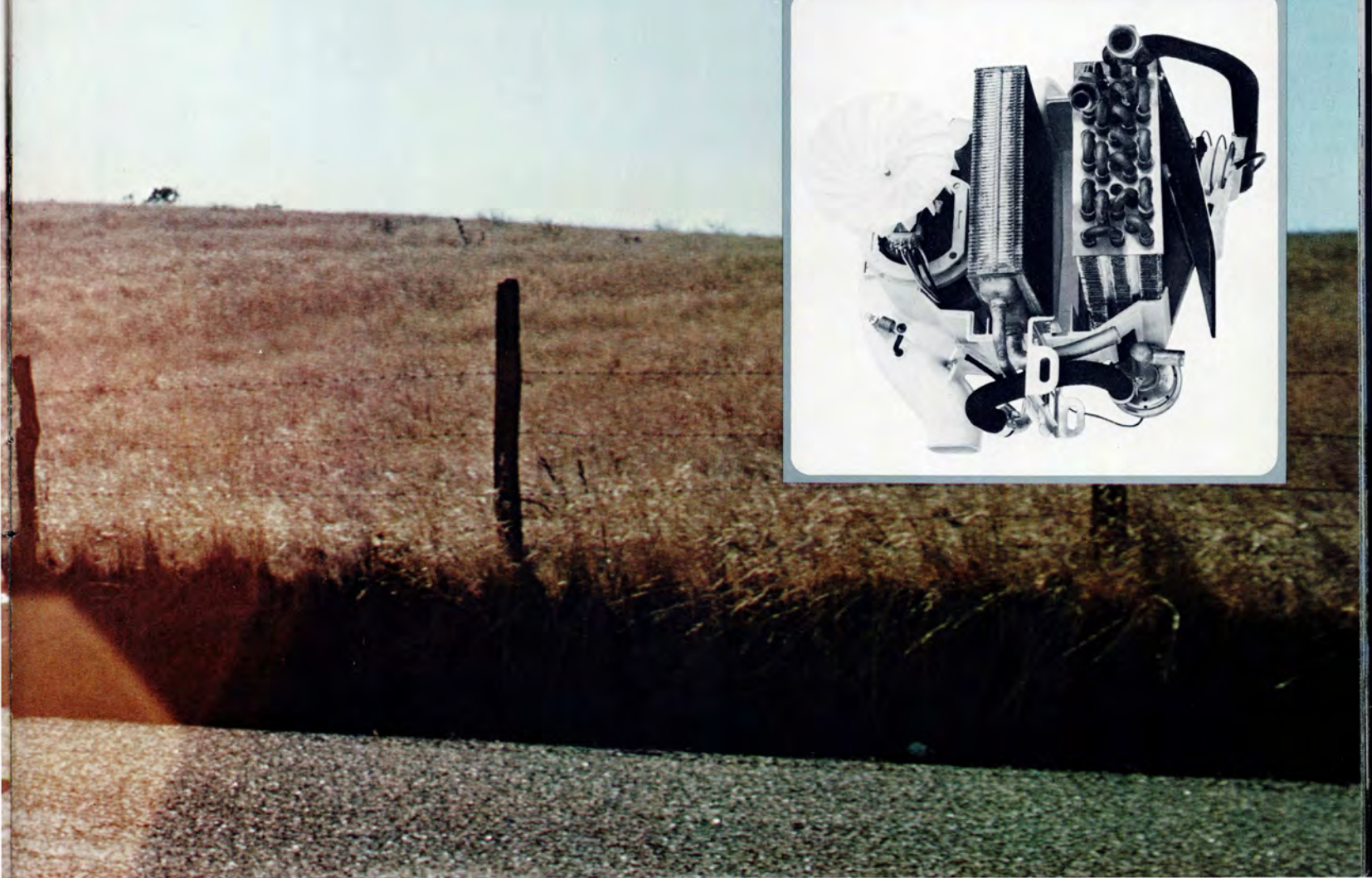
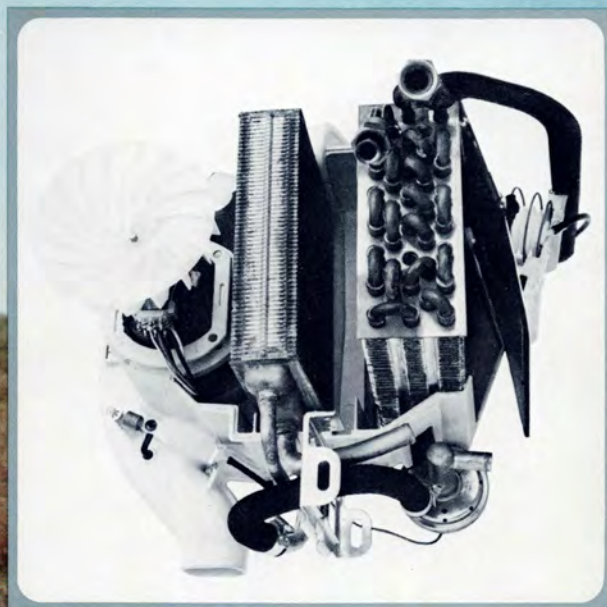
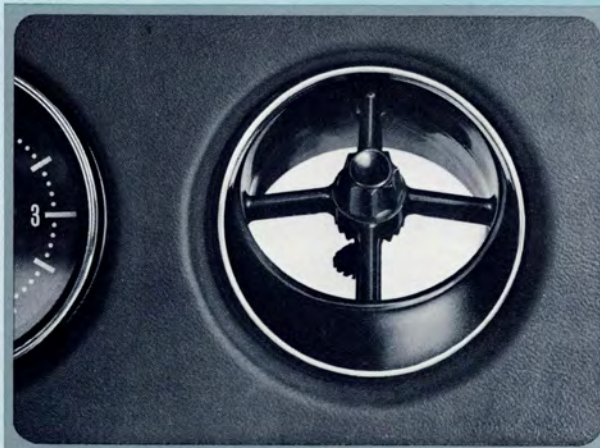
The greatest amount of incoming air is available through the two center dash vents. Similar outlets, which also can be infinitely adjusted and swiveled, are at each end of the dash. For maximum heating these vents should be closed and the floor outlets opened. For maximum cooling the vents should be opened and the floor outlets closed.

FLOW-THRU GRILLE

Looking down through the rear window you see the vents for Volvo's flow-through ventilation system. In between the vents is a one-way flap which lets stale air out.

HEATING A/C UNIT

Side view of Volvo's heating and air conditioning unit shows one of the two fans. Flap to the right is in the recirculation position, used for maximum air conditioning. Normally the flap is open at the top for maximum fresh air intake. Because air passes through the evaporator unit before the heating core (center of the picture), incoming air can be dehumidified on a chilly, damp day and then warmed.



Something else new for all Volvos in 1974 is the controversial ignition interlock required by law. Its job is to prevent you from starting the engine until you, and anyone sitting next to you, have properly fastened your safety belt. Some people are very unhappy about having an electronic device tell them what to do. They may argue about that, but there just is no longer any argument about the value of the belts themselves.

As you may well know by now, Volvo feels very strongly about that subject. The company has spent millions of dollars pioneering safety belts and proving their value to the rest of the world.

While you're evaluating Volvo's personality and character, remember that Volvo was the first auto manufacturer in the world to put safety belts in its cars as standard equipment. Way back in 1959. You can be sure that public demand wasn't the reason. Philosophy was. Since then, the company has studied more than 30,000 accidents involving Volvos and nearly 45,000 people. Here are some of the results: Three-point belts reduce fatal injuries by about 80%. Among belt wearers there were no deaths in crashes up to 62 mph, yet people without belts died in crashes as low as 12 mph. This year, three-point belts are required for two front seat passengers. And Volvo now installs three-point belts for outboard rear seat passengers too.

Volvo's inertia reel system, which is self-adjusting, is among the most advanced in the entire industry. Automatically, this mechanism adjusts the belt for you when you put it on, and allows you to move about, to adjust the radio or open the passenger door. But the mechanism will lock up tight when you swerve or jam on the brakes.

If you're not wearing your belts all the time now, start today.

Character Builder

Fuses always seem to blow out during bad weather. Usually, this means you have to look for the trouble under the hood. But in a Volvo, the fuses, all twelve of them, are kept warm, dry and away from possible corrosion below the dash by the driver's door.



SAFETY BELT

This cutaway shows how the one-piece Volvo safety belt is stored in the rocker panel. The panel is ventilated to be rust free (note the opening at the bottom center), so rather than take up room inside the car for storing the safety belt, the reel is located in the rocker panel. Inside the take-up mechanism is a pendulum which senses sudden movement — quick starts, stops, turns and steep grades — and causes the reel to lock. Normally the reel is free to rotate so the safety belt is easily unwound for fastening and comfortable to wear.

REAR WINDOW DEFROSTING

The value of an electric rear window defroster/defogger was known to us eight years ago. It's still an extra cost option on most domestic models but standard on all Volvos. Special electricity-conductive paint is applied to the inside of the glass. These "wires" will warm the window in seconds to dispel misting and melt ice.



Considering how much time you spend in your car, the room inside it should be important to you. Although engineers have developed formulas for measuring roominess, what really counts is how you feel after you've driven it for an extended period of time. Be sure to spend all the time you need in a Volvo to evaluate its comfort and roominess for yourself. Then take some time to check out all around visibility. In a Volvo you can see all four fenders through 3845 square inches of glass, 4638 square inches in the station wagon. Notice how much room there is between your head and the roof. How much room there is for your legs in the front seats. All this space plus nearly eight inches of seat travel combine to give you all the legroom you should need unless you grow to be over 6'6" tall. In the back, check how easy it is to get in and out, especially how much room there is between the front seat and your knees.

Because engineers call the shots at the factory, there's just no room for wasted space in a Volvo.

Character Builder

All Volvos have an odometer with one more digit. It will read to one mile short of a million before it returns to zero. Volvo added the extra digit for two reasons: To subtly remind you of the durability built into all its cars, and to satisfy dealers and used car customers who complained that they often couldn't tell the true mileage of used Volvos.

With the introduction in 1964 of its adjustable back support, Volvo laid claim to the most versatile seat in the automobile industry. Nine years later, this feature appeared for the first time in a domestic car.

Not content to rest on its laurels, Volvo has improved its seats through the years. 1974 is no exception. In fact, Volvo seats this year have a variety of subtle engineering changes in them, all designed to make them stronger or easier to adjust.

But the most noticeable addition for 1974 is for comfort: Automatically heated driver's seats in all 164E and the new 140 Series GL models. Hidden inside the seat cushions and backrests are thermostatically-controlled heating pads. When the temperature is below 57 degrees, the seat starts to warm itself as soon as you turn on the ignition. It takes but three minutes for the seat temperature to rise from 32 degrees to a nice comfortable 79 degrees and stay there.

Also new is a stronger seatback reclining mechanism. Using a knob instead of a lever, the new system replaces a friction clutch with positive locking gears. The adjustments of the backrests from bolt upright to a reclining position remain. Only the adjusting system is changed. By removing the adjustable headrests you can still lower both front seat backs to turn your Volvo seats into twin beds.



SEAT FRAME

The Volvo seat is mounted on the four protruding studs of the frame. Adjustments are made by using alternate mounting points in the seat, fore and aft by raising the horizontal bar (1), screwing the front attachment up or down (2) and raising or lowering the back of the seat to any of three positions (3). Note the duct (4) that distributes heated or cooled air to the rear floor.

SEAT BACK ADJUSTMENT

Turning this knob changes the angle of the seatback. Another knob alters its profile to give support for your lower back.

HEATED SEAT

This 164E driver's seat has been sectioned to show its many special features. Over the steel frame is a multi-layered cushion on a flexible base. A heating pad is fitted in the cushion and backrest to take away a disadvantage of leather upholstery . . . winter's chill. In front of the net storage pocket behind the backrest you can see the five steel wires forming the lumbar support.



The seat frame is tubular steel. It supports a steel wire grid stretched between coil springs. The seat cushion is made of two layers of plastic foam with a stiffening layer in between. To give you support for your thighs on a long trip, the higher front edge of the cushion has softer foam. And the sides of the cushion and the backrest are raised for lateral support.

Volvo covers its seats with three different kinds of upholstery. The 142 and 144 sedans have tough acrylic cloth that breathes; the material won't retain winter cold or summer heat. And you have a choice of colorful stripes as well as solid colors. The 145 station wagon, which can get heavy use, gets heavy-duty, leather grained vinyl. The 164E and the 142/144GL models have luxurious and durable leather-faced seats.

There are three more adjustments you can make to a Volvo seat. Two of them allow you to raise or lower the whole seat or tip it forward or backward. So if you should happen to have short arms and long legs, for example, you can gain extra legroom at the same time you shorten the distance to the steering wheel.

The third and final adjustment is Volvo's famous adjustable back support, a feature that led *Industrial Design* magazine to call this seat an orthopedic delight eight years ago. Here's how it works. Inside the back of the front seats are five parallel steel wires in a spring-loaded frame. By turning a knob at the side of the backrest, you can tune these wires to provide softer or firmer support for the lower or lumbar area of your back. For those who experience backaches it's an important ride comfort feature. Try it yourself. You can see the seatback bulge when you turn the knob.

Rear seat passengers are in for a comfortable surprise too. Rear seats are contoured for comfort, safety belts are easy to use, visibility is excellent, shoulder room is ample, knee room is exceptional and a fold-down armrest is standard equipment on all sedans.

Character Builder

The little button you had to push to adjust for legroom has been transformed into a long, metal bar which runs across the front of the seat underneath your legs. It's easier to reach but it's best feature is that the bar now releases a catch on both sides of the seat. For more positive locking.



REAR SEAT

Striped upholstery will be more popular in the next few years as will cloth. Both are found in the '74 142 and 144 models. Rear seats feature a fold-down armrest and 3-point safety belts. A lap belt is fitted for a third passenger.

STATION WAGON SEATS

Seats in the Volvo station wagon differ only in their upholstery; leather-grained, heavy-duty vinyl. Headrests can be raised for taller occupants and six other types of seat adjustments are featured.



Last year Volvo completely eliminated carburetors in favor of fuel injection. For 1974, the 164E continues to use electronic injection while the 140 Series cars have a new constant-flow injection system.

Volvo began testing fuel injection in 1968 as part of the search for the best way to control exhaust emissions without restricting performance. Test results proved so impressive that Volvo started installing fuel injection on production cars in 1969, first on the four-cylinder models and then on the six-cylinder 164E. Now you can't buy a Volvo without it.

For good reasons.

Fuel injection on a Volvo engine definitely delivers better overall performance than carburetors. The basic reason for this is simple. It is more efficient to spray fuel directly into the engine than it is to squirt it more or less into the airstream — and then let it find its way into the engine

through the intake manifold. Carburetors have become more and more complicated as engine demands have grown more critical. As exhaust emission controls tighten, the compromises necessary with carburetors become increasingly unacceptable. By more precisely controlling the air/fuel mixture to each cylinder, fuel injection can cope with a considerably wider range of operating conditions. For these reasons, and despite the extra cost, Volvo predicts an accelerating switch to fuel injection by the rest of the auto industry.

The 164E system is electronically controlled by a small computer that automatically reacts to five different functions; air pressure, air temperature, water temperature, throttle position and engine speed. Based on the messages it gets from all these sources, the computer precisely regulates how long the fuel injectors stay open. With fuel pressure at a constant 28 pounds per square inch, the injectors may stay open anywhere from two to 12 thousandths of a second.

In contrast to this proven space-age system, Volvo's new constant-flow injection delivers its precise air/fuel mixture mechanically. As air speed increases and the engine uses more air, more fuel is injected. It's as simple as that. In an era of more complicated engines, Volvo has made a technical advancement everyone can understand.

Of course, there's much more to the CI system, as we call it, than its simplicity. And our electronic injection is more down to earth than transistors and diodes.

Whichever system you get, you'll discover an engine that's more responsive and avoids the hesitation and surge problems associated with today's carbureted engines. An engine that's satisfied with regular, low-lead gasoline.

Character Builder

Adding to the durability of both Volvo engines for 1974 is a variety of modifications starting with stronger connecting rods. Pistons are stiffer, piston pins are heavier, crankshafts are improved and flywheels now have eight retaining bolts instead of six.

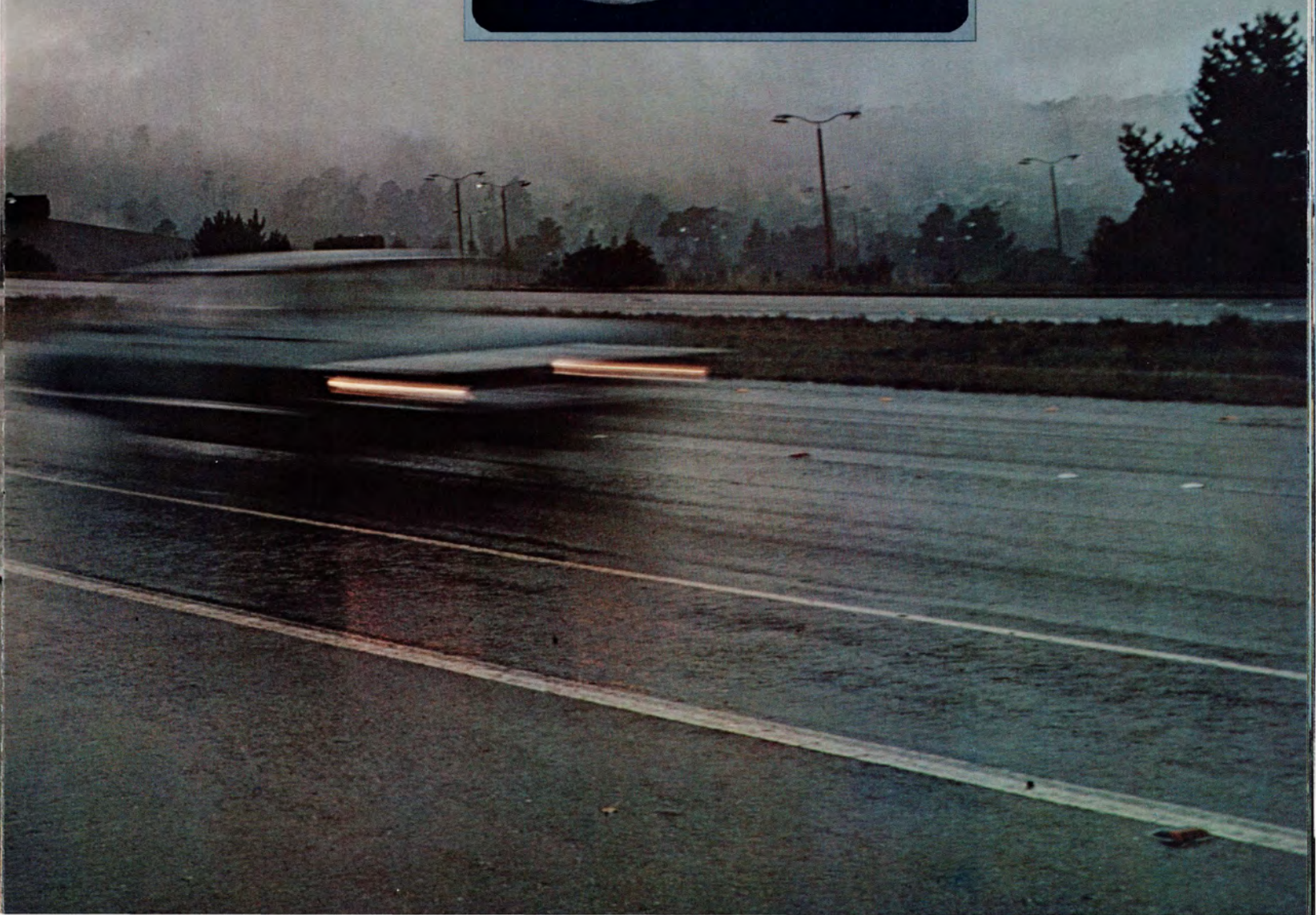
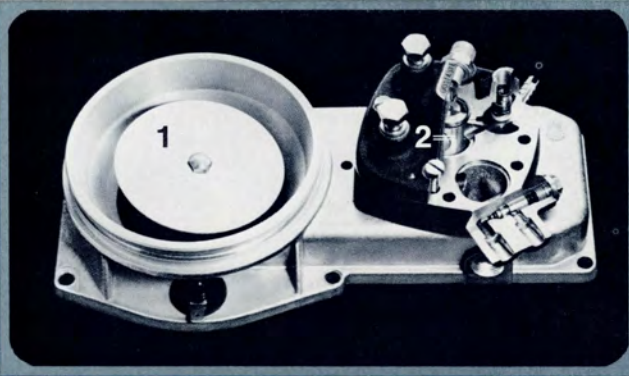
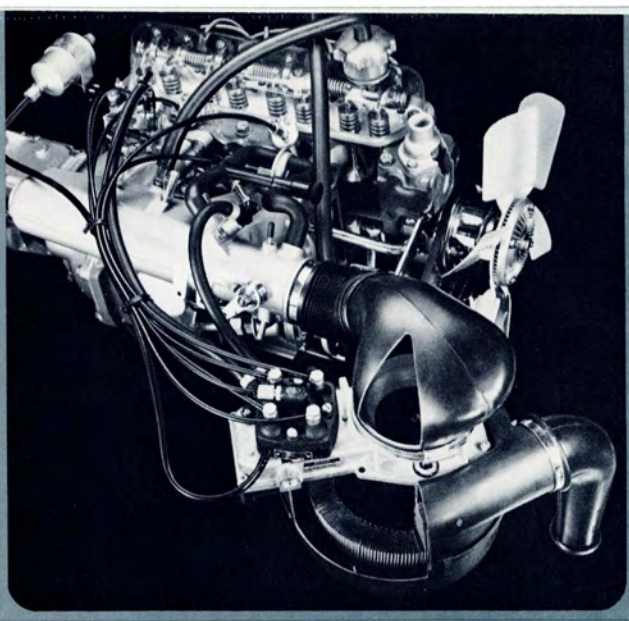


VOLVO CI SYSTEM

Volvo's new CI (Constant Injection) system is a major breakthrough for gaining excellent emission control without a sacrifice in performance. Though complex in appearance, the system actually is simple in operation. Air enters the engine via the inlet snorkel (far right), passes through the fiber air filter and straight up through a conical chamber to the intake manifold.

AIR/FUEL METERING UNIT

A disc (1) in the conical chamber is attached to a balance bar. As more air is sucked into the engine it raises the disc for passage and also lifts a piston (2) to allow an increased supply of fuel to the injectors. The ratio of air and fuel is in perfect balance for fast response and varies depending on engine speed.



Volvo uses transmissions as tough as its engines. Whether you prefer to shift manually with four speeds or automatically with three, your Volvo will be equipped with a transmission designed to match the torque characteristics of your engine and handle all the power it can deliver.

Consequently, Volvo uses four different transmissions. For 1974, the 140 Series manual transmission has a stronger reverse gear and a bigger reverse gear axle stud to minimize flexibility; the gearshift knob now is locked on the lever which also is better secured.

Character Builder

Driveshafts on 140 Series models have two improvements you'll probably never notice either. The rear U-joint is heavier for 1974 and both halves of the driveshaft now are balanced together to reduce the possibility of unbalanced vibration.

When you buy a 164E or a 142/144GL, you get your choice of an automatic transmission or a manual four-speed with electrically-operated overdrive.

Overdrive once was popular on American cars but Volvo is now one of the few auto makers still offering this economy feature. Attached to the rear of the manual transmission and operated electrically by a switch on the steering column, the Volvo overdrive unit in effect provides you with a fifth gear. Engine speed is lowered 21% below fourth gear — for the same road speed.

So on the highway your engine doesn't have to work as hard, which means it will run quieter and burn less gas.

Worth mentioning too are some parts outside the engines. A one-horsepower starter motor, for example. Hooked up to a heavy-duty battery and a 55 amp alternator, it's designed to start your Volvo when the temperature drops way below zero. Combustion gases in a Volvo engine can climb as high as 5300 degrees. Part of this intense heat is converted into the mechanical energy that powers your engine, but more than one-third of it is transferred to the cylinder walls.

Volvo's cooling system is designed to handle the heat. It's sealed to reduce evaporation and corrosion. Volvo also uses a unique cooling fan that never turns faster than about 3000 rpm. A hydraulic slip clutch keeps it from turning any faster, saving horsepower and reducing fan blade noise.



164E ENGINE

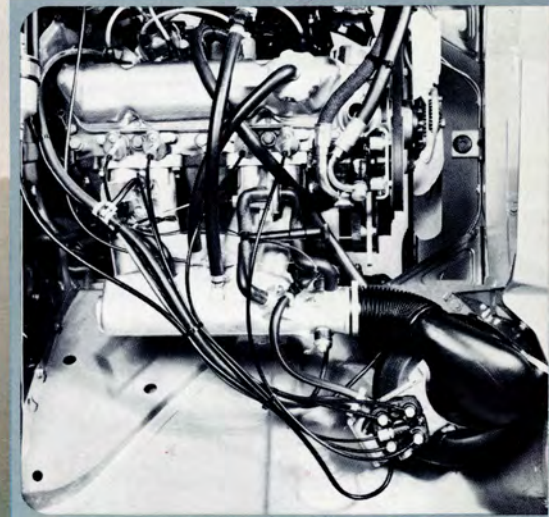
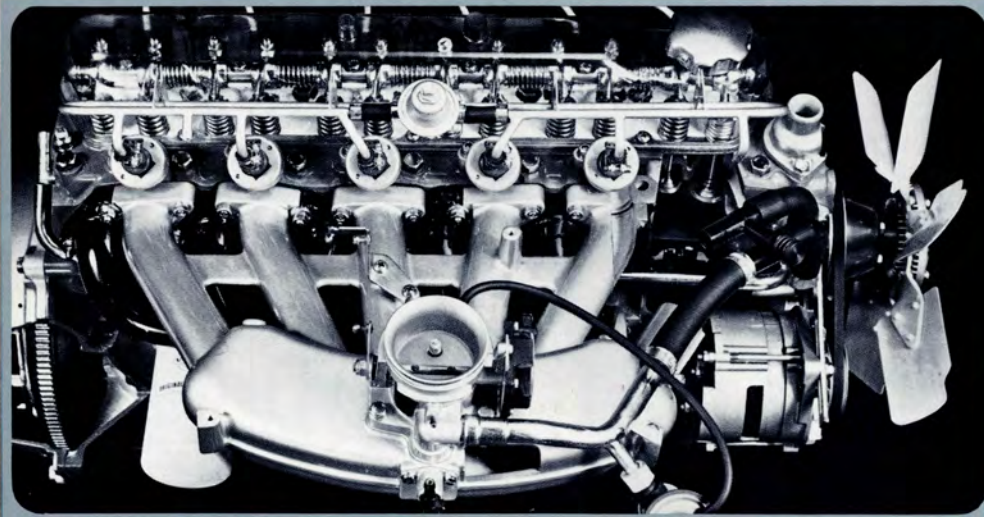
Electronic fuel injection is featured on the six-cylinder engine. A miniature computer beneath the passenger's seat accumulates data from five sensors and orders the injectors to vary their time of opening. By regulating the air/fuel ratio electronically, the 164E engine will adjust quickly to altitude or temperature changes and to the whole spectrum of operating conditions — from idle to acceleration.

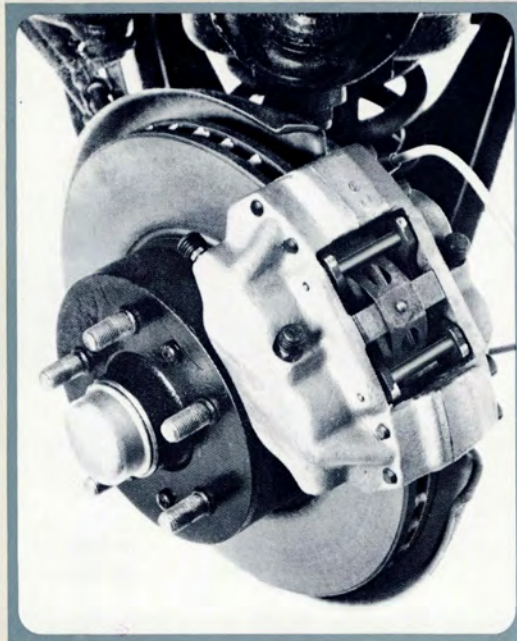
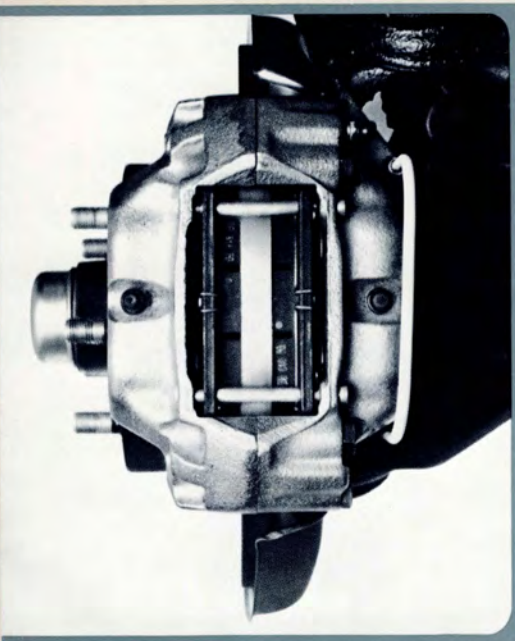
ENGINE COMPARTMENT

Accessibility of engine components, especially the CI system, is evident in this cutaway 144. Pressurized fuel passes through a filter (top left) to the fuel distributor (bottom right), then to each cylinder and a cold starting valve on the intake manifold.

AUTOMATIC TRANSMISSION

Volvos with automatic transmission have become more popular thanks to a clever floor-mounted shift lever introduced in 1972. The lever allows direct shifts between drive and second speed but the push button must be partially depressed to allow entry to neutral or first speed. As a further precaution, the push button must be pressed all the way down for reverse and park positions.





DISC BRAKE CALIPER (Left)

End view of a front disc caliper shows accessibility of the replaceable pads held in position by steel pins. Though seemingly tight against the pads, the disc spins freely until hydraulic pressure forces the pads into contact.

VENTILATED DISC (Right)

Front brakes on the 164E are slotted for better cooling. High heat absorption and fast dissipation along with easy inspection and servicing are features of disc brakes.

Volvo was one of the first imported car firms to offer an automatic transmission and most of our sales today, especially in congested traffic areas, are models with automatic transmissions.

These torque converter, three-speed units feature part throttle kick-down for passing acceleration. Automatic "up-shifts" provide good performance. A new floor-mounted selector was introduced in 1972 to improve the transmission's flexibility. Now you can select first speed only, second speed linked only with the first, and drive speed with automatic shifting between all three speeds. A pushbutton control on the shift lever prevents incorrect or inadvertent shifting.

Because heat build-up can be excessive in automatic transmissions, Volvos are equipped with an automatic transmission oil cooler housed in the base of the engine radiator.



Character Builder

On many of today's cars the foot-operated handbrake is really just a parking brake. But Volvo engineers put the handbrake lever alongside the driver's seat where it's easily reached and operated.

Disc brakes have several advantages over drum brakes. They do a better job of dissipating heat, the worst enemy of any brake. Drum brakes are enclosed, making them hard to cool. Disc brakes are exposed to the airstream. During tests, Volvo discs have withstood temperatures as high as 900 degrees. Able to dissipate heat better, disc brakes are able to handle repeated hard braking.

The 164E, being heavier in front than the 140 Series cars, is equipped with special ventilated discs to further improve heat dissipation.

Disc brakes have greater mass so they can temporarily accept larger amounts of energy (in the form of heat) without fading. This difference can be vital. At times, a Volvo can produce braking effort equivalent to more than 700 horsepower.

Drum brakes have an inherently uneven self-energizing effect. Rotation of the wheel tends to intensify the braking action of drum brakes, but this effect is not even on each wheel. Unfortunately, the time you're most likely to notice this unevenness is when you need your brakes most — in an emergency.

This can be the cause of so many cars skidding sideways under heavy braking. Disc brakes have no self-energizing effect at all. Constant increases in pedal pressure produce constant increases in braking action.

Lastly, disc brakes are easier to inspect and service.

Far too many car buying decisions are based on visible references, such as styling, upholstery and colors. But the Volvo owner, we know, when showing off his new car is more likely to point out the solid engineering features. And the dominant engineering feature of the 164E and 140 Series models ever since they were first introduced is the brakes. That's still true today, although fuel injection now shares the engineering spotlight.

Volvo engineers have done such a successful job of developing this brake system that few significant changes have been made since the first 144 was built.

To begin with, you'll have disc brakes on all four wheels. They've been standard on Volvos for eight years, yet during all that time only one American car has had the same thing. The Corvette. Meanwhile Detroit has pretty well converted to front disc brakes, although sometimes only as an extra-cost option. But perhaps the tide has finally been turned by Chrysler's introduction of four-wheel discs on its Imperial.



If four-wheel disc brakes are so much better than drums, then why is Detroit (plus many European manufacturers) being so slow to make the switch? A straight answer is cost. The auto industry has a big investment in drum brake production equipment. Furthermore, the disc brake system is more expensive. With drum brakes at the rear, it's simple to have the parking brake operate the same brake shoes as the foot brake. But disc brakes require a whole separate parking brake system. That's why so many manufacturers keep drum brakes at the rear.

Volvo hasn't compromised. In its concern for safety the company includes, as standard equipment, four-wheel discs and the separate parking brake. It's actually a complete two-wheel drum brake system built into the rear disc assemblies and operated by steel cables.

Because disc brakes have no self-energizing action, Volvo has added a power brake system to reduce maximum pedal pressure to a comfortable 70 pounds per square inch. The system multiplies the effect of brake pedal pressure by 3:1 for the 140 Series models and 4:1 for the heavier 164E.

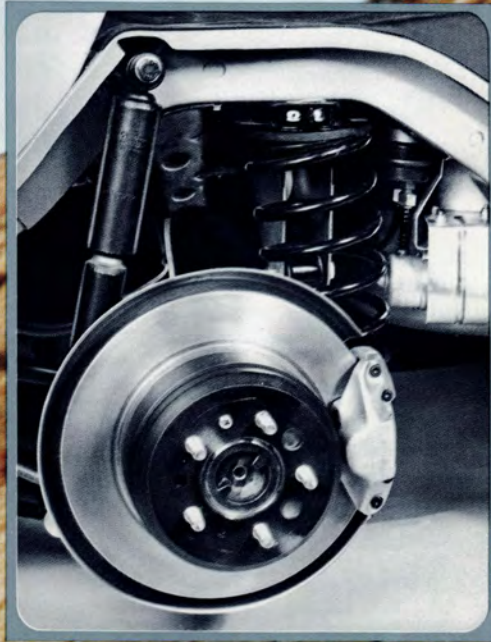
When you apply the brakes, some of the car's weight transfers from the rear to the front. The harder you apply the brakes, the more you unload the rear wheels and load the fronts. The amount of load on a wheel, or how much weight there is pushing it against the road, makes a big difference in its braking capacity. But too much braking power on a lightly loaded wheel causes the wheel to lock. When that happens, normally on the rear of course, braking capacity drops off drastically. But worse than that, the car usually starts to go out of control.

To solve the problem, Volvo engineers have incorporated pressure relief valves in the brake system to prevent the rear wheels from locking prematurely. Under normal braking, the hydraulic fluid passes freely through the valves. Under hard braking, the valves automatically limit the fluid pressure to the rear wheels so that they won't accept more braking power than they can handle. Volvo has designed this system so that changes in brake pressure distribution correspond very closely to changes in weight distribution caused by how hard you use the brakes.



REAR SUSPENSION

To balance the Volvo braking system, smaller pads and larger discs are fitted at the rear. Inside the drum is the independent hand brake. Behind the brake are rear suspension components, a telescopic shock absorber and coil spring. At the right is the electric fuel pump and above it is a fuel pressure accumulator. This latter device reduces the possibility of vapor lock on a hot engine by maintaining pressure in the fuel system and it eliminates an excess of fuel in the system when starting.



If the brakes on all four wheels of a car are connected to the same single hydraulic circuit, damage to the circuit could cause complete loss of brakes. To prevent that possibility, brake systems are divided into two independent circuits. If one fails, the other still works.

Today, most auto makers use separate circuits for the front and for the rear wheels. Volvo's separate circuits each control three wheels — both fronts and one rear. The result is the superior stopping efficiency shown in this table:

BRAKE SYSTEM	APPROXIMATE STOPPING EFFICIENCY
Rear wheels only	30%
Diagonal wheels	50%
Front wheels only	70%
Volvo (Three wheels)	80%

Volvo suspension isn't exotic, but careful engineering of proven components has developed a rugged suspension system that plants all four tires firmly on the road and keeps them there. Volvo anchors its rear axle with two strong horizontal support arms, two torque tubes and a transverse stabilizer bar or panhard rod. This latter feature has been modified for 1974 to provide additional ride comfort.

Four-wheel coil springs and telescopic shock absorbers give just the right amount of bump dampening at each wheel. Subtle changes in spring mountings improve the balance of the new cars and the rear shock absorber mountings are strengthened with new retaining bolts.

An independent front suspension, a strong stabilizer bar, radial tires and proper weight distribution also combine to give Volvos good roadholding and ride comfort.

Radial tires are standard on all Volvos and now are beginning to appear on domestic cars as original equipment. Radials are expensive and difficult to manufacture, but they are credited with significant benefits. They have more flexible sidewalls than conventional tires to absorb impacts and hold the road more effectively. Since the tread deforms less, they roll easier and generate less heat. The result is lower fuel consumption and longer wear.

And radials normally provide better emergency braking, because of better road grip.

Steel-belted radials, though even more costly, have been heralded for their long life. They're standard equipment on the 164E.

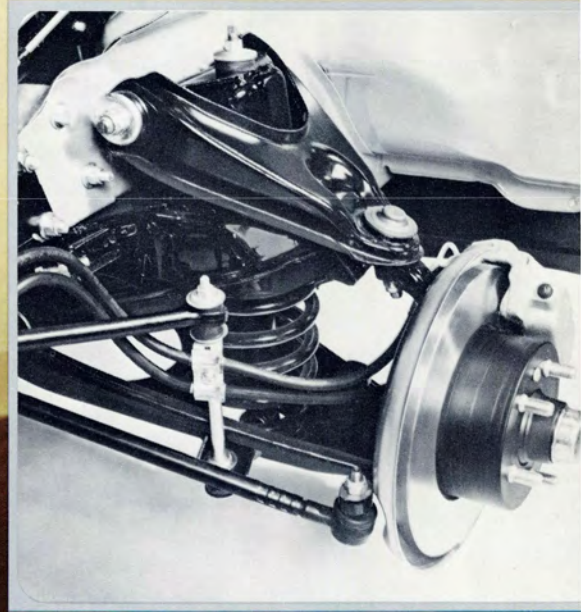


FRONT SUSPENSION

The independent front suspension uses rubber-mounted control arms, a stabilizer bar, double-acting shock absorbers and coil springs. Balanced, unequal A-arms at the top and bottom restrict wheel movement transmitted to the steering wheel.

RADIAL TIRES

Volvo suspensions are "tuned" to counteract the inherent rough riding characteristics of radial-ply tires. Now heavily promoted by tire manufacturers, steel-belted radials are becoming more popular on new cars, though usually at an extra cost above \$100. They're standard on some top-of-the-line models and on the Volvo 164E.



Although steering isn't really part of a car's suspension, it does play a vital role in your evaluation of how a car handles.

Precise steering is part of a Volvo's personality. Knowing that you seldom turn the steering wheel more than 100 degrees, Volvo designed its steering system with a high reduction ratio for lighter steering within this 100 degree range. Other improvements have reduced manual steering effort at full lock by 20% — for parking ease.

SAFETY STEERING COLUMN

This advanced steering column has a break-away joint, a sleeve inside a bellows-type jacket (1), a grooved, slide attachment below the instrument panel (2) and a mechanism which absorbs impact and realigns the steering wheel (3).

CHILDPROOF DOOR LOCKS

Childproof rear door locks were introduced in 1973 models. Pushing the catch down inactivates the regular locking button and the inside door handle but does not interfere with opening the door from the outside.



Power-assisted steering is standard on the 164E and, in 1973, Volvo added this feature to 140 Series models equipped with automatic transmission. Volvo's system carefully adjusts its workload to yours. When you're driving straight ahead, the system supplies no power assist, but it does begin to help you the moment you start turning the wheel. Then, whether you go faster into the turn without changing the wheel position or you turn it even more, the system automatically senses the increased load and delivers more power assist. In fact, Volvo has designed its system so that power increases gradually at first and then increases progressively faster as you turn the wheel more and more. In other words,

Volvo's power steering handles just enough of your work to keep you from ever getting arm weary, but not so much that you lose the feel of how the car is handling.

Character Builder

Many Americans consider power steering a must to alleviate the difficulties of maneuvering in a crowded parking lot. But just as important are front wheels that can be turned sharply. A Volvo will make a U-turn between 31½' and 34', depending on the model . . . at least 10 feet less than many full-size cars.





VOLVO