VOLVO

Engineering Features
164 and 140 Series

Volvo 140 Series

Introduction

Volvo 164

The addition of the six-cylinder 164 to Volvo's product lineup has expanded our coverage in the medium price field. This elegant new car, which shares many engineering features with other Volvo models, also has created additional interest in the lower priced 140 Series.

The family resemblence between Volvo models is not an accident. Styling, we've found, is not among the important reasons owners give for having bought a Volvo.

The reasons that are listed by Volvo owners include durability, quality engineering, economy, safety and good handling. More personal reasons include comfort, visibility, driving ease and luggage space. So Volvo designers haven't resorted to styling gimmicks to identify different models.

The six-cylinder 164, for example, is completely different from the four-cylinder 144 from the windshield forward, but only trim distinguishes the more expensive car in other areas. The real differences are hidden under the hood and inside and underneath the unit body.

This book takes a hard look at all of Volvo's sedans; the four-door 164 and 144, the two-door 142 and the 145 station wagon. It shows you Volvo's important selling features and advanced engineering. And it also details the important changes incorporated into 1970 models. With illustrations and charts this features book shows the differences between models and explains the advantages in owning any one of them.

Distinctive 164 front end features a cast aluminum grille. The distinctive diagonal slash was adapted from classic six-cylinder Volvos of the '30s.

140 Series cars have a B-20 grille insignia, Volvo's designation for the 2-litre four-cylinder engine.

New for 1970 are illuminated side markers, amber in the front, red in the rear. Wraparound turn signals also are visible from the sides.

Stainless steel wheel trim rings and additional molding are 164 features. American-sized whitewall tires are standard on the 164 and the 140 Series.

Volvo's 1250 square inch windshield is kept clean with full-sweep 16-inch wipers. Double laminated windshields on 1970 cars are bonded to the body.

Rear lighting units are set at the extreme corners. Wraparound bumpers front and rear are protected with hard rubber inserts.

Exterior

It comes as a surprise to most people to find that the Volvo 144 is only three inches longer than the Ford Maverick. The 164, Volvo's longest car at 185.6 inches, is in fact shorter than some so-called "compacts."

Volvo has been able to put a full size interior, trunk and engine compartment in a compact size car because of efficient engineering. There is no wasted space in a Volvo. The extensive use of glass says a lot about the car's functional design - there is a total of 3,800 square inches. All four corners of the car can be seen from the driver's seat for easy parking.

Unit body construction combines extra strong side posts and bulkheads with precision-stamped body components. This means, for example, that the doors, trunk lid and hood fit properly to begin with and will stay that way. Another benefit of unit construction is crushable front and rear body sections that will absorb crash impact without deforming the passenger compartment.

All doors open to an 80° angle and have an additional stop position for easy exit and entry in crowded parking lots. Patented latches will keep the doors closed even under severe impact conditions.

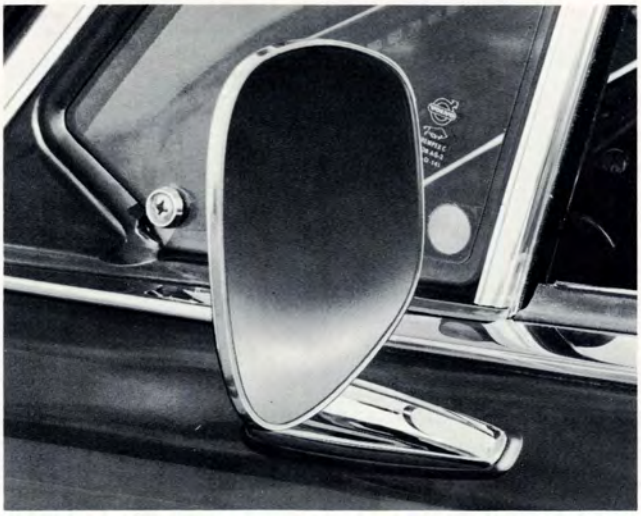
Volvo's strong but lightweight wraparound bumpers are made of rust proof anodized aluminum and protected by hard rubber inserts to prevent dents and scrapes. Another exterior feature now shared by all models is fully tinted glass to reduce radiated heat. An important advantage when combined with optional air conditioning, this feature was previously found only on the 164. The Volvo glass is only slightly (but adequately) tinted so as not to detract from night driving visibility.

Electric rear window defrosting also has been added to the 142 and 144 sedans. They used to rely on the fresh air heating system for this. The 145, which did include this feature on 1969 models, now comes equipped with a rear window wiper and electric washer too.

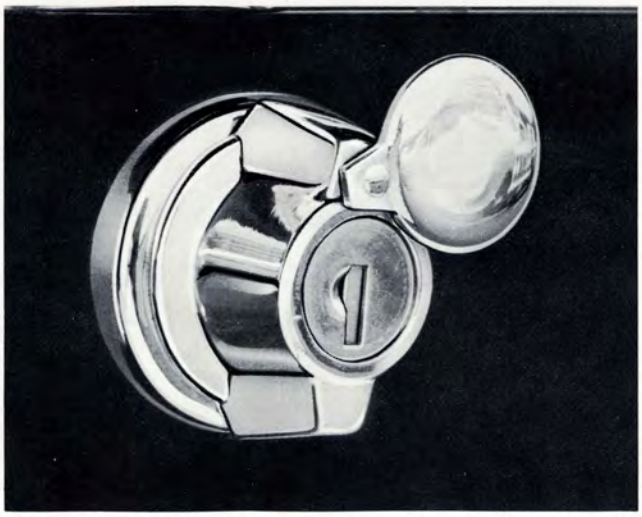
Something not so obvious about a Volvo is the five primary inside and outside coats of paint plus a sixth outside coat that gives a Volvo its glossy sheen. Every Volvo that comes off the assembly line is protected by 33 pounds of paint, including a dip in primer. Protecting the underside of the car equally well are two preservative coats, the second one being the familiar heavy black underseal.

Volvo Exterior Specifications

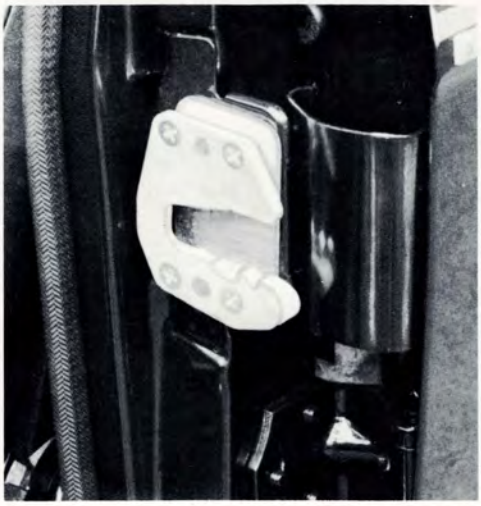
	140 Series	164
Length	182.7 inches	185.6 inches
Wheelbase	102.4	106.3
Width	68.3	68.3
Height	56.7	56.7
Track, front and rear	53.1	53.1
Ground clearance	7.1	7.1
Curb weight, pounds and distribution		
	142 - 2579	2937
	50.2/49.8	53.1/46.9
	144 - 2635	
	50.1/49.9	
	145 - 2751	
	46.4/53.6	



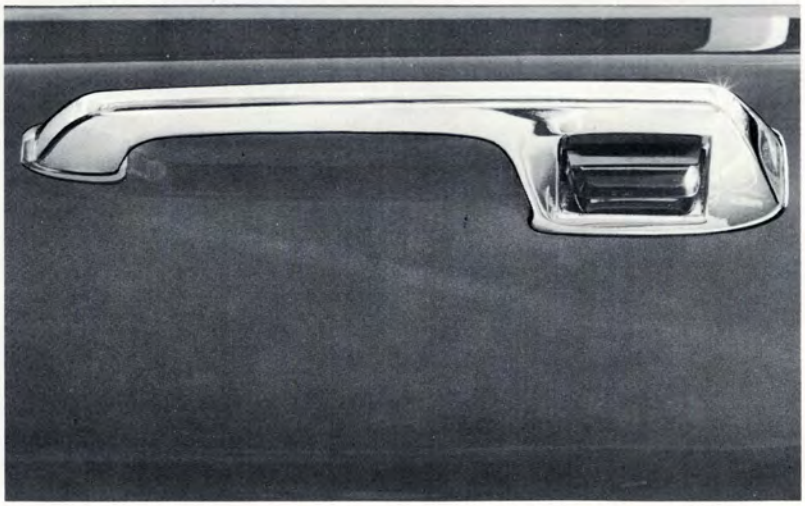
Easily adjustable, spring-loaded safety mirror is tinted to reduce glare. The 164 and 145 have a similar mirror on the passenger's side.



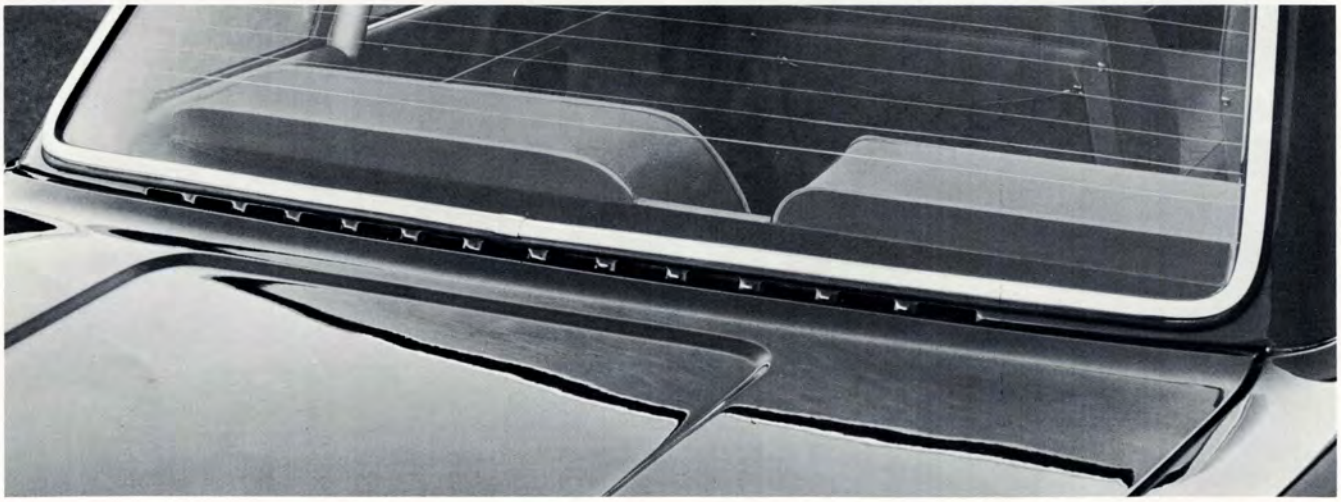
A swivel hood will keep the 164 trunk lock from freezing up. A Volvo trunk can be left unlocked, if desired, for convenience.



Crash tests have proven that the patented latches keep doors closed during severe impacts.



Pushing this broad lever opens the door even if it's covered with ice.



This grille below the rear window is the only exterior change on 1970 Volvos. Stale inside air exits through these one-way exhaust vents for increased passenger comfort.

Interior

When the Volvo 144 was introduced four years ago safety experts applauded its arrival because of the many advanced passenger protection features built into it.

Federal regulations later required many of Volvo's interior advantages as standard equipment on all cars, such as shoulder/lap safety belts, interior crash padding and impact absorbing steering wheel.

Volvo led the way again in automotive safety when it installed front seat head restraints a year before they were actually required by law. On 1970 models Volvo engineers have repositioned the headrests to correspond with the most normally used height. But the head restraints can still be adjusted to suit taller passengers.

Another interior addition, along with Volvo's foolproof steering wheel lock, is an ignition switch with a warning buzzer that will remind owners to remove the key.

The instrument panel and controls are common to both the 140 Series and the 164. Facing the driver is a ribbon-type speedometer with a sliding pointer which can be set by the driver to any desired speed. A 999,999 mile odometer and a separate, push button reset trip odometer are immediately below the speedometer.

Full width, padded sun visors are notched to extend over the top of the rearview mirror, blocking out annoying and dangerous "hot spots." The anti-glare, tinted mirror has a breakaway feature built into the roof. This mirror now is standard on all Volvo models.

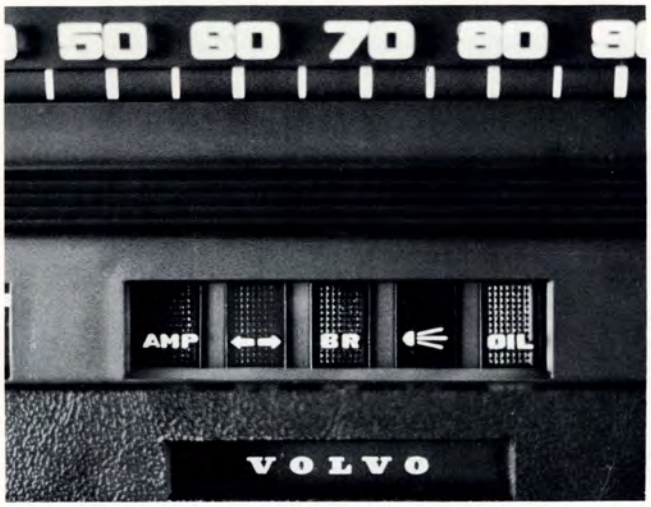
Other interior features include armrests on all doors and a folding rear seat center armrest in the sedans. Assist handles, with handy clothes hangers attached, are installed above the doors for rear seat passengers. An additional assist handle is mounted on the dashboard for front seat passengers. Special anti-theft safety latches control the frameless vent windows. Behind the center underdash panel is the easily accessible nine-fuse storage area.

Volvo's patented 3-point shoulder/lap safety belts are fitted for front seat passengers. Volvo belts are one-piece and have only one adjustment point in contrast with the three-piece, four-point, double adjustment belts used in most other cars. These belts fasten in a center mount with one-hand operation. The 164 is equipped with automatic take-up reels which eliminate belt adjustment and make for increased passenger safety and comfort. This unique inertia reel system is fully enclosed in the door posts. Three sets of seat belts are provided for rear seat passengers.

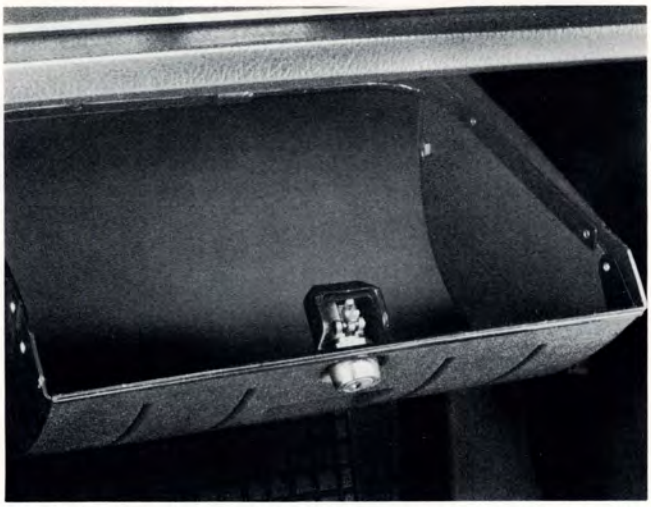
Increased soundproofing for a quieter ride is another important addition on new models. The floors of the 140 Series cars are covered with rubber mats with color-coordinated carpeting on the tunnel and rear window ledge. The 164 is fully carpeted with tough synthetic material that can be removed for easy cleaning.

The range of interior and exterior colors has been extended for 1970 models. It includes five different interior colors for both the 140 Series and 164 along with eight common exterior colors. In addition, the 164 also is available in two new exterior colors – a burgundy and a metallic blue.

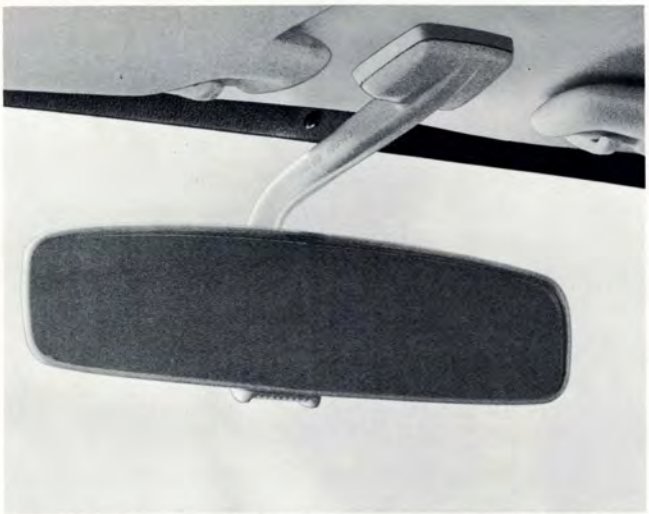
Glare free Volvo 164 fully padded dashboard has control knobs on the left and right of the instrument panel. Central heater controls are illuminated dials.



There are warning lights for alternator charging, directional signals, hand brake application and/or brake circuit failure, highbeams and oil pressure.



13-inch wide glove compartment, part of the matching full width underdash paneling, is lockable and illuminated.



All Volvo models for 1970 have a breakaway, tinted interior mirror with an anti-glare feature operated by a slide on the bottom.

Automatic transmission shift lever is steering column mounted. Illuminated quadrant is positioned below the dashboard warning lights.

Volvo 3-point safety belts on 140 Series cars have a new, convenient-to-use combination hanger and adjusting handle.

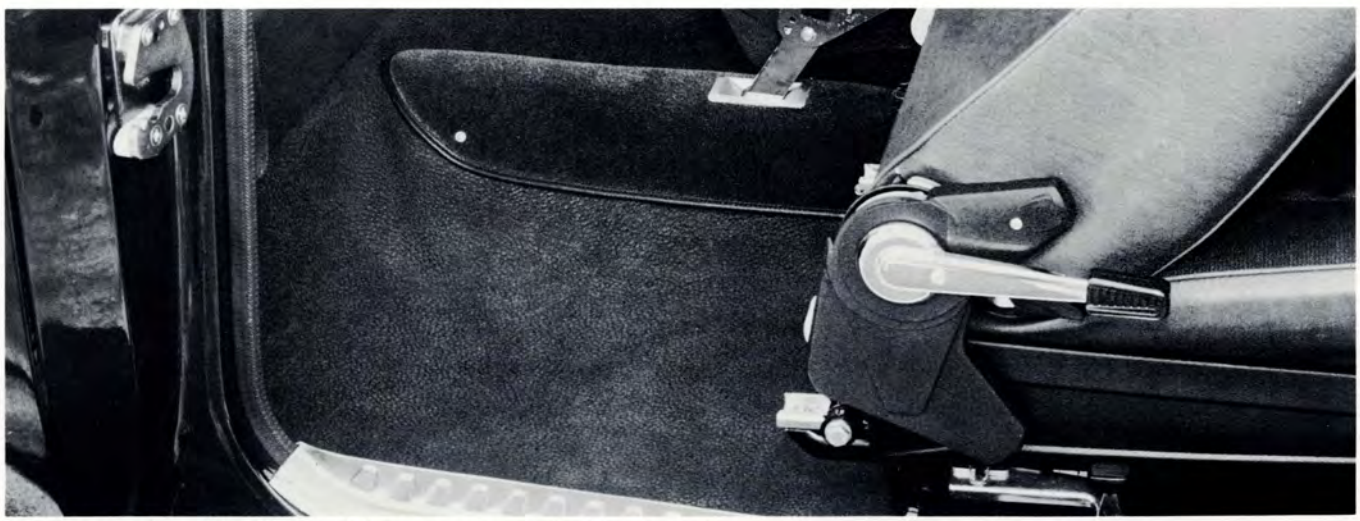
Driver and front passenger one-piece shoulder/lap belts lock into a quick release center mount with one-hand operation.

Hand brake lever sets between the driver's seat and door and has a dashboard warning light.

The interior windshield surround and corner posts now have a glare free cover.

Volvo Interior Dimensions

Front seat width, hip height	56.3 inches
Width, front seats	22.4
Depth, front seats	19.3
Headroom, front	37.4
Height, front seat cushion - floor	164 - 12.6 - 14.2
	140 Series - 13.4
Height, front seat backrest	20.9
Rear seat width, hip height	56.3
Depth, rear seat	18.5
Headroom, rear	35.0
Height, rear seat cushion - floor	13.0
Height, rear seat backrest	23.6



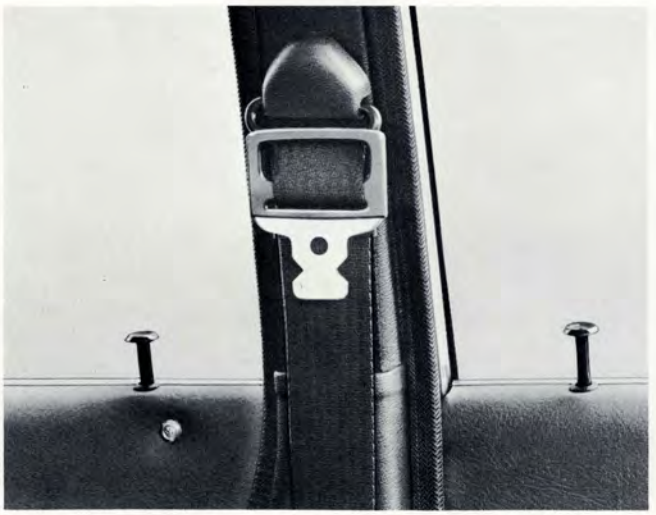
Levers on *either* side of the 142 front seats are pushed down to tip the backrests forward for rear seat entry.

164 dash is finished with a wood grain pattern. The windshield washer has a spring loaded switch to prevent being left on accidently.

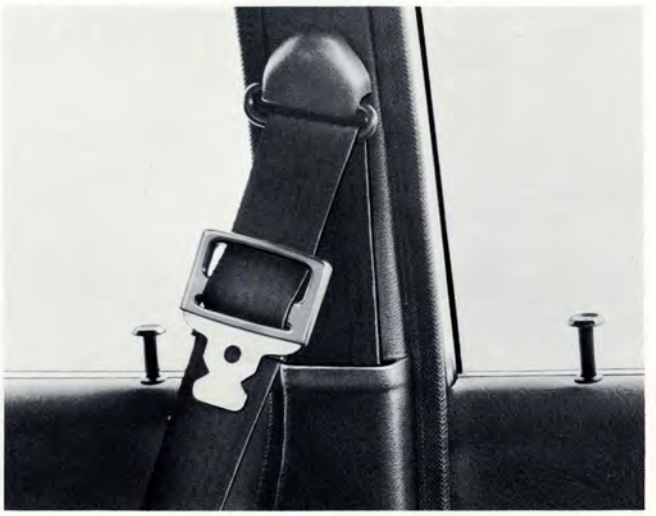
The 164 four-speed transmission now has a longer shift lever. It's set close to the driver's hand and requires only a short throw.

The backs of the 164's seats have net covered storage pockets attached, a convenience for rear passengers.

Standard equipment on a 164 is this locking console. It can be used for storing valuables since the console has a separate key.



Unique 164 features are inertia take-up reels for the 3-point belts. Adjustments are automatic as the retracting mechanism takes up any slack.



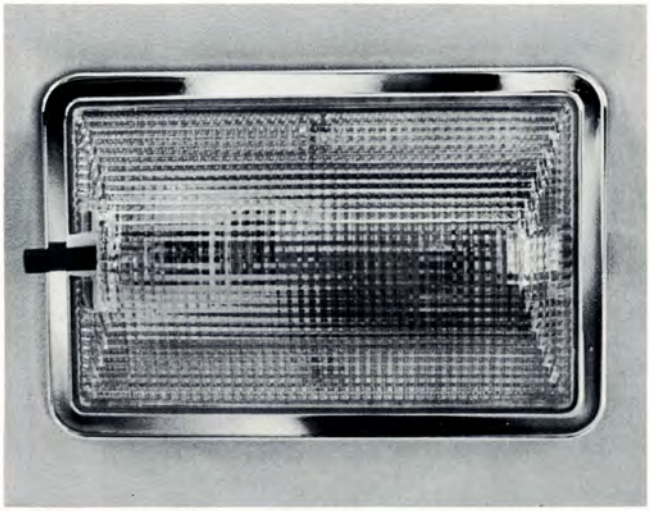
The inertia reel mechanism is fully enclosed in the center B-post. Occupants need only to pull out as much belt as is needed.

Redesigned door panels now enable the vent windows to be almost fully swiveled.

Hinged rear window of the 142 sedan can be opened for additional ventilation with a spring loaded latch.

Doors have recessed safety handles and are fitted with an armrest.

This plate attached to the driver's side door post showing the month and year of manufacture is a federal requirement.



Accessible to all passengers, this roof lamp provides full interior lighting.

An inside hood release is supplemented by a safety latch under the hood.

Seating

Since 1964, when Volvo seats were first equipped with adjustable back supports, passenger comfort has been a Volvo speciality. The fully adjustable seats in the 140 Series and 164 are identical except for adjustment mechanisms and upholstery.

The front seat backs are separately adjustable from bolt upright to fully reclining. An exclusive benefit of this adjusting mechanism is protection against whiplash injuries. The mechanism includes a friction device which will release the backrest if the car is subjected to the force of a ten mile-an-hour rear end collision. The front seat backrests will recline automatically at a controlled rate, protecting passengers from injury.

An exclusive Volvo feature is adjustable lumbar supports for both driver and passenger seats. They are operated by knobs on the sides of the backrest. Marked "firm" to "soft," they adjust the seat's tension in the critical area against which the occupant rests the lower part of his back.

The driver's seat on the 164 has two separate fore and aft adjustments that total 10.9 inches of travel. And there is more legroom in the 164 than in any other car on the road. Normal adjustment is made by raising the lever at the right front corner. This operation enables the seat to be moved forward or backward 7.9 inches on its rails.

For extra short or extra tall drivers a second lever, in the front center, is raised to move the entire seat assembly forward and up, or back and down. Three stops on this device allow 1.6 inches of height adjustment.

The combination of these two systems allows the driver to control the amount of legroom and armroom he wants. The driver also can distribute his or her weight properly on the seat for maximum comfort.

Similar adjustments are possible on the 164 passenger seat and both front seats in the 140 Series cars. Fore and aft movement is made with a lever on the outboard side. Moving the front and rear of the seat up or down or further increasing legroom are simple adjustments that can be made with the cushion removed.

A folding center armrest divides the full width three-passenger rear seat on the sedans, and creates individual seating for two occupants. There is ample rear seat legroom. And proper cushioning support gives excellent riding comfort. Rear seat passengers in the 164 can store loose items in nylon net pockets attached to the backs of the front seats. Other rear compartment features on all models include side armrests, ashtrays, assist handles over the doors and separate rear seat heating.

Volvo 140 Series seats are upholstered with spun acrylic fiber for the cushions and backrests. This woven synthetic fabric has advantages over vinyl because it keeps the seats cooler in summer and warmer in winter. This extra strong material also provides better grip, is easy to clean and does not discolor. What is more, it's fire retardent and anti-static. Sides and backs of the seats and the head restraints are matching vinyl.

The head restraints, which are standard equipment on Volvos for the third year, now are fixed to a new minimum height. This height corresponds to the adjustment Volvo engineers found was most normally used.

The 164 seats are upholstered in leather, supplied by the same firm that outfits Rolls Royce cars, for luxurious comfort. The durable leather now is available in five colors; black, burgundy, light blue, beige and grey.

Individual front seats in the 140 Series cars are designed to provide balanced shoulder, hip and thigh support. The centers of the cushions are padded with two layers of urethane foam with firmer foam on the higher sides and softer foam at the front. The cushions are supported underneath with horizontal rubber strips for further comfort and support.

Individual bucket seats in Volvo sedans have backrests that adjust from bolt upright to fully reclining. After removing the head restraints, and adjusting the rear cushion to lay flat, these seats can be converted into twin beds 63-inches long.

A center armrest divides the full width rear seat and folds up for a third passenger. The backrest is designed so that accessory headrests can be fitted.

The 164 Driver's seat has five separate adjustment mechanisms to position the seat correctly in relation to the steering wheel and pedals. This leather upholstered seat can be moved fore and aft, up and forward or back and down – the backrest is infinitely adjustable. Seat tension in the lower backrest can be adjusted and the head restraints can be raised.

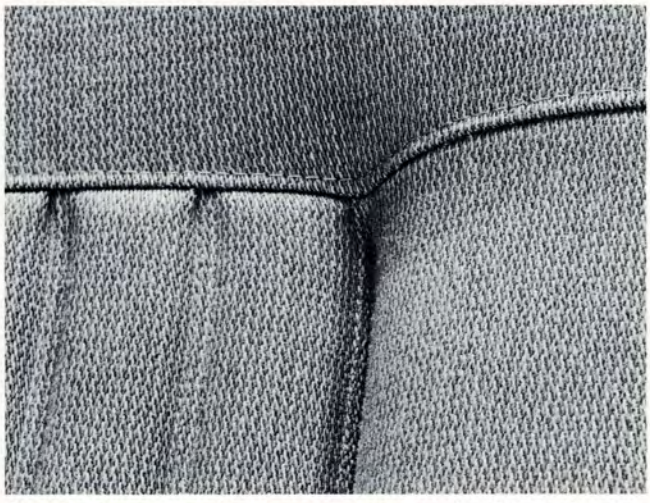
Lever on the outboard side of the seat adjusts the backrest to any position. This mechanism is part of an anti-whiplash device that will fold the seat back at a controlled rate if struck from the rear.

A knob on the side of the front backrest controls the tension of a wide horizontal strip inside the seat back. Volvo's exclusive lumbar support device provides comfort for a critical area, the lower part of an occupant's back.

These two levers adjust the 164 driver's seat. The top lever is a back and forth adjuster only. The other, in the front center of the cushion, is used for moving the seat up and forward or back and down.

140 Series seats and the 164 passenger seat can be raised or lowered with this side adjuster. There is another adjuster in the front center of these seats and a position for moving the entire seat one-inch rearward.

Head restraints on the front seats are raised 2¼ inches on 1970 models. They can be further raised to suit any occupant's height or removed to convert the Volvo seats into twin beds.



Closely woven, easily cleaned spun acrylic fabric for the 140 Series seats now comes in five colors, dark blue, light blue, gold, red and grey.

Heating and Ventilation

Thorough fresh air heating and ventilating systems are built into Volvos for maximum passenger comfort. Hot air can be regulated in terms of intensity, direction and temperature. The heating system is so effective that its full capacity is needed only in extremely cold weather.

The system is controlled by three vertically mounted, illuminated, finger-tip operated discs. These are recessed into the center of the dashboard. An adjacent knob operates a 100-watt two-speed blower that delivers 182 cubic feet of air per minute. Heated air for the front comes from outlets under the dash and is evenly distributed so it circulates freely to warm the whole car quickly. Two additional outlets atop the transmission tunnel heat the rear passenger area.

Three vents across the top of the dashboard supply the windshield with air. Any adjustment, from full force for defrosting to a partial air flow for defogging, can be made. Air can be directed to either the floor or windshield or both, by dialing the floor and defroster discs.

The third disc, for temperature adjustment, is connected to a thermostat in the air stream. The temperature selected is automatically maintained regardless of changes in speed, outside temperature or engine temperature.

Fresh air, drawn from a vent at the base of the windshield, enters the car through outlets at the sides under the dashboard. These outlets have a foot operated lever and two positions for partial or full force intake. Opening the floor and defrosting ducts will further aid cooling. This fresh air also helps prevent rust. A constant flow passes through the sill plates in the rocker panels to avoid moisture accumulation.

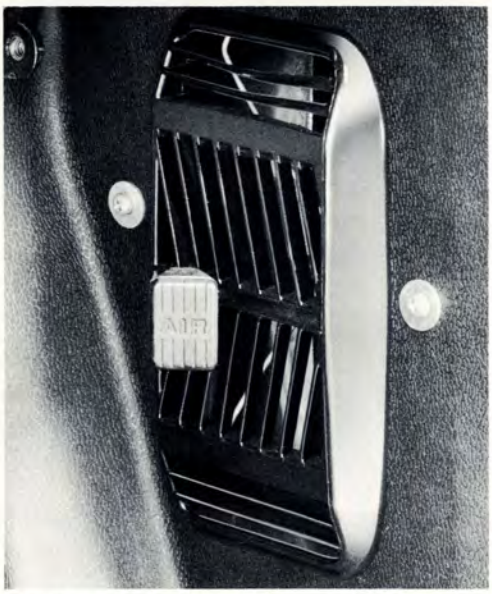
Electric rear window defrosting is another standard feature. Special heat-conductor wires, cast onto the glass, defog or defrost the rear window. The lighted dashboard switch will only supply current when the ignition is on to prevent accidental battery drain. The wires are so small in diameter that they are virtually invisible.

For driving comfort in extreme hot weather, optional Volvo air conditioning is available. Cold air direction, force, distribution and temperature are all separately adjustable. Maximum dispersion of cooled air is provided by three adjustable outlets installed in the underdash panels. Ducting for these outlets has been redesigned to provide greater distribution of cool air. Temperature and blower controls are conveniently located in the center.

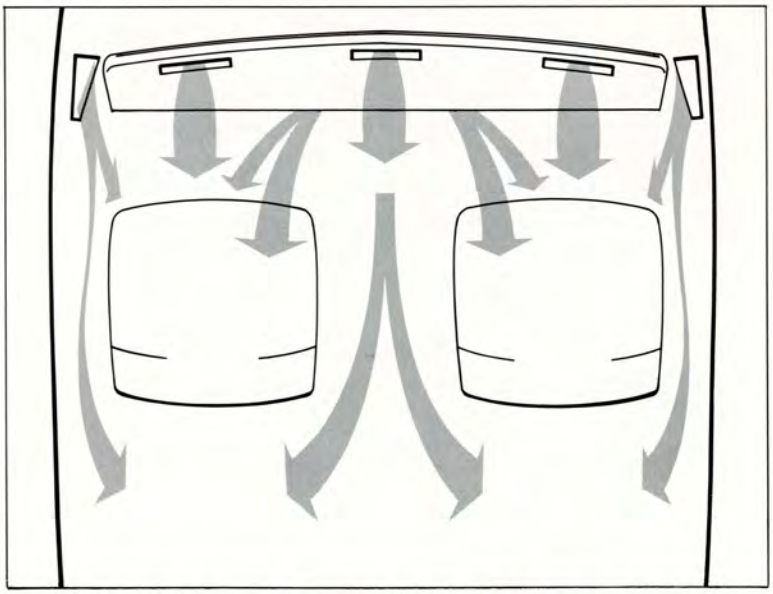
This specially designed air conditioner unit has a drive belt that runs free when it is turned off. There is only a negligible horsepower loss in operation even though it produces 12,000 B.T.U.

A new feature on 1970 sedans is a flow-through air ventilation system that pulls stale air from the front of the car out through vents located below the rear window. This system eliminates the need for opening the side windows for fresh air circulation and also increases heater output. Merely opening the floor or heater vents creates enough positive pressure inside the car to open a one-way rubber flap between the interior and exterior grilles. Since the Volvo air conditioning system produces negative pressure this flap remains closed to prevent any loss of cooling.

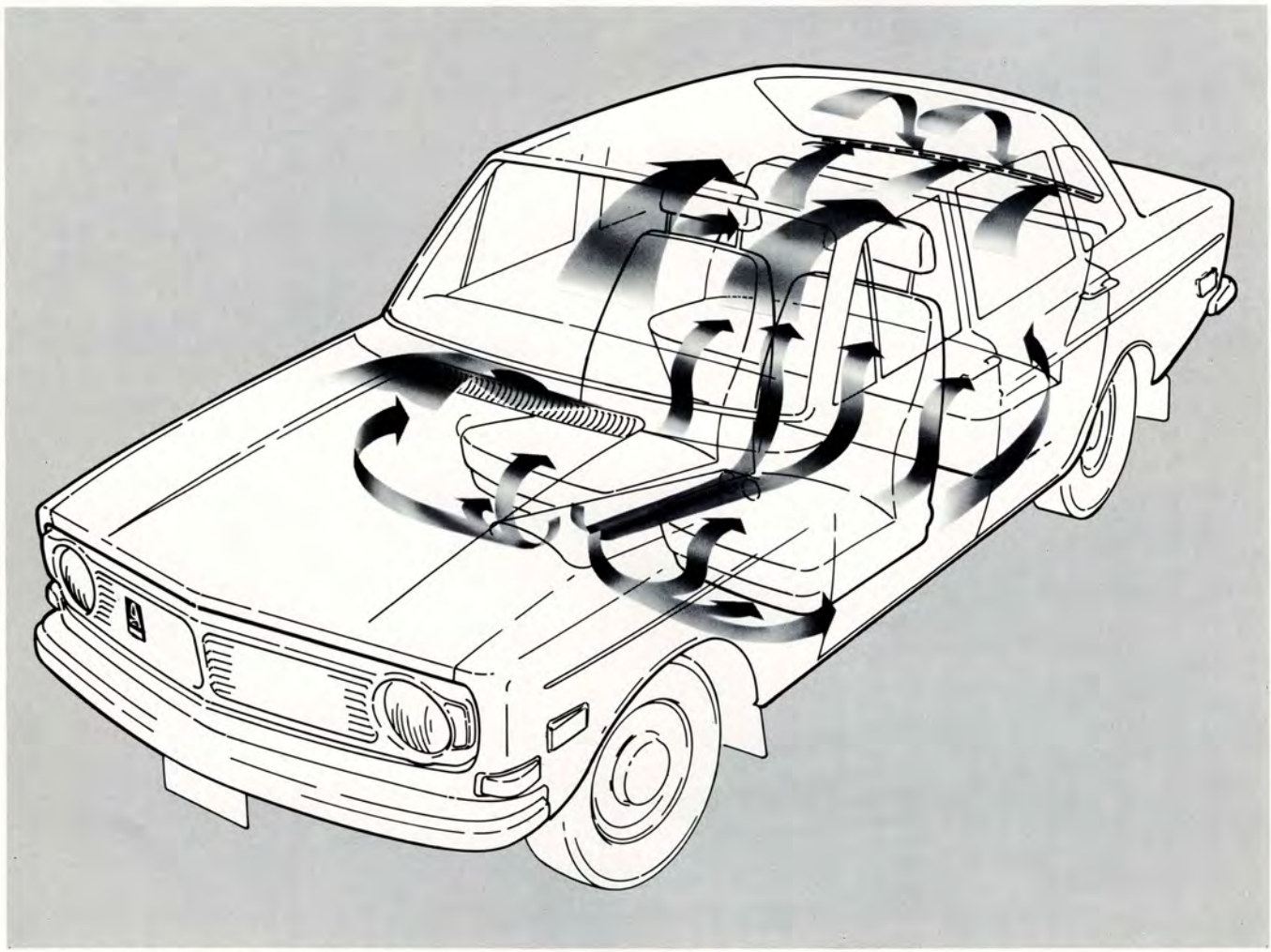
Stale inside air exits through this grille, part of the new flow-through ventilation system. Clear plastic drain tubes in the trunk will accomodate water accumulated in a rainstorm.



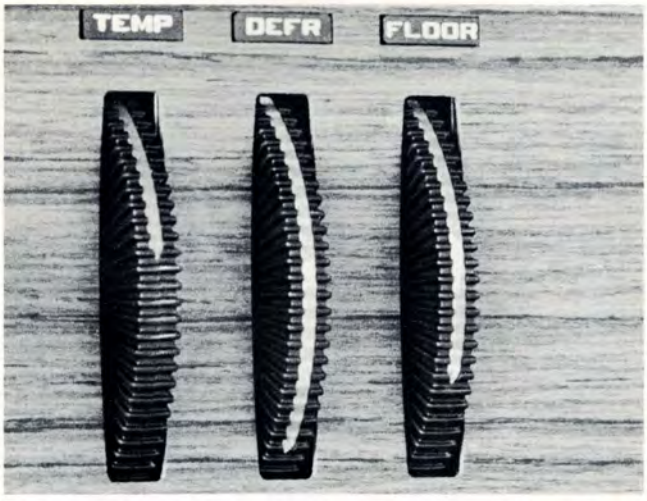
Fresh air enters the passenger compartment through two side vents. Two open positions are provided for partial or full force intake.



In addition to the two side vents, the fresh air heating system draws air through defroster vents, underdash outlets and, through ducts, to the rear floor.

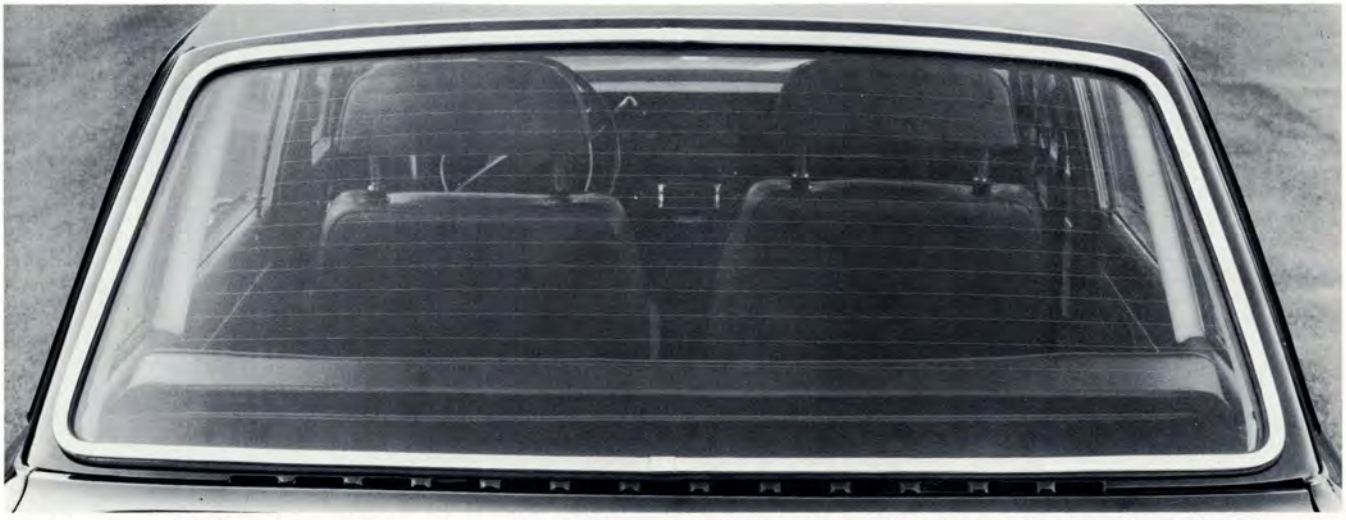


Fresh air is drawn from an intake at the base of the windshield. Air flow in the passenger compartment passes over, under and around the front seats and exits through a grille below the rear window when the floor vents are open.



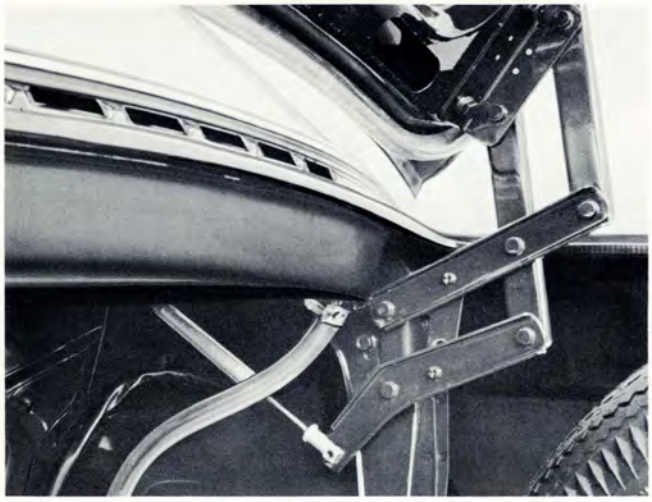
Centered on the dashboard are the fresh air heating system controls. Dials determine the temperature, direction and amount of air flow.

Rear seat passengers are kept warm with temperature controlled heat via extra ducts atop the transmission tunnel.



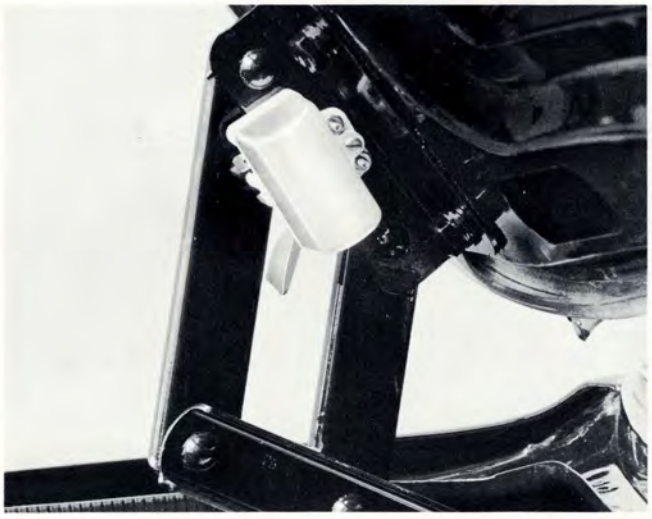
All Volvo models now have rear windows that are electrically defrosted. Special heat-conductor wires across the tinted glass are controlled by an illuminated dashboard switch to keep the window free of mist and ice. It never gets hot to the touch. Maximum power is 150 watts.

Custom air conditioning with redesigned ducting for increased cooling power is optional. Controls in this center panel adjust the temperature and blower speed. Additional outlets at each end of the underdash panel may be adjusted for amount and direction of cold air.

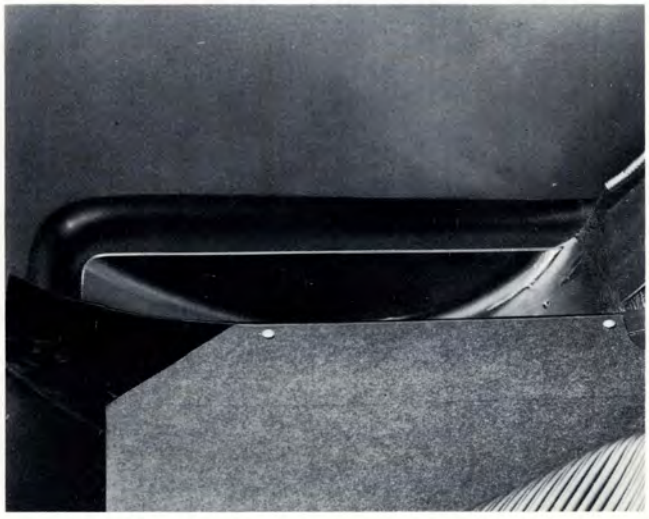


Two gas operated cylinders enable the trunk lid to open easily to any position.

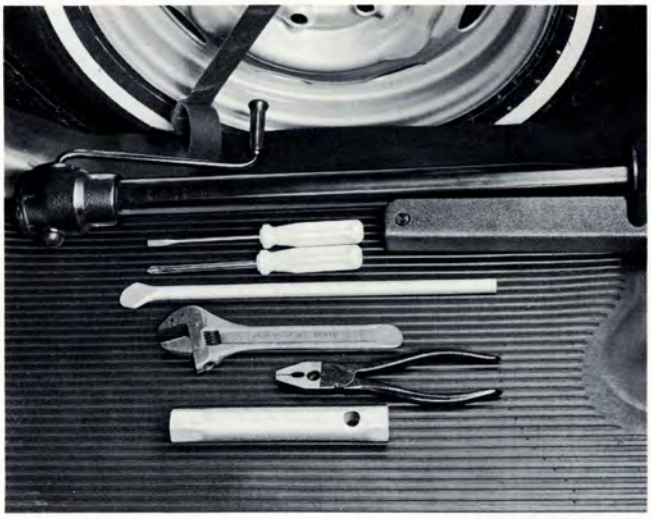
A recessed area enables vertical mounting of the spare tire for easy accessibility.



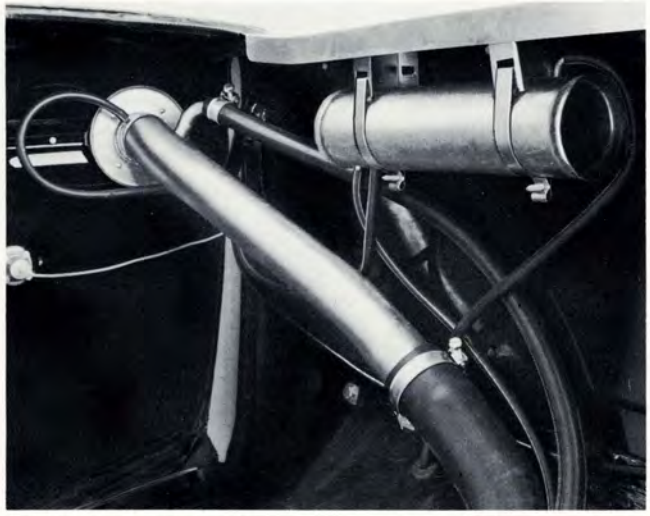
The 164 is equipped with an automatic light in both the trunk and engine compartments.



An additional well under the floor mat can be used to store tools or an accessory spare gas can.



The easy-to-use Volvo safety body jack lifts a single corner of the car. The jack and tools are supplied in plastic pouches.



Hidden behind the fiber cover is part of the evaporation control system which prevents gasoline vapors from escaping from the tank.

Trunk

The Volvo luggage compartment has more usable space than can be found in *any* full size car. What accounts for this great storage capacity is the height and box-like structure of the trunk which even permits storing luggage vertically. Storing luggage upright also means you can easily get at each suitcase without disturbing any other pieces.

The flat trunk lid opens easily with gas operated springs that do the lifting. Inside, the spare tire is stored in a well where it is readily accessible but out of the way. Another well, hidden by the floor mat on the other side, is a storage area for tools or an accessory gas can.

The trunk lid, with a latch that can be left securely closed but unlocked if desired, features an attached lamp on the 164 for automatic illumination. The protective rubber floor mat can be removed for easy washing.

Volvo Luggage Compartment Dimensions

Width, minimum and maximum	52.0 - 55.0 inches
Width, with tire removed	61.0
Height	22.0
Length	47.6
Capacity	23.6 cubic feet

Volvo sedans have an unusually large box-like trunk with 23.6 cubic feet of space for at least six vertically-placed suitcases. The trunk floor is covered with a durable rubber mat and the sides are covered with insulated fiber material.

The one-piece rear door is lifted by a powerful gas operated cylinder and when opened is locked in place. A special safety lock makes the inside latch inoperative.

With the rear seat folded the 145 has a 70 cubic foot cargo area. The entire floor, sides and wheel wells are carpeted as is the inside of the rear door.

145 Station Wagon

The Volvo 145 shares engineering features with the 140 sedans and has many of its own. Efficient planning of its interior space, for example, results in 70 cubic feet of cargo area despite its modest exterior dimensions. Both front and rear passenger areas share the sedan's spaciousness. And even folding the back seat down doesn't at all interfere with fore and aft front seat travel. Mechanical specifications remain the same as the 144 with the exception of stronger rear springs and shock absorbers.

The 145 has a low loading height and a fully upholstered flat floor. The rear seat backrest and the bottom of the cushion, which folds vertically, also are upholstered as are the wheel arches.

A total glass area of 4,608 square inches provides excellent visibility. The one-piece tailgate features an extra large electrically defrosted rear window. Two tinted outside rear view mirrors are standard.

Opening the rear door either from inside or outside is easy. A powerful gas cylinder actually does the lifting. A lever located near the latch inactivates the inside handle. An extra luggage compartment roof lamp lights automatically when the tailgate is opened.

Additional 145 features for 1970 include an electric rear window wiper with an electric washer for keeping the window clear when driving in rain or snow or on wet roads. A dashboard switch for the wiper and washer is located to the left of the speedometer.

Volvo 145 Station Wagon Cargo Area Dimensions

Volume	70 cubic feet
Underfloor space	3.5 cubic feet
Length, minimum and maximum	44.5 - 74.0 inches
Width, minimum and maximum	42.0 - 52.0
Height	33.0
Width, tailgate	46.0
Height, tailgate	31.5

New safety features on 1970 145 station wagons include an electric wiper and electric washer to provide all weather visibility through the rear window. Other rear window standard features are electric defrosting and tinted glass.

Back of the full width rear seat is upholstered with durable carpeting material. The folding levers are recessed for safety to prevent accidental opening.

Pushing down on the front edge while pulling up from the rear unlocks the rear seat cushion so it can be raised and moved forward on rails.

A handle on either side of the backrest turns to fold the seatback flush with the floor. Folding this seat does not limit front seat travel.

Vertical mounting of the spare wheel and tire in the left corner means the wagon doesn't have to be unpacked to change a flat tire.

Underfloor Compartment with an additional three and a half cubic feet of storage space has two lids. Floor is covered with a rubber mat.

Reservoir for the electric rear window washer is stored in the side underfloor compartment. The container holds 1½ quarts of cleaning solution.

B20 and B30 Engines

The four-cylinder and six-cylinder Volvo engines are now in their second year of production. Both powerplants are virtually identical internally, using the same pistons, connecting rods and valve gear. These two and three litre engines are direct descendants of time-tested Volvo engines and feature rigid construction and exceptional strength.

The four-cylinder model, designated B20, produces 118-horsepower at 5,800 r.p.m. and 123-foot pounds of torque at 3,500 r.p.m. The six-cylinder B30 engine in the 164 developes 145-horsepower at 5,500 r.p.m. and 163-foot pounds of torque at 3,000 r.p.m. That's 33% more torque and 23% more horsepower in the six-cylinder model. Compression ratio for both engines is 9.3:1.

For 1970 there are two visible changes under the hood. One is a flexible cooling fan which has stainless steel blades that flatten out at high engine speed to save horsepower, reduce fan noise and increase water pump life. This fan is standard on all models and is the same unit that formerly was supplied only on air conditioned cars.

The other new feature is a cannister and hoses for the gasoline evaporation control system. Although required only in California, this system is standard equipment on all Volvos sold in North America. Designed to eliminate gasoline vapors from polluting the atmosphere, it operates automatically without effecting performance. The cannister containing charcoal granules is mounted behind the carburetors on the 164 and under the air cleaner intake on the 140 Series models.

Gas tank vapors collected and stored in a trunk container are pulled forward by the normal suction action of the carburetors. The fumes enter the cannister, are mixed with air entering the bottom of the cannister, and then are sucked into the engine to be burned. A styrofoam filter, that should be changed every 24,000 miles, is placed in the cannister's base to purify the incoming air.

Before their introduction last year the engines were both in the process of development for seven years. Both share many similarities with the previous B18 engine that powered Volvos for eight years. The similarities are in the areas of strength and durability.

Both the B20 and B30 engines are identical to those produced for late 1969 models that incorporated changes in piston design and redimensioned crankshaft main and rod bearing journals for smoother running.

The B30 crankshaft has seven main bearings and the B20 crankshaft has five, one between each cylinder. The crankshaft journals are induction hardened for protection against wear. Lead/bronze alloy bearings, 50% stronger than those previously used, are used for both main and connecting rods. The same material is used for the camshaft bearings. At Volvo's engine plant each individual bearing is inspected for conformity to tolerance standards as are all crankshaft journals. In addition, each crankshaft is dynamically balanced to guarantee vibration-free performance at even the highest speeds.

Although the two engines have the same bore and stroke measurements, the B30's 33% more torque and 23% added horsepower calls for additional strength in some components. For example, the clutch, flywheel, camshaft and cooling and lubricating systems all were redesigned for the six-cylinder engine.

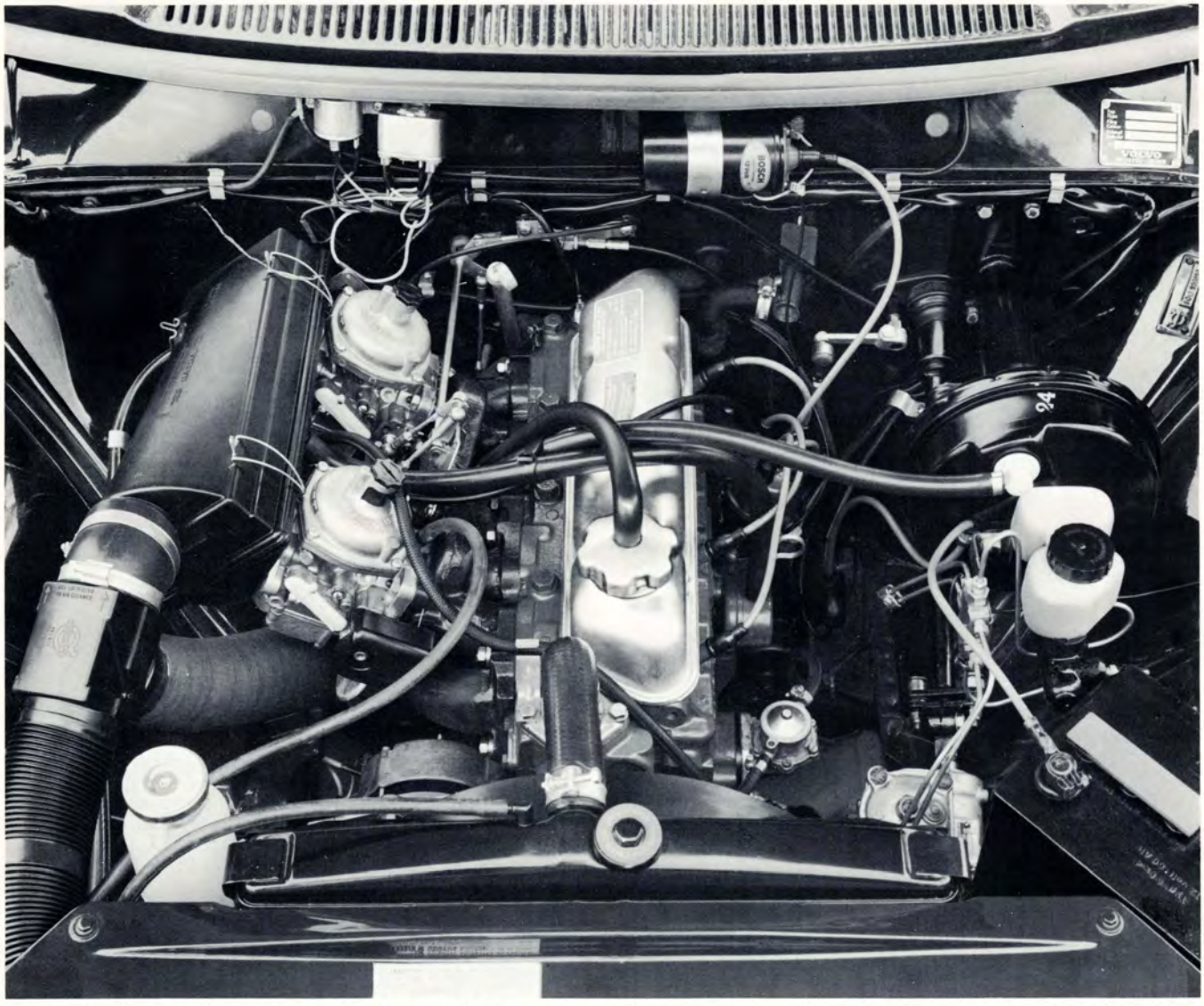
The engine compartments easily accommodate the powerplants and provide ample working room. The addition of an air conditioning unit does not interfere with routing servicing accessibility. The entire electrical system is easily reached as is the fuel system and oil filter.

The Volvo electrical system is 12-volt with enough power to operate all accessories simultaneously. An alternator supplies a maximum output of 55-amps on the 164 and 35-amps on the 140 Series cars – enough to charge the 60-amp hour battery even at idling speeds. A one h.p. starter assures quick winter starts without excessive cranking. The ignition system is protected against moisture with rubber seals originally developed for Volvo-Penta marine engines.

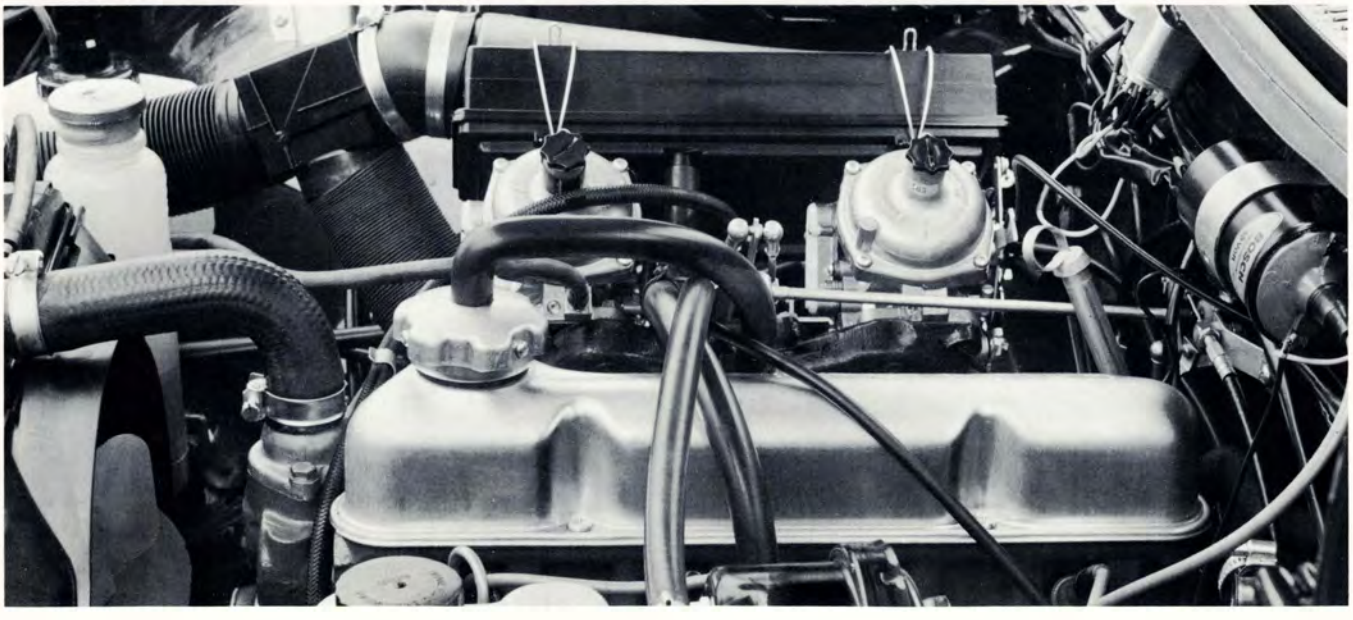
The dominant underhood feature is Volvo's unique air induction system. This is designed to supply the carburetors with heated air of a constant temperature for maximum performance and low exhaust emissions. Additional engine benefits are fast warm up and quieter engine operation.

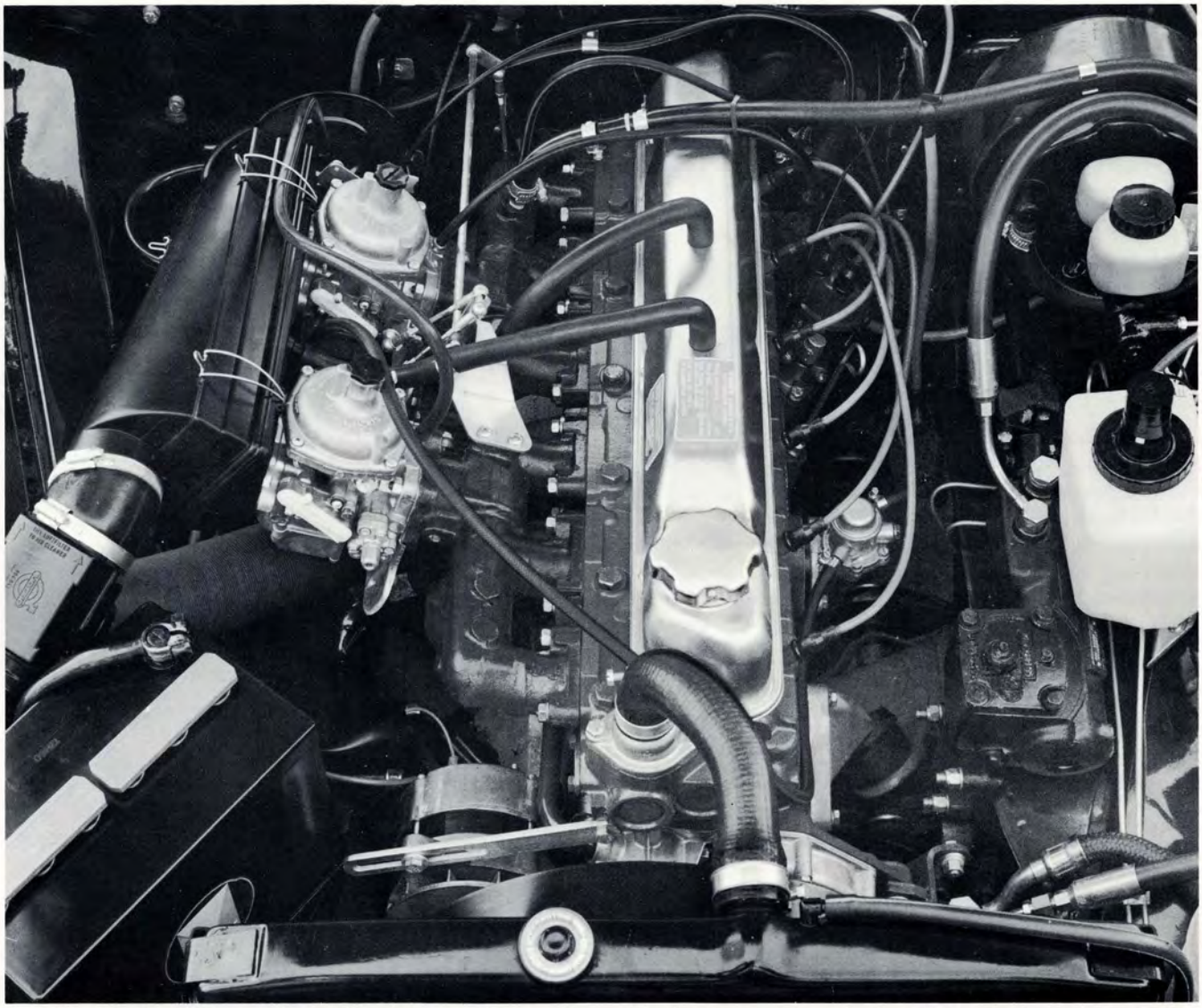
The induction system draws cold and warm air through flexible tubing and automatically regulates the flow with a thermostatically controlled flap valve in a housing at the air cleaner. Depending on the temperature in the housing, cool air is taken from the front of the engine and/or hot air is taken from around the exhaust pipe. This system can hold temperatures to within a few degrees of the optimum temperature of 85°F. The entire mechanism is completely automatic.

When the engine is cold, all the intake air is drawn from the lower branch that wraps around the exhaust pipe, the first external part of engine to

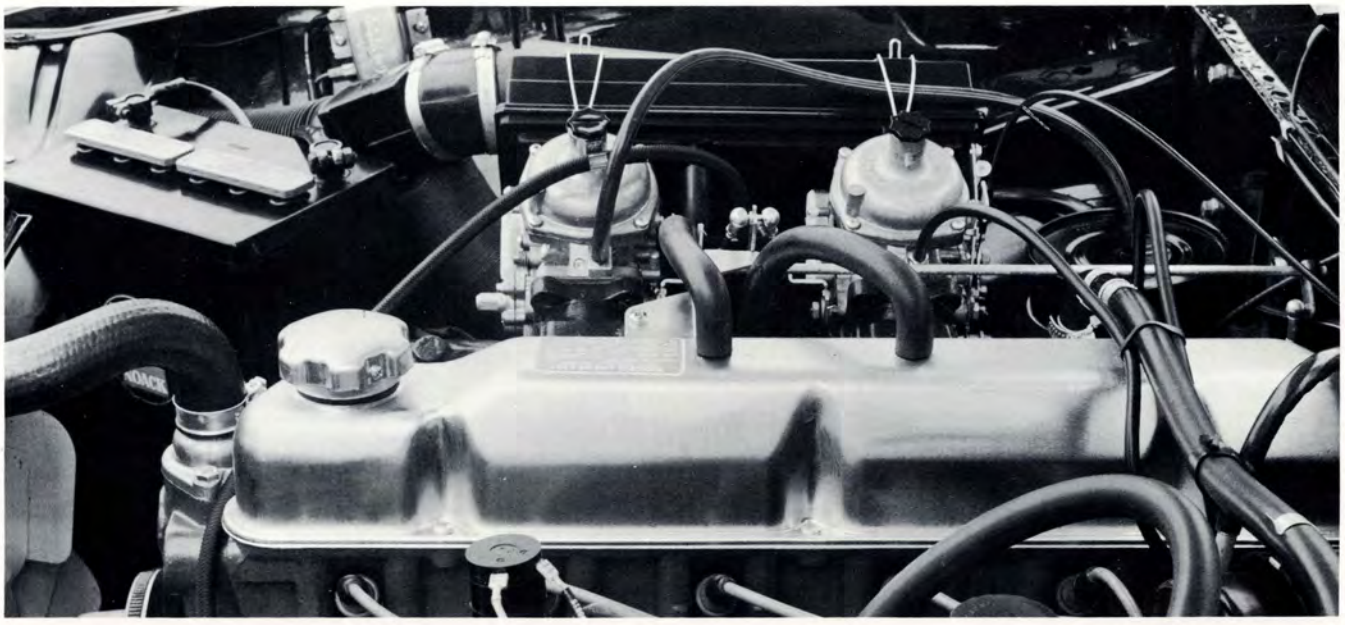


The 140 Series' four-cylinder engine produces 118-horsepower at 5,800 r.p.m. and 123-foot pounds of torque at 3,500 r.p.m. Designated B20, this 2-litre powerplant features dual carburetors that are factory sealed. Contributing to longevity are automatic rotating valves and a five-main bearing crankshaft.

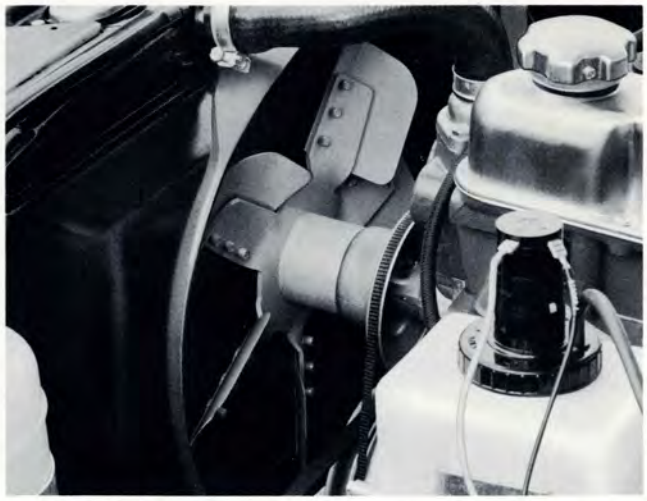




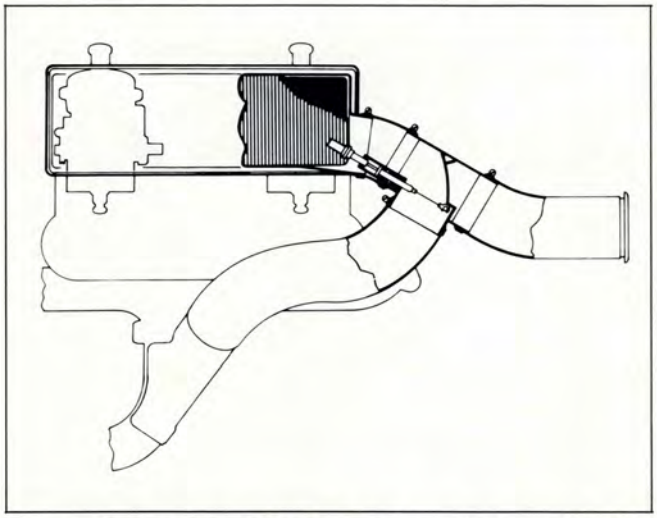
The six-cylinder 3-litre engine, with the same bore and stroke as the 2-litre B20, shares with it many internal components such as pistons, connecting rods and valves. Maximum power of the 164's B30 engine is 145-horsepower at 5,500 r.p.m. Peak torque of 163-foot pounds is developed at 3,000 r.p.m.



Two air intake branches, drawing hot air from around the exhaust pipe and cool air from the front of the car, meet at a coupling in front of the air cleaner housing.



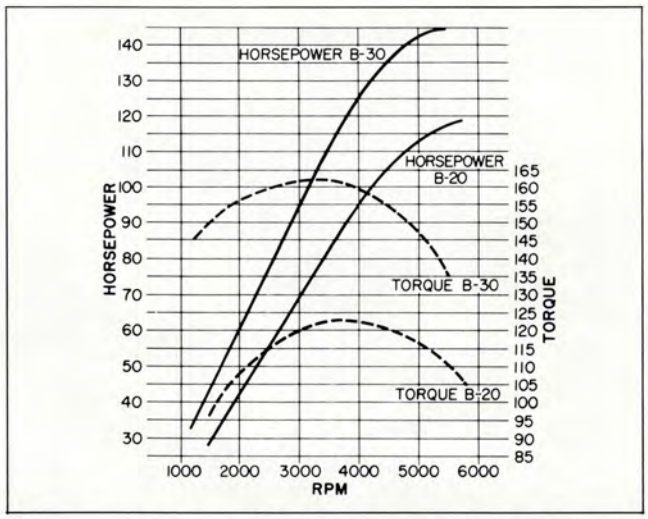
Flexible stainless steel fan blades change pitch as engine speed varies. At high speeds, when the fan is not needed for cooling, the blades are nearly flat to save horsepower.



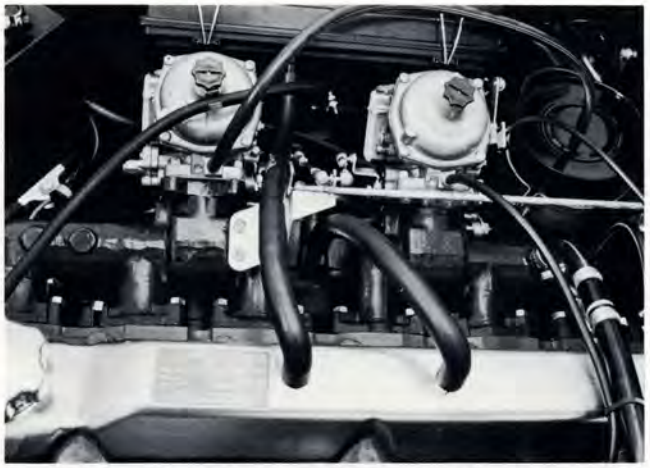
Temperature sensor in front of the coupling controls the position of the flap valve. Here it is shown partly open to take air from both branches.

The sealed cooling system with 10 p.s.i. pressure has a transparent expansion tank for visual inspection of the coolant level.

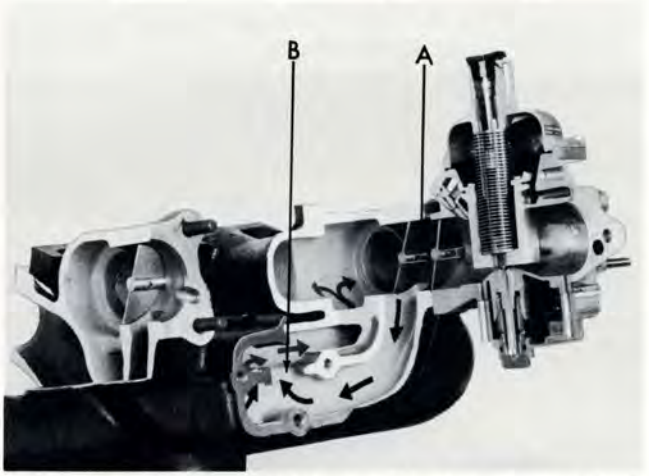
Flap valve in the coupling is positioned here with the forward branch closed, permitting only heated air to enter the carburetors.



Power curves of the Volvo engines show that the more powerful 164's edge is even greater at low and mid range engine speeds.



Dual Zenith-Stromberg carburetors are shown with manifolding for the six-cylinder engine's twelve port head.



The Volvo exhaust emission control system is contained inside the intake manifold. The secondary valve (A) is closed at low engine speeds routing the air/fuel mixture to a central preheating chamber (B) which is warmed by the exhaust manifold. Both carburetors feed into this chamber from which the mixture spreads to the induction ports as required. At high engine speeds, where combustion is more complete, the secondary valve opens to bypass the preheating chamber.

Part of the evaporation control system in this cannister where gas fumes are mixed with filtered air before being sucked into the carburetors.

get hot. The choke is needed only initially as the temperature of the intake air rises so fast. The system adjusts to take air from both branches as the temperature rises.

The twin Zenith-Stromberg carburetors were specifically designed for Volvo's exhaust emission control system and are sealed at the assembly plant after the engine is tuned. Only the idle can be adjusted. The carburetors also automatically adjust to compensate for higher ambient temperatures.

The air/fuel mixture travels from the carburetors to Volvo's exhaust emission control system entirely contained inside the dual inducation manifold. There, the mixture is heated and blended inside a preheating chamber to produce better combustion and cleaner exhaust. At higher engine speeds valves inside the manifold open to permit the mixture to flow directly into the combustion chambers. This system was introduced on cars built for the U.S.A. in the summer of 1967 and has been supplied on all dual carburetor Volvos throughout the world since last year.

A look at the horsepower and torque curves clearly shows that the power increase of the 164 is more evident at low and mid engine speeds than at the top end. For example, the torque increase at 2,000 r.p.m. is more than 45% over the four-cylinder engine.

This gives the 164 far greater pulling power than a 144 despite 300 pounds of additional weight. Power is transmitted to the rear wheels via a strengthened drive shaft and carefully chosen final drive ratios (3.31 to 1 for the automatic and 3.73 to 1 for the manual shift).

The 164 achieves speeds of 34 m.p.h. in first gear, 54 m.p.h. in second, 80 m.p.h. in third and 109 m.p.h. in fourth gear. It cruises at 60 m.p.h. at only 3,100 r.p.m.

The final drive ratio for the standard transmission 142 and 144, and the 145 with either standard or automatic transmission, is 4.3 to 1. This ratio gives speeds through the gears of 32, 50 and 73 m.p.h. Engine speed at 60 m.p.h. is 3,500 r.p.m.

The four-speed fully synchronized transmissions are standard on all models, but the 164 unit was specially designed to handle the increased power of the six-cylinder engine. The 164 floor shift also is provided, with the 164 using remote linkage. The shift lever on 140 Series cars is directly connected to the transmission.

A three-speed automatic transmission equipped with an oil cooler is optional on all models. A larger 11-inch torque converter is used on the 164. A part throttle kick down feature is provided for smooth low speed shifting between 25 m.p.h. and

(continued on page 30)

37 m.p.h. The gear selector is column-mounted and the standard PRNDL quadrant is illuminated. Hot or cold readings of the automatic transmission level can be checked with a dip stick whose carrier allows for expansion of the fluid.

Volvo engine and power train specifications

Engines

164 - Type B30. Water cooled, six-cylinder in line, cast iron block and head, seven main bearing crankshaft. Pushrod operated overhead valves with gear driven four-bearing camshaft. Bore: 3.50 inches. Stroke: 3.15 inches. Displacement: 182 cubic inches (2979 cc.) Maximum horsepower: 145 b.h.p. at 5,500 r.p.m. Maximum torque: 163 foot pounds at 3,000 r.p.m. Specific power output: .80 b.h.p. per cubic inch displacement. Power to weight ratio: 20.3:1. Compression ratio: 9.3:1. Oil filter: Full flow. Oil capacity: 6.3 quarts including filter.

140 Series - Type B20. Water cooled, four-cylinder in line, cast iron block and head, five main bearing crankshaft. Pushrod operated overhead valves with gear driven three-bearing camshaft. Bore: 3.50 inches. Stroke: 3.15 inches. Displacement: 121 cubic inches (1986 cc.) Maximum horsepower: 118 b.h.p. at 5,800 r.p.m. Maximum torque: 123 foot pounds at 3,500 r.p.m. Specific power output: 1.03 b.h.p. per cubic inch displacement. Power to weight ratio (142): 21.9:1. Compression ratio: 9.3:1. Oil filter: Full flow. Oil capacity: 4 1/8 quarts including filter.

Clutch

Diaphragm spring type, single dry plate - nine inch on 164, 8½ inch on 140 Series.

Cooling system

Sealed, 50% anti-freeze coolant circulated by engine driven water pump. Transparent expansion tank. Capacity: 164 - 13.0 quarts; 140 Series - 10.0 quarts. Engine driven fan equipped with flexible stainless steel blades.

Fuel system

Twin horizontal 1.75 inch Zenith-Stromberg CDSE (emission) carburetors supplied by a mechanical pump. Tank capacity: 15.5 gallons. Fuel required: Premium.

Transmissions

Manual: Four-speed, fully synchronized with floor mounted gearshift lever.

	140 Series		164	
	Ratios:	Overall	Ratios:	Overall
1st	3.13:1	13.46	3.14:1	11.71
2nd	1.99:1	8.56	1.97:1	7.35
3rd	1.36:1	5.85	1.34:1	5.00
4th	1.00:1	4.30	1.00:1	3.73
Reverse	3.25:1	13.98	3.54:1	13.20

Automatic: Hydraulic torque converter, three-speed with part throttle kick down. Column mounted illuminated gear selector with standard P.R.N.D.L. quadrant.

	Ratios:	Overall 142/144	Overall 145	Overall 164
1st	2.39:1	9.80	10.28	7.91
2nd	1.45:1	5.95	6.24	4.80
3rd	1.00:1	4.10	4.30	3.73
Reverse	2.09:1	8.57	8.99	6.92

Rear axle

Hypoid type. Ratios: 140 Series with standard transmission and 145 with automatic transmission - 4.3:1, 142 and 144 with automatic transmission – 4.1:1; 164 with standard transmission - 3.73:1, 164 with automatic transmission - 3.3:1.

The 140 Series and 164 front suspensions are identical except for thicker springs and stronger shock absorbers and stabilizer bar on the six-cylinder car.

Volvo rear axles are carried by longitudinal control arms and torque rods to prevent axle shift.

Power steering is standard on the 164. Hydraulic pump, top right, is belt driven. Fluid reservoir is at the bottom center.

Suspension and Steering

The Volvo suspension uses coil springs all around and double acting telescopic shock absorbers at each corner for a firm but well controlled ride. Up front in the 164 the independent suspension's springs, shock absorbers and stabilizer bar are stronger to compensate for the increased weight of the six-cylinder engine. 145 rear springs are supplemented by hollow rubber springs that limit vertical axle travel on very rough roads or when the wagon is fully loaded.

In the rear, Volvo uses a live axle, accurately stabilized by rubber mounted support arms and torque rods. A 164 feature is a wheel bearing which absorbs greater lateral stress during cornering. The stress is taken on both sides of the car and both sides of the bearings, adding to longer life.

Tires for all models are American-sized 6.85 x 15. Large 15-inch wheels and tires enable the disc brakes to be properly ventilated.

The 164 has a power assisted recirculating ball and nut steering system. ZF designed, the unit makes steering and parking easier and is both firm and responsive without the vagueness associated with most power systems in use today.

Only 3.7 turns of the steering wheel are required to turn it lock to lock. The 164 has a tight turning circle of 31.5 feet.

The manual steering in the 140 Series gives light, precise control with only four turns lock to lock. The high front wheel turning angle enables the car to make a 30'4" turning circle.

Different safety steering columns are used on the four-cylinder and six-cylinder cars. The 140 Series column is made in two sections which meet in the engine compartment. Brackets on each section are coupled together by two steel pins suspended in hard rubber bushings which also effectively absorb road noise and vibration. Normally this column performs as a solid unit. In a collision, however, the two sections separate.

For the 164 the column is a specially developed four-section unit. The upper two sections are designed to telescope and will collapse under pressure from either end. Connecting these sections with the two bottom sections is a universal joint coupling. A hard rubber coupling that absorbs road shock and vibrations joins the two lower sections to the steering box.

Volvo suspension and steering specifications

Front suspension: Independent with rubber mounted control arms. Steering knuckles supported by ball joints. Stabilizer bar. Coil springs with double acting telescopic shock absorbers. Permanently lubricated.

Rear suspension: Solid rear axle carried by longitudinal, rubber mounted control arms and torque rods. Transverse location by rubber mounted track rod. Coil springs with double acting telescopic shock absorbers.

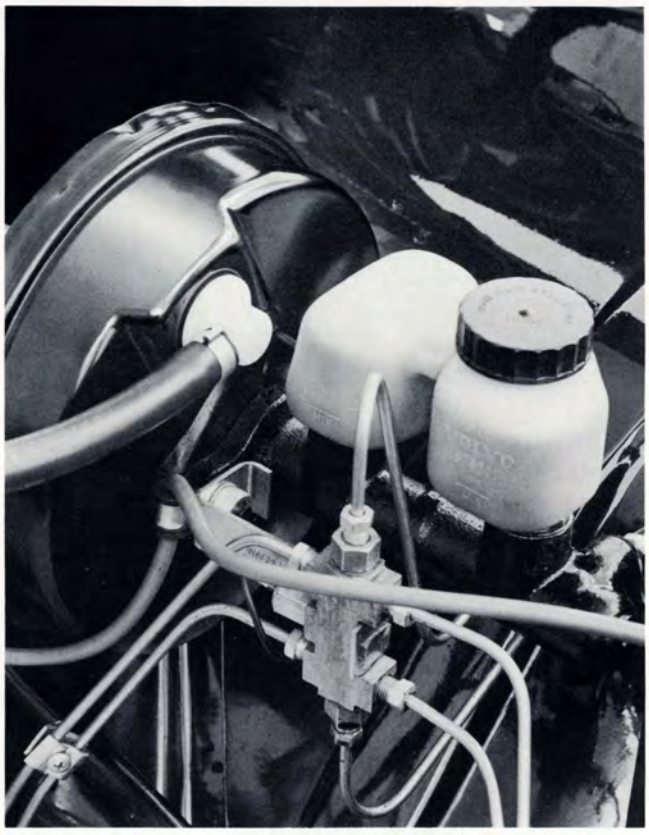
Wheels and tires: Pressed steel wheels, rim size 4½ Jx15 inches. 6.85 x 15 tires. Low-profile whitewall, tubeless.

Steering: 140 Series - Cam and roller type with four turns lock to lock. Turning circle 30 feet 4 inches. Safety steering column. 164 - recirculating ball and nut type with power assist. 3.7 turns lock to lock. 31 feet 6 inch turning circle. Safety steering column.

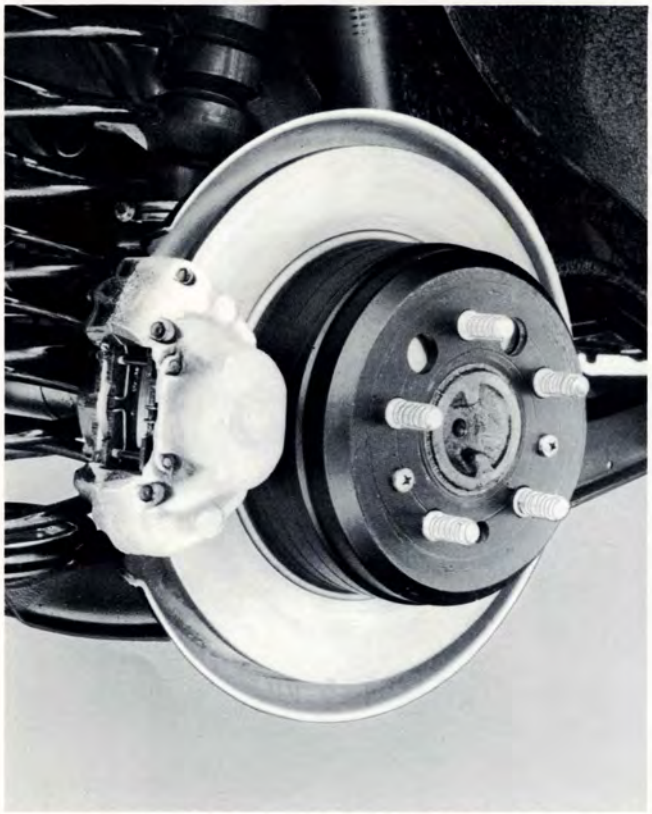
The 140 Series steering column is coupled together by steel pins suspended in hard rubber bushings to absorb shock.

Auxiliary hollow rubber springs on the 145 supplement the rear coil springs to limit vertical axle travel on rough roads.

Power assist is standard on all Volvos. The 164 booster for the disc brakes has a powerful 1:4 reduction ratio.



Power assist and hydraulic fluid reservoir are shown here for 140 Series cars. Visual inspection of the fluid level is another safety feature.



Volvos have disc brakes on all four wheels. Rear discs have a separate hand brake system enclosed inside the drums.

Front disc pads on the 164 are 35% larger than those on the 140 Series, compensating for the greater front end weight.

Brakes

Volvos feature an advanced braking system using power assisted, self adjusting disc brakes on all four wheels. An exclusive 3-wheel dual brake system has each circuit operating on both front wheels and one rear wheel. Not only is it more efficient than the four other possible dual brake systems, but it also eliminates the hazard of control loss during heavy braking. With one circuit inoperative, a Volvo maintains directional stability even during panic stops.

Proof of this efficiency is the fact that a Volvo 144 needs only 37 more feet to stop from 60 m.p.h. on only one circuit.

The hydraulic system has three immediate failure warnings built into it. In addition to the instrument panel warning light, both pedal travel and pedal pressure will increase noticeably (but not uncomfortably) if one of the circuits should fail.

Contributing to the ability of the Volvo to stop straight is a pair of special pressure relief valves incorporated into both rear brake hydraulic lines. They regulate hydraulic pressure which prevents rear wheel lockup, the primary cause of loss of control during emergency braking.

To back up this advanced foot brake system, Volvo has added an efficient hand brake which features a brake drum for each rear wheel. An automatic dashboard reminder light warns the driver that the hand brake is applied.

Volvo brake specifications

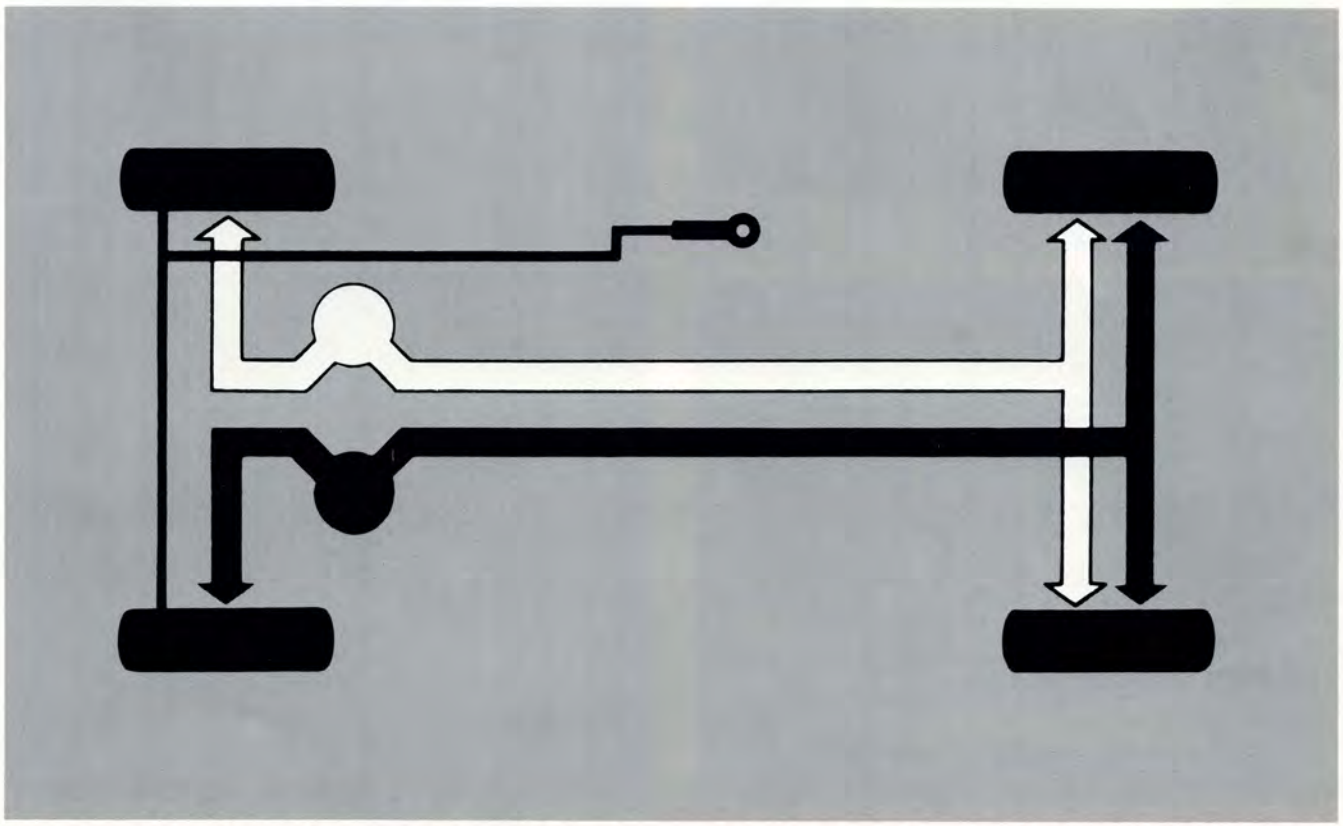
Power assisted, self-adjusting four-wheel disc brakes. Twin circuit hydraulic system, each circuit operating on both front wheels and one rear wheel. Each circuit alone provides 80% of total four-wheel braking effectiveness. Special pressure relief valves operate on rear wheels.

Front: 10.7 inch discs. Pad area: 164 - 27.0 square inches; 140 Series - 22.8 square inches.

Rear: 11.6 inch discs. Pad area 14.4 square inches.

Hydraulic power assist: 164 - 1:4 ratio; 140 Series - 1:3 ratio.

Handbrake: Mechanical drum brakes acting on both rear wheels. Lining area: 27 square inches. Dashboard warning light.



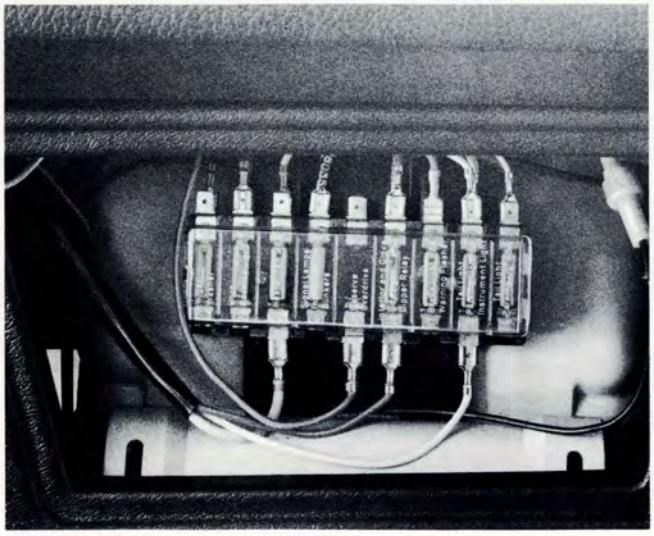
The unique Volvo dual brake system has each hydraulic circuit operating on three wheels, two front and one rear, for efficient, straight line emergency stops. Pressure relief valves incorporated into both rear brake hydraulic lines prevent premature locking of the rear wheels.

No tools are needed for simplified headlight adjustment. Two knurled knobs accessible under the hood do the trick.

A lever mounted on the steering column gives mounted lever fingertip operation for dimming highbeams and operating directional signals.

Powerful motor pumps cleaning fluid onto the windshield from a 1½-quart container installed under the hood.

Side markers are illuminated on 1970 models. These lamps operate on the parking light circuit.

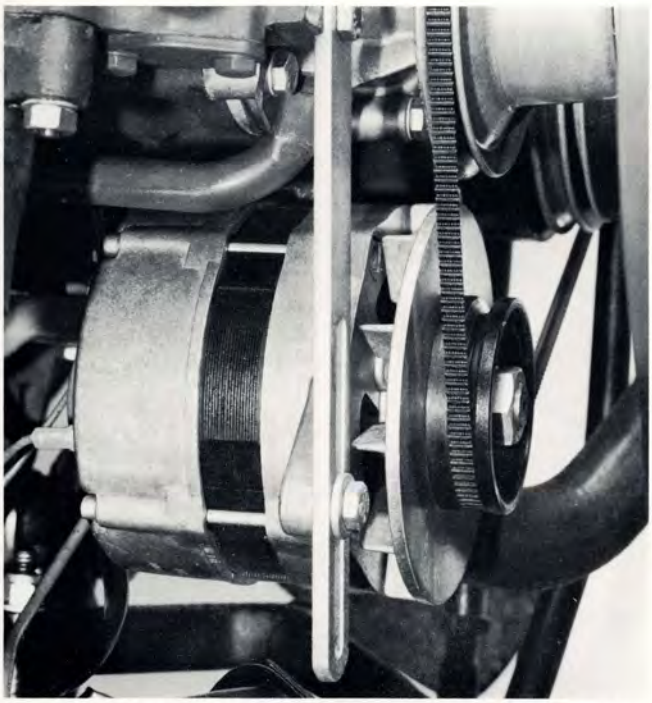


The fuse block is mounted inside the car behind the center underdash panel to give protection against corrosion.

Knob on the lower left controls the 145 rear window wiper and washer. Alongside is the rear window defroster switch.

Electrical System

A strong 60-amp hour battery, normally supplied only for much larger engines, is standard on all Volvos.



The 164 is equipped with a high capacity 55-amp alternator for full battery charging, even while idling.

Capacity of the Volvo electrical system is more than enough to start the engine in the coldest weather and to operate all accessories, including air conditioning.

Volvos start with a 12-volt system and a 60-amp hour battery usually supplied for large V-8 engines. The starter produces one-horsepower to start engines at the coldest winter temperatures.

An alternator is supplied on all models. Maximum output is 35-amps in 140 Series models and 55-amps in the 164. This is enough power to keep the battery full charged regardless of operating conditions.

To protect the electrical system from moisture and ensure wet weather starting, Volvo has adapted protective features from its marine engines. The spark plug connectors have silicon rubber seals and polyester is used for the distributor cap and suppressors.

Volvo electrical specifications

Voltage	12
Battery capacity	60 amp hours
Alternator rating	164 - 55 amps
	140 Series - 35 amps
Starter motor output	1 h.p.

Gauges and equipment

Fuel gauge and water temperature gauge, alternator, oil pressure, headlight beam, directional signal, hand brake and foot brake warning lights. Two-speed 100-watt electric blower. Electric rear window defroster. Two-speed electric windshield wipers plus electric windshield washers. Rear window wiper and washer on the 145. Automatic backup lights. Variable instrument lighting. Illuminated glove compartment. Interior courtesy lights. Cigarette lighter.

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