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PARTS FAMILIARIZATION WORKBOOK NO. I

Section 3: 140



During 1960 the 50,000th Volvo PV 444/544 was exported to the United States. The P120 was beginning to develop a following, and Volvo was building 80,000 cars per year for world markets. Every fifth car produced was sent to North America.

The Volvo parts market was also developing and growing. Surveys indicated that the typical Volvo owner kept his or her car longer and drove it farther than many other makes. Routine maintenance was the reason that many Volvos rolled up more than 100,000 miles on their odometers.

This may not appear to be hot news today, but back in the 60s good maintenance seemed to be an exception. Most cars generally needed more routine maintenance to keep running -- oil filter changes at 1,500 miles/2,414 km, suspension lubrication at 3,000 miles/4,800 km, tune-ups at 5,000 miles/8,000 km and even routine valve jobs at 25,000 miles/40,000 km! It seemed like most cars back then always needed something ...

Unlike the European car buyer, many North Americans would purchase a new car every twelve to eighteen months. Whether a domestic car or an import, the trend was to get rid of the thing before it needs parts. It was easy to skip needed maintenance or repairs by purchasing a new car. Most large manufacturers restyled the same cars over and over again just to keep this cycle (called planned obsolescence) going. This was to change in time.

It seemed that a small but growing number of family car buyers wanted to go against this existing trend. They were keeping their cars longer, following maintenance schedules and buying only quality parts. This new trend considered practical ideas like car safety, insurance, depreciation, economy, routine maintenance and total operating costs. The market was changing and Volvo was preparing for this change.

Plans were made in June of 1960 for a totally new Volvo compact-sized sedan to succeed the P120 and PV. The 140, originally named both the P660 and 1400, was officially introduced in the fall of 1966 in Sweden. The first year for the 140 in the United States was 1967, and a record number of Volvos (33,189) were sold.

Improvements to engine, drive train, suspension and electrical parts from the P120 were combined with a new, larger, modern body. The 140 was a leap ahead of the P120s and PVs in the areas of comfort, roominess and luxury.

In 1967 not many five-passenger sedans could average more than 20 miles per gallon, exceed 100 miles per hour, stop faster than many sports cars and, with decent care, go past 100,000 miles before needing major engine work. The 140 could.

More safety features were built into these cars than any other previous one. Volvo safety design reached a higher level of detail and precision with the introduction of the 140. Many people feel that these cars were largely responsible for starting Volvols reputation for safety in North America.

In addition to the 144S (four cylinder, four doors, "sport" engine), a 142S (the "2" meaning two doors) and a 145S ("5" meaning five doors -- station wagon) were introduced. A total of 1,205,111 140 cars were produced from 1966 through 1974. The 140 was a success all over the world.

TIP: The successor to the 140 is the 240 (covered in Workbook No.2). Don't combine them in your thinking -- for parts purposes, they are two entirely different cars.

Engine

All 140 used the four-cylinder, five main bearing overhead valve gasoline engine already described in the P120 and PV. A diesel engine was never available for these cars.

Both engines' size and fuel systems changed throughout the years. Study the engine designation table below and familiarize yourself with the engine identification numbers:

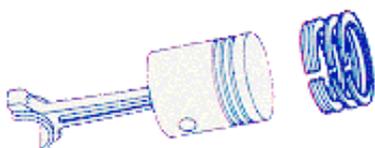
Engine		Fuel	Applications	
<u>Type</u>	<u>Size</u>	<u>System</u>	<u>Model</u>	<u>Years</u>
B-18B	1,778 cc (1.8 liters)	2x1 barrel carbs	142S 144S 145S	1967-68
B-20B	1,986 cc (2.0 liters)	2x1 barrel carbs	142S 144S 145S	1969-72
B-20E	1,986 cc (2.0 liters)	electronic fuel injection	142E	1971
B-20F	1,986 cc (2.0 liters)	electronic fuel injection	142S 144S 145S	1972-3

B-20F	1,986 cc (2.0 liters)	continuous fuel injection	142 142GL 144 144GL 145	1974
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Internal engine parts (crankshaft, bearings connecting rods/bolts, blocks, freeze plugs, timing gears/case/seals) did not change very much between 1970 and 1974. The majority of changes were made to pistons and rings, first as the above engine grew from 1.8 liters (B-18) to 2.0 liters (B-20), and as compression ratios changed to meet stricter smog laws.

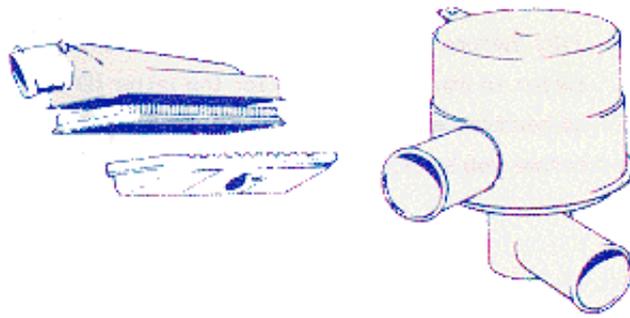
TIP: Before looking up a part number for an individual standard-size piston, don't forget to look for the letter (D or G) stamped on the top of the piston to be replaced. The stamp helps to determine the part number needed.

The addition of electronic fuel injection (B20E engine) on the 1971 142E was the second time this system had been applied to a Volvo (the first time was on the 1970 P1800 Sports Coupe). The benefits included a cleaner-running engine, more horsepower, and better driveability. All USA Volvos were fuel injected in 1972 and have been ever since. **NOTE:** The 1974 models had a mechanical (instead of electronic) system called continuous injection (CI). Parts are not interchangeable between systems or with Canadian model 140 Volvos (many of which had twin carbs through 1974).



All 1971 through 1973 fuel-injected 140s have a fuel filter located back by the gas tank. This filter should be replaced every twelve months or 12,000 miles. Carbureted engines make do with a cleanable element on top of the fuel pump -- no filter to replace.

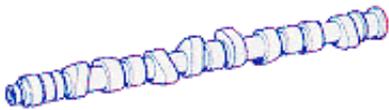
Many new and mysterious looking parts appeared with fuel injection. This new system contained many parts that didn't look like anything else. Fuel injection was one of the first examples of a new trend toward more complex parts. It's easy to get confused, so don't feel alone.



The rectangular-size, pleated-paper Volvo air filter you may be familiar with was first used in 1969 on carbureted B720 engines. Fuel-injected models used around paper filter through 1974. All air filters on the 140 are located on the right side of the engine. Replacement was called for every 24,000 miles for 1970 through 1974 on all 140 models.

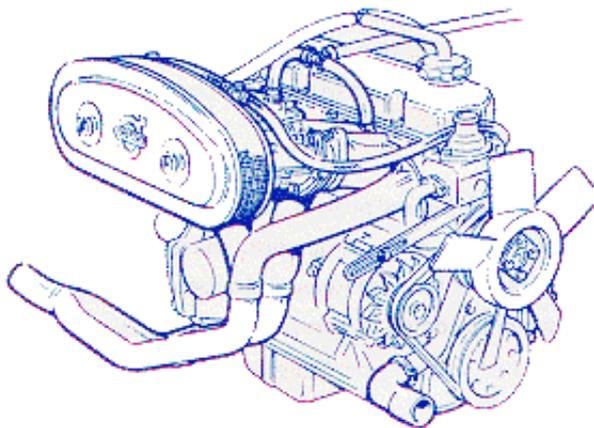
Air conditioning was available as a dealer-installed option just like the P120.

A few different camshafts were used on stock B-18 and B-20 engines. Generally, a carbureted engine used one type and a fuel injected engine required a different one. Ordering the correct camshaft with the correct engine means that the engine can perform like it did when it was new.



TIP: Mixing cams can lead to poorer performance and exhaust emissions headaches. We recommend against this!

In the early 1970s, a number of Volvo owners wanted "hotter" camshafts and other B-18/20 high-performance engine parts. The Volvo R-Sport Program was introduced in response to this need, and it contained an assortment of racing camshafts and other special genuine Volvo parts. With these parts, a B-20 could be made to pump out more than 180 horsepower at the rear wheels and make a Volvo competitive on certain racetracks.



These B-18/20 parts were purchased by both car racers and the general public, and a few are still available.

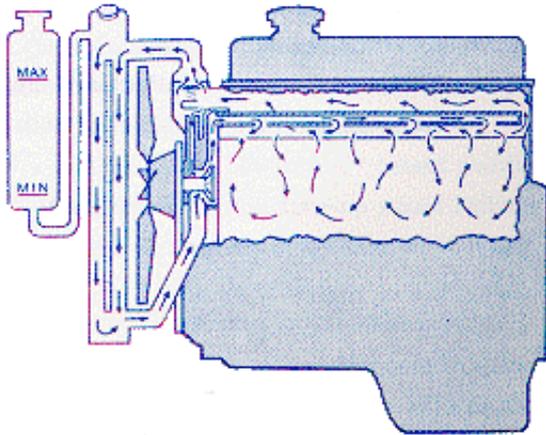
You might run into someone who remembers a 140 sedan or wagon with R-Sport engine parts. The expression, "wolf in sheep's clothing," was very appropriate

Whether the 140 was mild or wild, it had to keep cool. The cooling system was an improved version of previous designs. Key parts to know are the:

- Water pump -- made of aluminum, located in the front of the engine and driven by a

fan belt.

- Thermostat -- found on top front of the cylinder head and available by temperature range.
- Hoses - both upper and lower radiator hoses and heater hoses are molded to fit the curves of the engine compartment.



The engine cooling fan on some models had a special center hub that limited fan speed to about 3,000 RPM to help reduce noise. This part, called a viscous fan coupling (fan clutch), usually needs replacement on higher mileage cars.

The 140 DID NOT HAVE the following major engine parts as standard equipment or offer them as a factory option:

- Aluminum cylinder head
- Turbocharger
- Overhead camshaft
- Catalytic converter

Exhaust system corrosion on the 140 proved to be a tough nut for Volvo engineers to crack. Volvo invested in new equipment, materials and design to combat this problem. The genuine Volvo mufflers and pipes that resulted from this effort were second to none when it came to corrosion resistance.

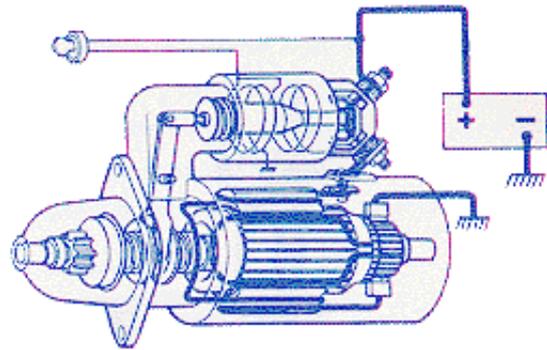
Electrical

The 140s were the first cars of Volvos to have all models equipped with a twelve-volt electrical system. The 1967 and 1968 models were the last Volvos to use a generator instead of a more modern alternator.

From 1969 on, all models came with an alternator mounted in the same location (right front of the engine) where the generator used to be.

Alternators were manufactured by SEV-Motorola or Bosch. Genuine Volvo exchange units are available for both generators and alternators.

As with the P120, a heavy-duty starter motor was fitted as standard equipment. You should still be able to obtain a starter motors.



For the first time in a Volvo sold here, the battery was located in the front of the engine compartment instead of back by the firewall. It was a twelve-volt 60-amp unit.

The severe Swedish winter places a burden on Volvo engineers to design reliable electrical parts. Special wide contact area terminals were fitted to all wire harnesses and connectors in the 140.

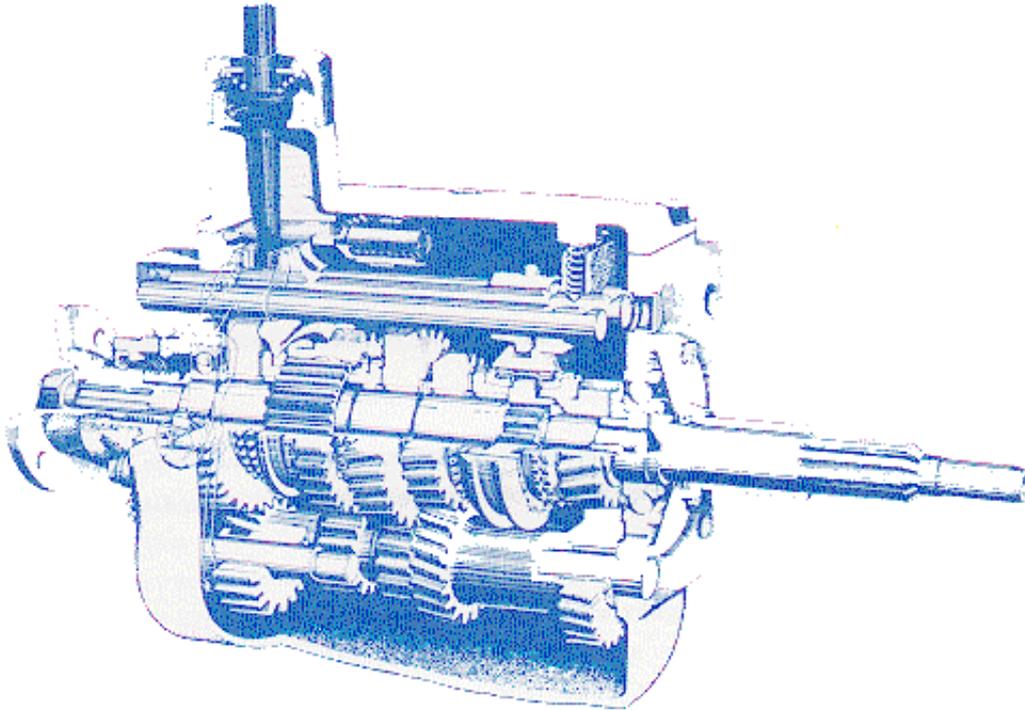
An easy-to-reach fuse box was built into the lower center of the dash. In 1967 the fuse box was hidden on many cars in the most difficult to find places. An easily accessible fuse box was a minor, but nevertheless important and convenient design feature copied by other manufacturers.

The Ignition System

All 140 used a conventional battery-coil ignition system. Spark plugs, contact points, distributor cap and rotor should be checked and cleaned every 6,000 miles/10,000 km or six months. On the average, a tuneup was recommended every twelve months or 12,000 miles/20,000 km.

A complete ignition tune-up on a 140 would include a new set of contact points, condenser, rotor, cap and spark plugs. A complete engine tune-up would include replacing the air filter and valve cover gasket. A new set of ignition wires might be needed also.

TIP: Remember that Volvos up to 1975 may require more frequent routine maintenance of their ignition system than newer cars do. Volvos from 1975 to the present use a breakerless electronic ignition system that needs less routine maintenance and has fewer parts to replace.



Drive Train

Both the M-40 four speed and M-41 four-speed with overdrive were used on these cars. These smooth-shifting, fully synchronized transmissions were designed to handle more horsepower than the output of a stock engine. Many owners of "hopped up" Volvos didn't have to worry about buying transmission parts because of a material or design failure.

Parts for rebuilding these manual transmissions are still available. Bearings, synchronizers and gears are the most common parts sold for rebuilding. The actual repair work is less complex than it looks -- especially when compared with newer manual transmissions or automatics.

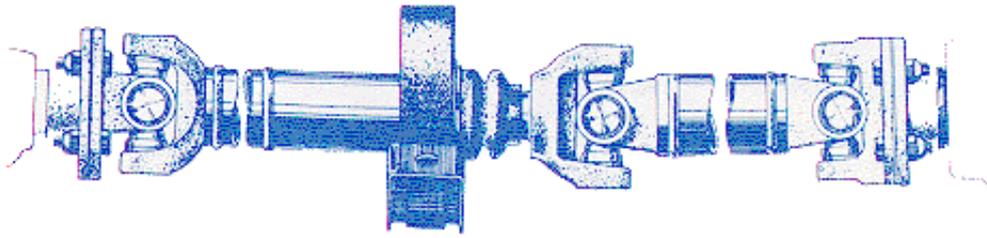
TIP: The three-digit number on the transmission is needed before you request the part number. Get the number first!

Automatic transmission maintenance called for checking on the fluid (type "F") level every 6,000 miles/9,600 km. The filter should be cleaned or replaced along with the fluid on all 140s every 24,000 miles/38,400 km. To change or clean the filter requires removing the transmission pan. Remember that a new genuine Volvo pan gasket is needed.

The driveshaft contains three universal joints and a center support bearing. The U joints will require replacement on higher mileage cars (usually more than 50,000 miles/80,000 km). A loud thumping or knocking noise coming from under the car when driven indicates the U joint should be replaced.

The rear axle assembly contains the differential and the left and right axles. The 140s continued with the "live" rear axle design introduced on earlier Volvos. The assembly was virtually maintenance free and has been known to last well over 100,000 miles. The "bullet-proof" design means that parts are needed only when things wear out (or when someone does something wrong).

An unusual ad campaign caught a few people by surprise in the middle and late 1960s. It advertised that Volvos lasted "an average of 13 years in Sweden -- a country where 70 percent of the roads are not paved." As you are beginning to become aware, this "no brag, just fact" approach was backed up by some pretty tough genuine Volvo parts.



Brakes Time for a change of pace!!

The year is 1966. Below is a profile of two typical car buyers and the type of cars they planned to purchase:

Buyer One:

He is 21 years old and have saved some bucks to buy his first car. It has to be a high-performance pavement ripper -- a heart-pounding two tons plus sedan with 425 horsepower, heavy-duty four speed, dual carbs, wide tires, heavy-duty suspension and dual exhausts. This monster can get it on! It can spread a strip of rubber in each gear and has no problem reaching 100 mph just as you shift into third ...

Buyer Two:

She needs a second car for commuting to work, so she shops around at the local dealerships and finds a cute little import car. For \$1,500 she can buy that car. After test-driving it, she notices how it seems to run circles around the big three-ton station wagon she has at home. It's quick steering, economical, well built and has a good reputation. It's a little slow "off the line," but it can cruise at the 70 to 75 mph speed she gets up to on the way to work

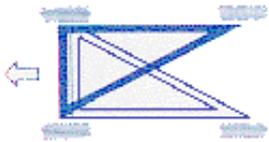
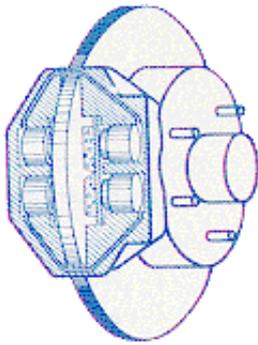
Can you guess what these two very different potential buyers are not aware of? Have an idea?...
Good brakes!

The brake system design on both of these typical 1960s cars was not up to today's standards. Amazingly, although these cars could accelerate blindingly fast and cruise at high speeds, many cars in the 1960s desperately needed better and safer brakes. Disc brakes were not yet available for most cars and even a leak in the brake system could cause total brake failure. New technology was sorely needed.

Volvo's contribution to car safety has a strong foundation in the area of brakes. The 140 pioneered

many new ideas for brake system design that resulted in a more safer car for everyone.

For example, in 1966, when most cars used drum brakes and a single circuit braking system, Volvo had a safer idea. The 140 pioneered four-wheel power-assisted disc brakes and a dual-circuit braking system in a passenger car. Pressure relief valves were built into the system to control braking action. Even the plastic see-through top used to check brake fluid on the master cylinder was a new idea!



When federal law in 1968 made the dual-circuit system, mandatory, the Volvo system already was designed to go a step further. Should a brake line get punctured, a Volvo still had braking effect on three wheels instead of just two as the law allowed. This triangle dual-circuit system introduced with the 140 is an important feature still seen on Volvos today.

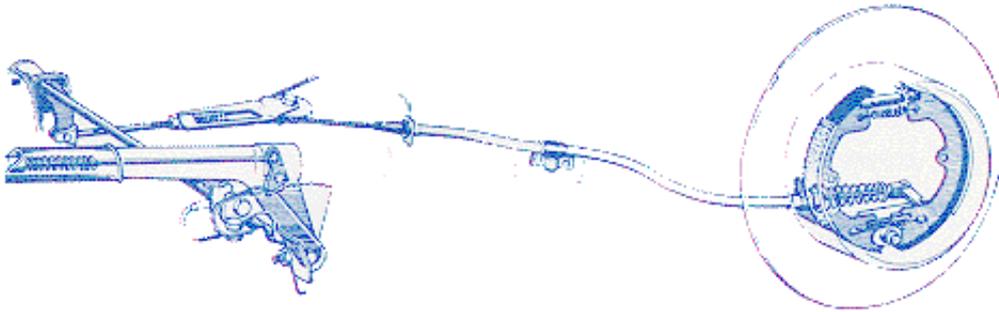
In addition to the use of Girling disc brake calipers already mentioned in the P120 section, another manufacturer of 140 calipers was ATE.

TIP: The name of the manufacturer is cast onto all calipers. It is needed when ordering brake pads, caliper rebuild kits or exchange calipers. Get the name before requesting your parts!

Disc brake pads are available for all front and rear calipers on 140 cars. The pads are sold in sets of two. Both front wheels and/or both rear wheels must be replaced at the same time. Brake pads for one wheel only are not available.

TIP: The Owner's Manual recommends checking the linings every 6,000 miles/10,000 km. Brake pads that are worn out will cause a screeching, scratchy sound. Worn-out pads can seriously damage the brake rotors (also called disc brakes). As with any disc brake system, the pads should be inspected regularly. Be aware that a customer may need new rotors in addition to pads.

All 140s had solid, non-vented brake rotors (except the 1971 142E -- the front rotors were ventilated) on all four wheels. A small drum brake was designed into the left and right rear rotor hubs. A small set of brake shoes are contained inside the hub and act as the parking brake. Both sets of brake shoes in each hub are operated by one cable.

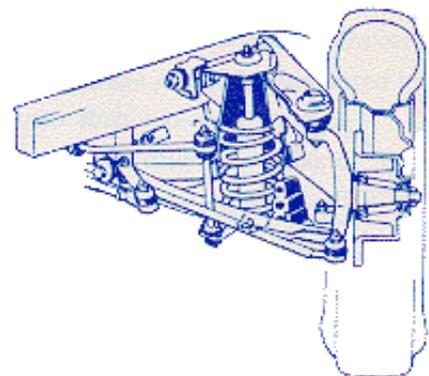


In time, the cable will stretch out of adjustment and need to be replaced. The brake shoes will also need replacement eventually.

The master cylinder is located on the left side of the engine, attached to the power brake booster. Both rebuild kits and entirely new master cylinders are available.

Suspension / Steering

The 140 Volvos have an independent coil spring front suspension that uses upper and lower wishbones (also called "All arms, control arms) connected to a front crossmember. Upper and lower ball joints are pressed into each wishbone and connect the steering knuckles to the wishbones. A stabilizer bar (also called anti-roll bar, sway bar) is also included on the front end.



Parts that should be replaced because of wear or age include:

- Ball joints
- Stabilizer bar bushings
- Control arm bushings
- Shock absorbers
- Rubber cushion buffers
- Coil springs

Accident damage could involve replacing the above parts plus one or more wishbone and the frame crossmember.

Stamped steel wheels (sizes 4.5 and 5 inches wide by 15 inches diameter) were the stock standard front and rear wheel installed on all models. These wheels had ventilation holes for cooling the brakes. Stainless steel trim rings and wheel hub covers were provided on all models.

The rear suspension was a refinement of the P120 design. The solid rear axle is supported by a pair of large control arms. A pair of torque rods and another rod that runs parallel to the axles (called a panhard rod) assist in keeping the rear end under control. Rubber bushings that eventually need replacement are part of the rods. Coil springs and shock absorbers round out the package. A stabilizer bar was not fitted to the rear.

The 140 has a very tight-turning radius of 30 feet, 4 inches, as compared with the P120s at 32 feet and the PVs at 36 feet. The ability to turn a Volvo around in a space smaller than most other cars was part of another Volvo advertising theme in the late 1960s. Many other smaller and larger cars needed more than 39 feet to turn around. The clever design of both steering parts and wheel well size helped to make 140s highly maneuverable.

The steering system on all 1967 through 1972 models (and most 1973-74 models) was a manual cam and roller type (not rack and pinion) system. Parts that may need replacement include:

- Left and right tie rods
- Left and right steering rods
- Steering arms
- Idler arm bushing

An important feature of the 140 steering system (P120 and PV also) was the ability of the steering shaft to collapse in a severe front-end collision. A special connector pin that joins the two-piece steering column shears off when forced. This helps to stop the driver from being impaled on the steering wheel shaft in a bad head-on crash. This feature was introduced on all Volvos in 1956 -- lightyears ahead of any other carmaker.

Power steering (P/S) was introduced on the 140 during 1973 but only as an option on automatic transmission cars. In 1974 it became standard equipment on all cars with an automatic. In addition to the above parts, the P/S pump belt should be replaced as needed. The P/S pump and pressure lines usually need replacement only when they fail to work.

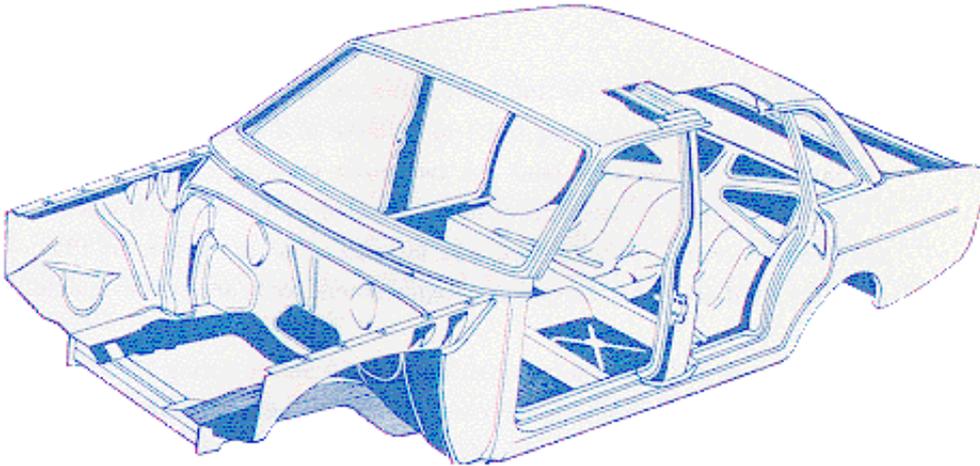
TIP: Someone that needs power-steering fluid is really asking for automatic transmission fluid (ATF). All Volvo power steering systems up through 1986 use Volvo-approved ATF (type "A," NOT type "IF").

The stock suspension and steering helped produce a comfortable ride, moderate body roll and predictable handling. Throughout the 1970s, a variety of optional handling packages (shocks, springs, stabilizer bars and bushings) were available for the 140. The Volvo Competition Service Department, at the time, provided R-Sport special performance suspension parts and technical

advice. Although this department no longer exists, the R-Sport name (and spirit!) continues in use today for specific genuine Volvo parts and accessories.

Body

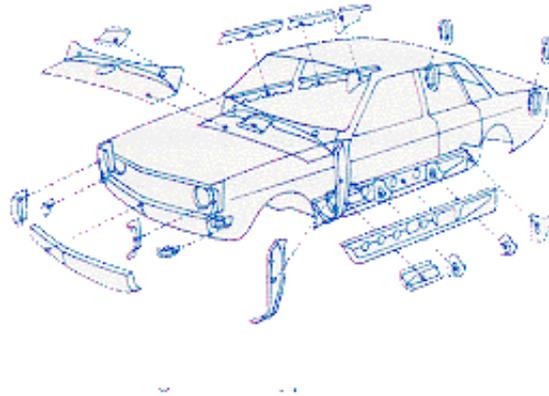
The 142, 144 and 145 model bodies are refinements of the unit-type construction of earlier Volvos. An average of 350 sheet metal component parts and 90 different subassemblies (groups of smaller parts) were used in a 140 body. Every body was manufactured from large panel section parts that were spot welded together. The finished 140 body contained the following features:



- Each spot weld (10,000 in all) that joins the panel sections is strong enough to support the weight of the entire body.
- The panel sections were welded to form a complete body. Then the doors, hood, trunk lid and other parts were fitted.
- Flat panel surfaces were reinforced with special Stampings for strength. These reinforced panels were combined to form a protective "safety cage" around the passengers.

This was practically a Volvo exclusive back in 1967. Today, this design is used by many carmakers.

The fight against rust and corrosion picked up where the P120 left off. New painting and rustproofing techniques were applied to the bodies and the replacement parts. By 1971 all Volvo 140 bodies passed through the paint plant on 16 conveyor lines that totaled nearly three miles in length.



Advanced rustproofing techniques included galvanizing vulnerable and selected lower structural parts -- rocker panels, door pillars, valance panels, headlight/taillight buckets, windshield cowl and others. Parts were galvanized by the hot dip method because it provides a much thicker coating of zinc. A variety of undercoatings were applied on both outside and inside areas of the body.

These 140s were one of the first cars to be designed with energy-absorbing front and rear body sections. Never before were the results of crash testing and research so intensely designed into a Volvo. The body parts are designed to work a special way in an accident. By using only genuine Volvo parts on a 140, compromises to safety will not have to be made.

The 140 have been out of production for more than twelve years. Many 140s are still rolling along -- some with more than 100,000 miles/160,000 km on the odometer. All odometers on 140s can register up to one million miles (999,999 miles instead of 99,999 on all other cars). The message here is durability -- both in the quality of the car and of the genuine Volvo replacement parts.

Specific areas that may need attention on higher mileage cars include the rocker panels, front fenders, front and rear wheel arches, inner fenders, hood hinge panels and the lower half of the doors. A customer can choose to have the body repaired using genuine Volvo parts either one of two ways:

1. Replace the worn-out portion of a body part with the entirely new part (example: replacing the whole damaged fender when the wheel arch is corroded away).
2. Repair only the worn-out portion of a body part with a new replacement section (example: keep the existing fender (damaged by corrosion) but replace the corroded wheel arch with a new wheel arch).

TIP: The installation of partial panels usually requires more labor time when compared with the replacement of the whole part (Example: repairing a corroded front wheel arch involves welding while a whole new fender just bolts on). The total cost to the customer (parts and labor) for both types of repair should always be considered.

The use of stainless steel for all exterior moldings and bumpers made of anodized aluminum (zirconium, an aluminum alloy, was used in 1974) helps fight corrosion. Genuine Volvo replacement parts are made of these same high-quality materials.

Bumper impact standards were introduced in late 1972. All 140s in 1973 and 1974 had energy-absorbing bumpers. These used two special shock absorbers mounted inside each bumper -- a system used on all Volvos today. The "bumper shocks" are available as a replacement part and need replacing if damaged in an accident.

The front grille is one entire aluminum piece on 140 models through 1970. In 1971 the front grille took on a squarish look. It was black in color and had the distinctive Volvo "slash" in the middle for the first time on a 140. In 1973 a more rectangular black plastic grille with the slash was installed.

In the interest of safety, Volvo has installed laminated windshield glass on all cars (including the 140). Laminated glass consists of two layers of glass with a middle layer of plastic. This makes the windshield more elastic and better able to absorb and soften hard impacts. Genuine Volvo glass imported from Sweden has the Volvo name printed on the glass. On certain Volvos, the Volvo logo (two round circles with an arrow) was printed on the glass.

The interior of the 140 contained two front seats designed with safety in mind. The seats were intended to provide not only comfort but a seating position that correctly fits the human body. The backrest angle can be adjusted as well as the firmness of the backrest. Long drives became more comfortable and safer.

Seats were covered with vinyl or cloth. Leather was not available in these cars (two exceptions: the 1971 142E and the 1974 142/144 GL had leather seats).

The most unusual feature on the dashboard of pre-1973 140s is the red "ribbon" type speedometer. A carryover from the earlier P120 and PV, it indicated increased road speed by increasing a line (ribbon) of red in the speedometer space. This setup seemed to say: the more red you see, the more cautious you should be! Definitely not your typical speedometer.



Fuel temperature gauges were also indicated along with charging, turn signal, hand brake, high beam and oil pressure lights. Many replacement dash parts are still available.

The 140 was an important contributor toward an expanded Volvo parts market. In the late 1960s aftermarket import parts suppliers were concentrating on small German, English and Italian cars. These were the volume sellers.

Throughout this period and into the early 1970s, the Volvo parts market grew because of increased 140 sales. It benefited from the focus of major aftermarket parts suppliers on Japanese car parts. The Volvo parts marketplace pretty much belonged to Volvo. But that was to change by the mid-

1970s.

Worldwide production of Volvos and sales in the North America had increased steadily from 1960 to 1970:

Year	Production	U.S. Sales	Canada Sales
1960	84,326	13,830	1,090
1970	204,991	45,359	7,034

This increase in production was largely due to success of the 140 in many international markets.

www.volvocars.com

