Building the Volvo Bertone 780 by Hand

Part 4

BY DAVIES OWENS

Volvo's marketing folks had worked hard to convey the vision for the Bertone 780 in printed materials. One glossy brochure declared, "From top to tail, inside and out, the Volvo 780 speaks only of exclusively designed comfort and elegance. Of the vanishing art of high-quality craftsmanship, the 780 is the perfect synthesis of Italian design and Swedish quality."

For Mario Panizza, project manager, and the 780 teams at Bertone in Grugliasco and Volvo in Gothenburg, there was no high-quality craftsmanship vanishing on their watch.

Most of the 1,500 workers at the Bertone plant were assigned to the 780 project, hand-building 12 cars per day on average. Had they been artists painting canvases, instead of building luxury coupes, their paintbrushes would have been flying.

Above The 8000th Volvo Bertone 780 rolls off the assembly line. From left: Claudio Cismondi, quality director; Paolo Caccamo, CEO; Roine Lundin, Volvo quality control. On the other side of the 780: David Diroccca, plant director; Leif Sjögren, Volvo logistics; and Mauro Charriere, C Shop manufacturing manager. Behind them, many of the C Shop workers.

Building a 780 was a highly synchronized, artful process, where creativity met with engineering precision. Carrozzeria Bertone had more interest in the 780 than in any other car in their 70-year history, as it transitioned from its singular coach-building role to participating in the design, engineering, purchasing, and production of the car. They also stood for 50 percent of the funding for the development of the car. Thus, it was high stakes for both Volvo and Bertone, and everyone involved insisted on quality in every step of the process.

Tens of Thousands of Parts

Mario stood next to Roberto Vigliano in the Experimental Shop office staring at the teletype printer as the print head moved quickly from left to right while making its distinctive whirling, buzzing sound.

Long before the Internet, Volvo had implemented a proprietary computer-based communications program that allowed direct and private contact between Turin and Gothenburg.

Roberto would compose a message to Volvo in Sweden on the clicking keyboard while looking at the green monochrome monitor. When he hit Send, the machine would transmit the message via the phone lines to the receiving computer, where a printer automatically printed it out. Cutting edge technology in the day and a highly efficient way to keep the two teams, more than a thousand miles apart, connected.

A 780 was comprised of tens of thousands of parts, and there were frequent new additions. Roberto had the daunting task of keeping track of all those part numbers. Some parts were the same as those used on other models, while others were unique to the 780.

During the five-year production run, there would be thousands of tweaks and adjustments to the parts list. While the 780 may have looked the same from year to year, Volvo and Bertone were continuously looking for ways to improve their masterpiece.

Some of the feedback came from customers. Other changes were initiated internally. Either way, there were thousands of parts to manage. Roberto knew from looking at the printout that there would be more work for him implementing the new change order.

This particular change order concerned updating the 780 badge on the trunk lid. There had been lengthy discussions between Volvo and Bertone about the badging of the car. From 1987 to 1990, all 780s had Volvo on the left and 780 on the right of the trunk lid. To further distinguish the 780, the Volvo changed the model designation to Coupe. ▷

European 780s with the diesel engine would receive the new badge starting in 1990, and all U.S.-bound 780s would get it for the final 1991 model year. A seemingly simple change, but with extensive work for Roberto and the Bertone team. Not only would the supplier have to create a mold for the new badge, but the C Shop team also had to be given further instructions to make sure only the correct cars got the new badging, while others still used the original 780 marking.

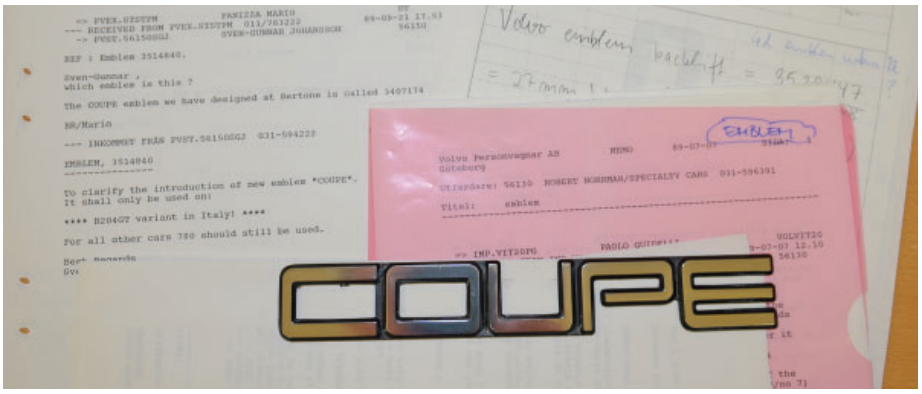
C Shop—Down and Back

Mario headed over to the C Shop to find Chris Constanzo, who was in charge of quality control in the final assembly area. To his right, more than 15 780s sat in a long line, still on their four-wheeled trolleys. At the very end, workers were turning the cars around and pointing them in the opposite direction. On both sides, a frenzy of blue-uniformed workers were moving around the cars like busy ants cutting up pieces of dropped fruit.

A dramatic transformation took place between the beginning and end of the C Shop. One could argue that the most concentrated and complicated phase of the production process occurred here.

Mario watched as two workers pushed a white 780 further down the line. They opened the doors, as they had on the previous six cars. At the same time, other workers brought over pre-configured wiring harnesses, installed them on the 780 bodies, and pulling bundles of wires through pre-cut holes, lined with rubber grommets, into the engine compartments. Other cables ran into the door cavities, behind the dash area, and into the trunk area.

Some 10 cars down, Mario could see other workers attaching a large jig to the front and rear frame rails, as had been done back in the A Shop. The jig then hydraulically lifted the 780 off the trolley and held it high enough for the workers to install the rear multi-link suspension system.



A simple change, such as rebadging the 1991 models from 780 to Coupe, required lots of paper work.

Volvo had developed this new split-axle design, which became standard on all 780s in the 1988 model year. It was a significant improvement over the solid rear axle. Workers using air tools attached four large bolts securing the multi-link to the bottom of the frame. They then installed the self-leveling Nivomat shocks, another high-end upgrade on the 780, using one top bolt inside the rear wheel well and smaller bolts up from the bottom into the control arm. The arms were then bolted to the lower body frame.

Simultaneously, a different team worked on the front suspension, attaching the front struts and brake assemblies. One worker installed the strut tower from the bottom side while his teammate used an air tool hooked to a long yellow hose to secure the top of the strut using three bolts inside the engine compartment. For added strength, workers temporarily clamped a yellow brace to hold the bottom of the strut in place before installing the engine.

To mount the engine, the workers activated the hydraulic cylinders on the jig, causing the entire car to rotate 90 degrees sideways. They then rolled the engine, on a smaller trolley, into the engine compartment and locked it in place with four large bolts securing the frame to the cross member. Together with the engine came the steering rack and remaining suspension components. With the engine locked in place, the transmission was installed before the car was rotated back to right-side up.

A few more components, such as bumpers, grille, front and rear valences, were added and then the wheels and tires. For the first time, the car now sat on its own wheels. Workers rolled the 780s forward and around the big U-shaped turn to point them back towards the beginning of the C Shop line.

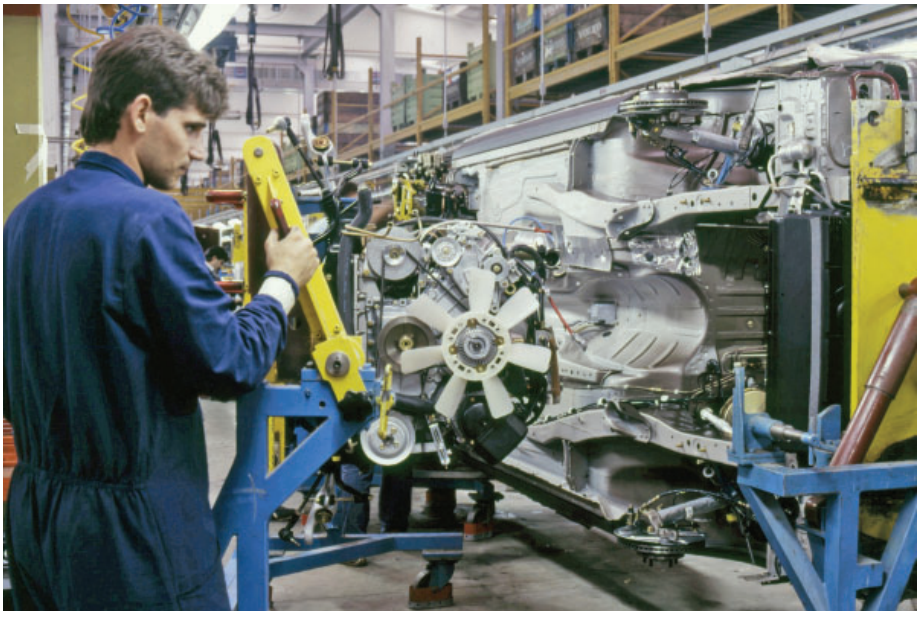
Long Technical Meetings

Chris Constanzo's wooden desk and black plastic chair seemed more fitting in a library than on the factory floor. No computers anywhere, just papers, files, and clipboards. Mario found Chris and commented how much things had changed since his early days at Bertone during the 262 project back in 1981.

Chris responded, "Quality control is everything. I have learned from Volvo to see faults in cars that I would never have spotted before. They are simply not accepted by Volvo." Mario agreed that these improvements in the production process were felt across the entire company, impacting all Bertone designed and produced vehicles.

As they were talking, Jan Dahlström walked up to them. He was another dedicated member of the Volvo team, who served as the primary contact for product documentation. Volvo had recently promoted him to a project coordinator position, which added to his responsibilities list. He generally worked out of Gothenburg, but traveled frequently to Turin to ensure the Bertone team understood all of the technical changes and the documentation was up to date. This was critical not only for

The cars were rotated on their sides, allowing the engines to be rolled in close and bolted in place.



Volvo purchasing and Bertone manufacturing decisions, but also for the many parts suppliers and aftermarket support.

Many technical documentation meetings would go on for hours. At times, it must have appeared to the Volvo and Bertone teams that paperwork and documentation was more important than building cars. Jan was thrilled to get a break and out of the stuffy conference room and be able to walk the factory floor.

Mario could tell that something was amusing Jan. When he asked, Jan said he couldn't stop thinking about what had just happened during their long meeting. Line by line, they had gone through every detail of the documentation to ensure everything was up to date. The meeting was so crucial that both his boss and his boss' boss were in the meeting, held in a small conference room. To save time lunch had been brought in—sandwiches and a small glass of wine to drink. Such a choice of beverage was a culture shock for the Swedes—drinking wine on the job!

After lunch, they moved into an even smaller room, where it quickly got warm. Soon people's eyes started glazing over and they were having a hard time paying attention. Before long, loud snoring could be heard.

To Jan's total embarrassment, his boss' boss was asleep with his head flopped over. Jan's boss attempted to wake him up by tapping him on the arm, but it made no difference. He then proceeded to shake his arm, and that woke him up. He opened his eyes with a shocked look on his face.

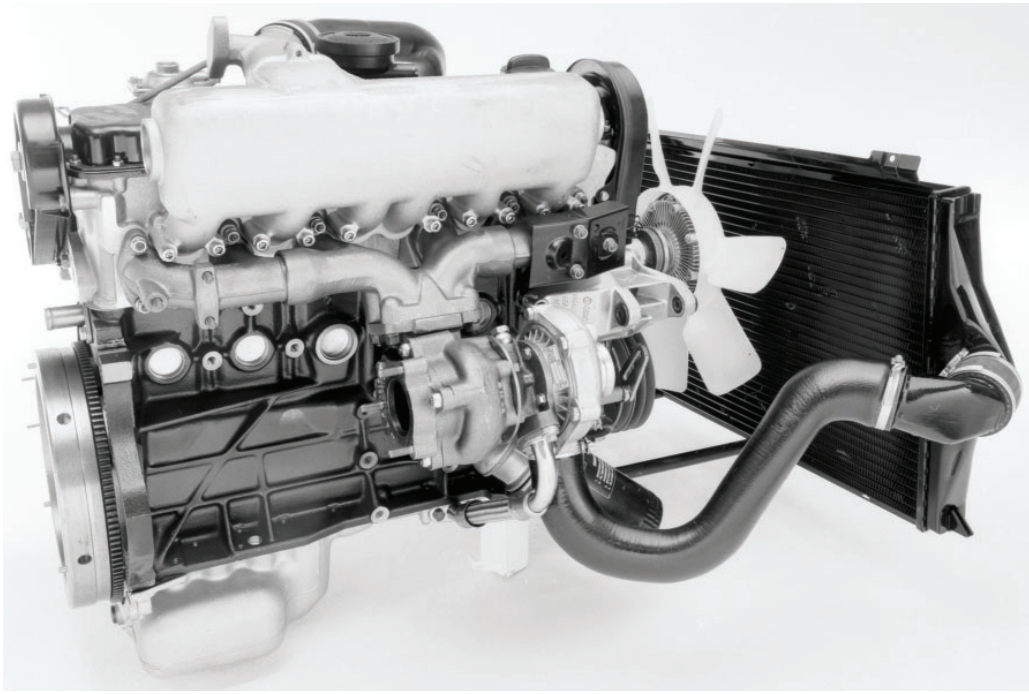
Everyone fell dead silent and tried to keep their faces straight, but then someone giggled. Soon the entire room burst into loud laughter. It was a technical documentation meeting that Jan would never forget. Maybe less wine for some of the Swedes at the next meeting, Jan commented to Mario.

Customized for Different Markets

As the cars left the paint area of the B Shop, workers placed instructions in a clear envelope attached to the plastic sheeting on the hood. This document served as the configuration guide to ensure the car was built according to specifications.

Once the windshield was installed halfway down the C Shop line, workers would attach a sticker, confirming the VIN number and providing additional instructions. These stickers helped establish the build orders and eventually directed the completed cars' shipping and distribution.

In the C Shop, the 780s took on their own personalities. Each car was built according to specifications depending on the distribution market. During the five-year production run from 1986 to 1991), Volvo shipped 780s to more than 25 different countries. The the fewest went to Chile (1 car) and the most to the U.S. (5,670). (Please visit 780coupe.com for the latest production records, updated with new data discovered this year.)



The D24TIC diesel engine, manufactured by Volkswagen, with a manual transmission was a popular powertrain for the 780 in Europe. The turbocharged 2.4-liter inline six produced 129 hp.

Cars meant for Europe received front headlight wipers, different side turn signals, headlamps, and orange side markers. Different instrument clusters (kilometers vs. miles) and sound systems were also installed. While the U.S. cars got only two engine choices, Bertone offered a total of more than six choices in the 780.

The most common engine for the U.S. market was the B280F V6 PRV, built jointly by Renault, Peugeot, and Volvo—same engine used by DeLorean. The V6 was the only choice for the U.S. market until 1989, when the B230FT red block was introduced to address complaints about the lack of power.

In 1990, the Turbo+ kit became standard on the 780s with the red block motor. This combination is why VCNA created the Volvo Concept 780 to promote the improved power plant (see the Mar-Apr 2018 issue of Rolling). Some 2,944 780s received the B230FT engine, distributed to the U.S. and other countries.

When it came to power and drivability, one could argue that the D24TIC turbo diesel paired with the manual M-46 transmission, was the best configuration. This combination was distributed only in Europe (1,024 units).

Subassembly

The C Shop line had a number of sub-assembly areas dedicated to assembling components, such as wiring harnesses, doors, interior rear side panels, and the dash. The door panels required extra attention due to the beautiful burled elmwood inlays.

The 780 had six separate wooden panels—two in the dash, two in the front doors, and two on the rear side panels. Burled wood comes from the twisted knot that sometimes grows on a tree creating exotic patterns. The Italian subcontractor, who hand-carved the panels, would write a unique number on the back of them to ensure that all six pieces had similar patterns.

After the wood panels had been separated for the various sub-assemblies, the workers had to ensure that the correct pieces were joined back together and made their way into a single car. High above the C Shop, there were racks of door panels waiting for the sub-assembly group to pull them, install the wood, and then have them ready for the C Shop line. Lots of finely tuned logistics.

Detailed Installation Instructions

It might seem that installing something as simple as a bolt wouldn't require more instructions than "Install the bolt," but not for Volvo.

Every step was detailed down to the number of seconds required for the installation. These operating instructions were prepared by the Bertone Production and Engineering Dept., in collaboration with Volvo.

Installation of the wheel lug nuts, for instance, was illustrated by a drawing. The instructions guided the workers to a specific part number and bin to make 100 percent sure the correct part was installed. Four wheels required 20 lug nuts, torqued to a specific level, and with an installation time of precisely one minute and 40 seconds.

The rear hat shelf had been designed with three brackets for mounting rear child safety seats. Workers screwed three plastic bolts into the open holes in precisely 15 seconds. The anchor bracket, to which the front seatbelt was attached, required a bolt with five different washers in a particular order and a nut. Another instruction sheet showed the exact location of these parts and the sequence in which the anchor bolt had to be installed and torqued.

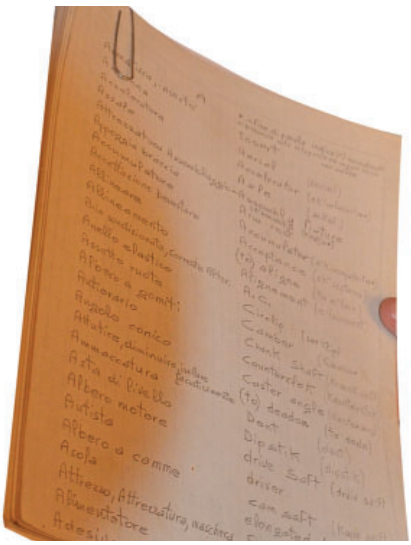
Three Languages

Building the 780 required endless hours of written and verbal communications between the Bertone and Volvo teams. The documentation assumed everyone spoke and wrote in the same language, but that was not the case. Few of the Bertone managers, and none of the line workers, spoke Swedish, except for a few courtesy phrases, such as *Smaklig måltid* (Enjoy your meal) or *Tack så mycket* (Thanks a lot). Likewise, few of the Volvo team knew any Italian, other than a words like *Ciao* (Hello) and *Espresso*.

So how did they communicate? English was the common language or shared uncommon language. But not everyone knew English. Nuccio Bertone himself did not speak English, only Italian and French. So, Paolo Caccamo, Bertone's CEO, had to translate. Conversations thus took longer as Paolo had to translate from English to Italian and then the Italian reply back to English.

Bertone had also put together a translation guide, consisting of a half-inch stack of handwritten pages held together by a paperclip. Multiple copies were floating around the C Shop. For example, halfway down on the first page was the Italian *Antiorario* with the English *Counterclok* (spelled phonetically) next to it. This was an important term since some bolts were reverse- or counter-thread.

Bertone's handwritten translation guide listed important terms in Italian and English.



Old World Craftsmanship

Despite all the documentation, there was still room for a fair bit of personal touch when it came to the actual building the 780. The workers took pride in their jobs and knew there was more to it than just following instructions. Everybody was an artisan in their own right and would work until they completed the step with excellence, and sometimes that took a bit of personal touch.

Door panels, for example, had to fit properly and the highest care had to be taken to ensure there were no visible gaps to the door frame. Wiring harnesses might require extra wrap and sometimes had to be pressed in tighter to avoid rattling on a bumpy road. The Bertone team frequently applied black sticky butyl tape, today known as dum-dum putty, to hold the sunroof wiring tightly against the roof and to keep the rear window drain lines from moving in the side cavities.

CEO Under the Dash

As Mario approached the end of the C Shop, he saw a leg in a black suit sticking out the driver's door of one of the cars. Coming closer, he recognized Paolo Caccamo with his hands up underneath the dashboard. Paolo was a dynamic leader, often working in the main office next to Nuccio Bertone. Still, he wasn't afraid to roll up his sleeves and solve a problem on the factory floor.

Next to him on the passenger side was Stefan Rudenstam, 780 project leader. He was primarily involved in supporting Bertone with the model year changes. If Volvo replaced a component on the 760, for example, it also had to be updated on the 780. Often it had to be redesigned to fit the 780.

Rudenstam and Caccamo had gotten into a discussion about a slight air leak in the ventilation system. The 780 inside air flow was controlled by dampers that were opened and closed by thin vacuum lines. Paolo explained that an extra step had to be added to secure the vacuum line to one of the dampers, but it was a problem that could easily be corrected.

Opening the Trunk

A worker was bent down by the open driver's side door, attaching two cables to the trunk and fuel door release mechanism that would go into the small opening on the B pillar.

One of the distinctive features of the 780, which really shows its Italian origin, is the way to open the trunk. There is no handle on the trunk lid, as on most cars. Instead, you open the trunk, and the fuel door, with a latch on the B pillar. There is also a switch on the dash for the fuel door and a button inside the glove compartment for the trunk lid.

Sven-Gunnar Johansson, the 780 technical project manager, recalls one of the more humorous moments at the 1985 Geneva Motor Show when an over-zealous journalist tried to pry the trunk open by rocking the car up and down. Sven-Gunnar rushed over, worried that the guy would literally tear it open. He calmly showed him the release mechanism on the B pillar and explained there was also a button in the glove compartment.

The unique trunk and fuel door release mechanism was mounted in the B pillar.

A Rolling Concert Hall

Mario had reached almost the end of the C Shop, where workers installed the last interior components and made final inspections. Adriano Bertuolo was sitting in a silver 780 testing the radio. He was the C Shop supervisor and often checked personally that his team had installed the electrical equipment correctly and that everything was working properly.

The 780 had an Alpine sound system, including a six disk CD changer, which became standard equipment in 1991. It was the most sophisticated Volvo sound system of its day, with independent amplifiers for the front and rear (located under the dash on the driver's side and the rear hat shelf). There was also a separate graphic equalizer, except in the 1991 model year.

Bertone 780 No. 8,000

Up ahead, Mario could see a group of people gathered around a bright red 780. Something extraordinary was happening. He walked up and saw the 780 had a large sign on the roof saying 8000th Volvo Bertone.

It was the 8,000th car completed. No one knew that day that there would only be 951 more cars produced before the last one rolled off the line December 7, 1990. For today, it was all celebration and a gathering of the plant leadership team.

Had there been a speech that day, it would no doubt have echoed Nuccio Bertone's words on the Bertone philosophy as they produced the 780:

> *Taste, distinction, class cannot be improvised. They are inherent qualities, produced by long generations of history, style, customs, and culture.*

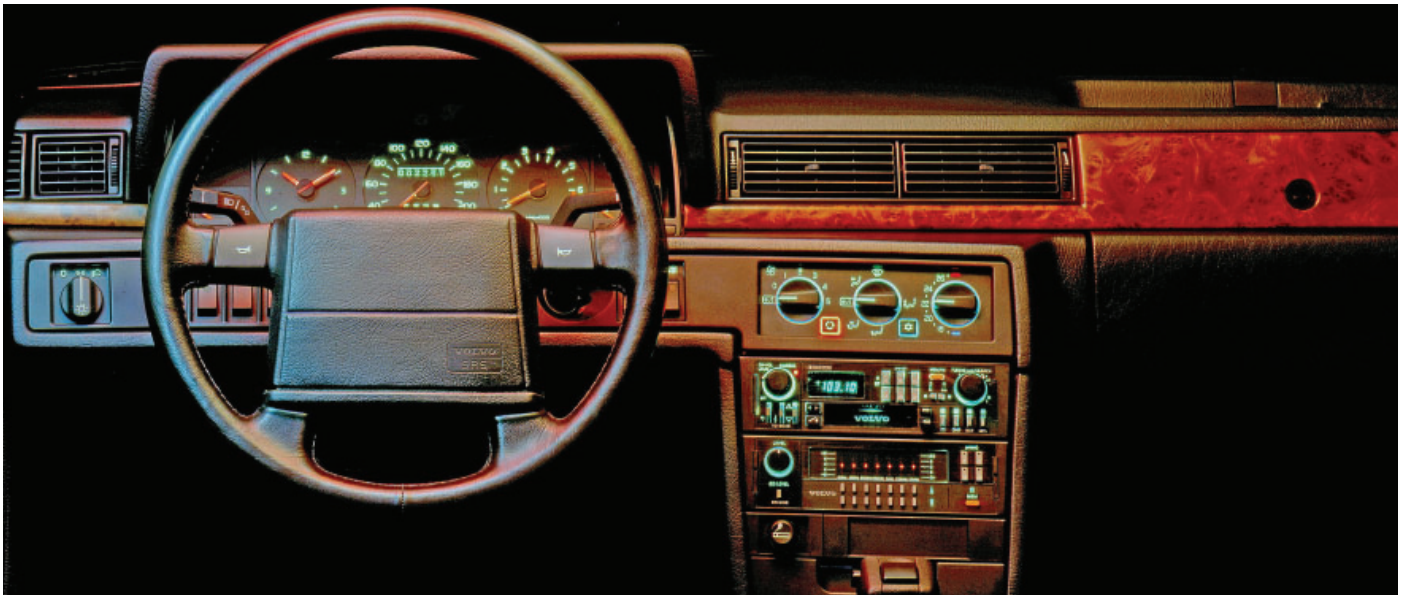
Adriano Bertuolo testing the radio at the end of the C Shop. He was a dedicated, hard worker and much loved. When I presented my slideshow to the Bertone folks in Turin in 2019, the photo of Adriano brought lots of cheers.

After the ceremony and the photos had been taken, the workers made sure fuel and fluids were all filled and then turned the key for the first time, bringing the 780 to life.

It was time to put the car through its paces. Mario watched as the team pulled it forward and got it ready for the final auditing and testing. A worker drove it onto the rollers in a large, enclosed area. The rear wheels began turning while a large fan blew air into the grille. ■

To be continued in the next issue of Rolling.

The first three parts of the series can be found in the previous issues of Rolling.

Davies Owens lives in Boise, Idaho and can be reached at davies@780coupe.com.

The 780 had a sophisticated Alpine sound system with a six-disk CD changer located in the trunk. There were two independent amplifiers—a front one mounted under the dash and a rear one under the hat shelf—and a graphic equalizer.