CHAPTER 4

FRAMES

Frame Types

General Motors has designed a few different frames over the years. Two basic frame construction types are full-frame and unit-body (or unibody).

Full-Frame

The oldest frame design is full-frame. Typically, the frame rails are constructed of .120-inch wall stamped steel that runs the length of the vehicle. GM used full-frame construction in their car-lines until 1996. They still use full-frame construction in truck-lines.

X-Frame

The X-frame was used in B-bodies from 1958 to 1964. As its name suggests, it was shaped like an X. The X met in the center of the chassis. It relied on the less-than-rigid floorboards to add strength. It was susceptible to twisting forces and lacked occupant protection during side impacts.

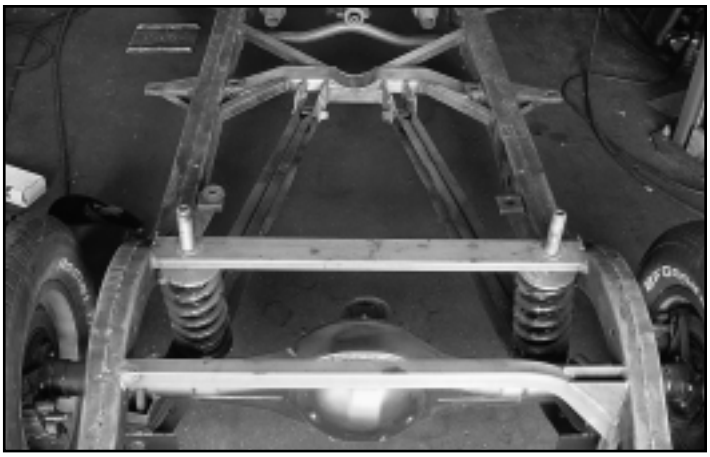
Ladder

The ladder frame is the oldest full-frame design. It typically consists of two long frame rails that run parallel for the length of the vehicle. The frame rails are separated by lateral supports. This design lacked strength in the early years. Early GM's only had one lateral support in the rear and one in the front. This design relied on the floorpan and body to add strength. It was extremely susceptible to twisting force.

Perimeter

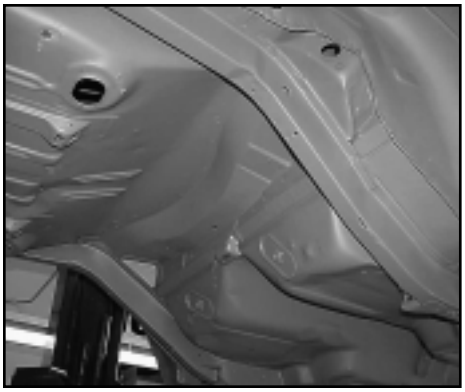
When GM decided to get rid of the short-lived X-frame in 1964, they switched to the perimeter frame. The perimeter frame is a version of the ladder

The B-bodies from 1958 to 1964 had an X-frame. The frame came together in the center of the car. This frame flexes easily and would need to be extensively modified for handling purposes.



The ladder-style frame consists of two frame rails that run parallel to each other, with one or two bars separating them. All the lateral supports shown were added to accept a truck-arm suspension. (Photo courtesy Hot Rods To Hell, Inc.)

The perimeter frame went around the outside edges of the body. Since it only has a couple of lateral supports, it is susceptible to flex. The frame is much stronger when the body is bolted on to help tie things together. (Photo courtesy of Hotchkis)



Unibody cars don't have full-length frames. The first- and second-generation F-body had a stamped sheetmetal rear frame and a front subframe. Here you can see the two rear frame rails of a '67 Camaro.

Some unibody cars don't have any resemblance to a conventional frame. The entire frame on this H-body is made of stamped sheetmetal, much like the frame construction used on all of today's GM production cars.

frame. The front and rear frame portions were approximately 12 inches inward of the external body panels. Notice, I refer to them frame in portions, not sections. This is a full frame, made as one unit. The front and rear portions were not much different than the front and rear portions of the older ladder frame or the X-frame. The center portion of the frame was the difference in design. The center portion of the frame ran around the outside of the passenger compartment. It was usually only an inch or two inward from the external body panels. This design is more resistant to flex and much stronger in a side impact.

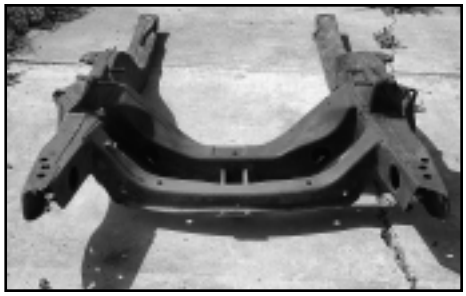
Unibody

The term unit-body is short for unitized body. The most common name for unit-body is unibody. This construction design was used by other automotive manufacturers well before GM did. Unibody construction is best described as body construction that incorporates body structure and chassis floorpan as one unit, to form a single, strong structure. Unibody construction was adopted by General Motors as a technological advance. It was introduced on the 1960 Chevrolet Corvair, along with other new designs that would be used well after the Corvair line was dropped. In 1961, the Pontiac Tempest hit the market with another version of unibody construction. In 1964 the Pontiac Tempest was redesigned. It shared the perimeter style full-frame with the Chevrolet Chevelle. Since then, the unibody has been refined. All GM car lines are now using unibody construction.

Subframe

With the introduction of the unibody in 1960, it was only a matter of years until GM engineers capitalized on its design. In 1962, GM came out with the Chevy II (first-generation X-body), which incorporated a modular type of frame. This new design incorporated a front frame section that could be completely removed from the body and the floorpan. The subframe on the first-generation X-body was unitized sheetmetal construction. The front subframe was bolted rigidly to the body firewall and floorpan. The second subframe design came out on the '67 F-body. It was a sub section of a full-frame. The factory attached the subframes on these cars with large rubber isolator bushings. The entire front suspension was attached to the subframe, making it a self-contained unit. It was a simple design that could be incorporated into more than one GM car-line at the same time. Pontiac, Oldsmobile, Buick, and Chevrolet took full advantage of this formula for many years. GM redesigned the F-body in 1982. The new design incorporated front suspension struts. The subframe was replaced with a large bolt-in K-member.

Here you can see that the front frame has been completely unbolted from the main body shell of this '63 Chevy II. Since the 1960s, companies have been building replacement front subframes for drag racing. Now, a few companies are offering bolt-on subframes with Pro-Touring in mind.



The stock front subframe is bolted to the body with six large bolts that attach it to the sheetmetal floor and the radiator support. From the factory, the six bolts have rubber bushings to isolate chassis vibration from the body.