

# How To

## Install a Late-Model Front End

Chassisworks A-arm frames and suspension systems provide a number of advantages over stock and other aftermarket designs in race cars, trucks, street rods, and Pro Street vehicles. Lower ride height, better weight distribution, the ability to easily adjust the suspension to compensate for differing conditions, more working room around the engine, increased structural strength and greater header clearance are among the most noteworthy improvements.

Best of all, these benefits are accomplished while eliminating up to 300 pounds from the nose of a car or truck. Available in either round- or boxed-tube versions and featuring the exclusive Chassisworks tubular A-arms, Mustang II-type spindles, rack-and-pinion steering and infinitely adjustable hub width (minimum 50 inches), these kits can be installed in virtually any make or model.

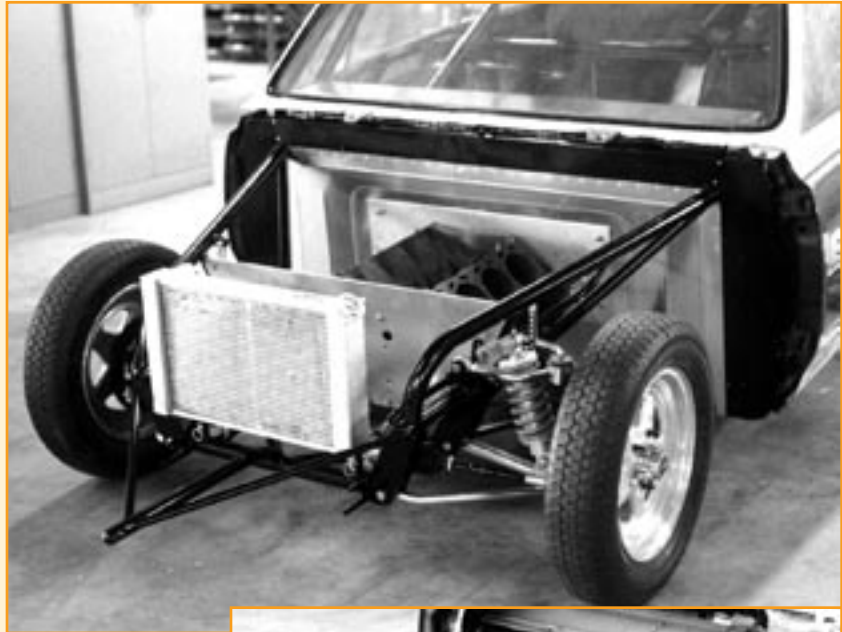
One of the more extreme "low-tech" methods of eliminating front-end weight is illustrated by the car used in this project. When this 1965 Olds 442 was converted into a fulltime drag car back in 1982, the roll cage and a ladder-bar rear subframe were installed by the owner. A large part of the weight-loss program consisted of taking a hole saw to whatever remained after all the "nonessential" material was removed.

Unfortunately, the structural integrity of the chassis also disappeared, right along with the pounds and ounces. This unwanted flexibility led to a host of problems, including a nasty string of broken transmission cases.

It was for these reasons that the Olds was rolled into the Chassisworks chassis shop. The object was to transform a well-used, worn-out and tired old warhorse into a high-tech, state-of-the-art racer, capable of handling today's higher-horsepower motors while meeting increasingly stringent safety requirements.

## Update an Older Doorslammer with Chassisworks Components

This "after" photo of our project car reveals a state-of-the-art front frame and A-arm suspension nestled within the confines of a classic 1965 Oldsmobile 442. All of the components used in this transformation, including the aluminum radiator, are available to the home builder through this Chassisworks catalog.



The "before" view of a perfect candidate for a high-tech transplant. This previously back-halved, ladder-bar Olds had spent the last 10 years of its life on the drag strip, but its heavy "Swiss-cheesed" frame flexed extensively and led to continual problems with consistency and broken transmission cases. Also note the lack of front brakes!



The first step in this project is to make sure the front wheels will wind up back where they started. With the wheels pointed straight ahead, the distance from the rocker panel to the front-axle center line is recorded. All of the new suspension brackets will be referenced from this measurement, and the tires will return to the center of the wheel well.



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All too often, as in this case, the front suspension is virtually ignored in the quest for greater performance. Most of the attention is focused on the engine and transmission, which of course are heavily massaged to produce and harness gobs of horsepower. The back half of the car will be modified in attempts to get that horsepower to the ground, and the roll cage is fabricated with an eye towards protecting the driver in the event of some sort of catastrophic failure.

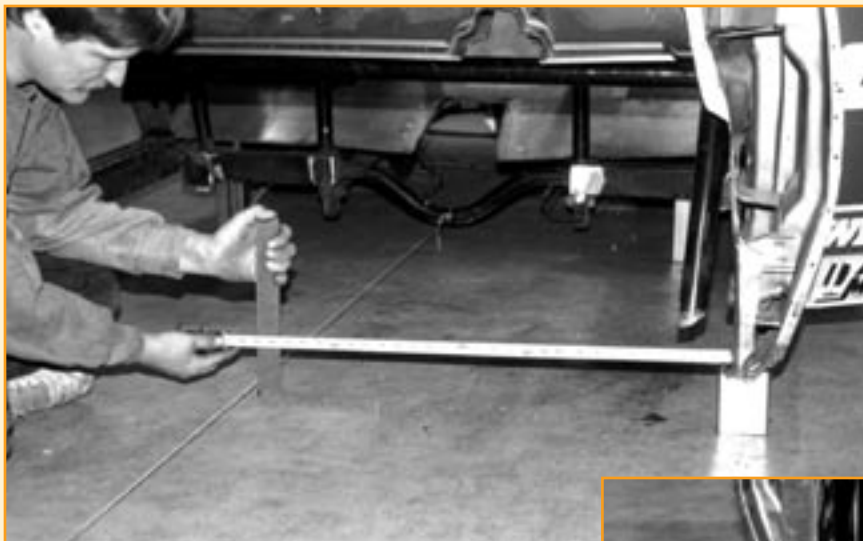
The front end, however, is apparently often thought of as merely a handy place to hang the front tires. With this Olds, the front brakes had even been completely eliminated — a dangerous example of an enthusiastic zeal for shedding weight getting in the way of basic common sense and the concept of self-preservation.

As Chris Alston sees it, this sort of behavior makes no sense at all. The performance, consistency, reaction time and handling of any car can all suffer greatly without a prop-

The Chassisworks diet plan is now well under way, with about 300 pounds scheduled to disappear by the time this project is completed.



With the stock front suspension in the dumpster, the nose clip is reattached to the car, and both the frame and front end are blocked up at the new (and substantially lower) 4-inch ride height.



One of the most critical components for the correct installation of the high-tech Chassisworks subframe and front suspension is a simple piece of string, tied onto the exact center of the rear crossmember and extending forward precisely through the middle of the car. Here, Chassisworks fabricator Jimmy Berg measures from the string line to the rocker panels to verify its location, after which the front of the string is taped to the shop floor to keep it securely in place.

After determining the correct frame width (as per the instructions included with each kit), the frame rail is tacked into position on the rear crossmember, blocked up off the ground, and checked in a couple of places with the use of squares and tape measures to keep it straight and centered on the string.



erly designed and installed front suspension. In any racing endeavor, this can often result in the dreaded "last-one-there" status; or, in the worst case, a mighty scary ride that may lead to a brush with the guardrail or a competitor.

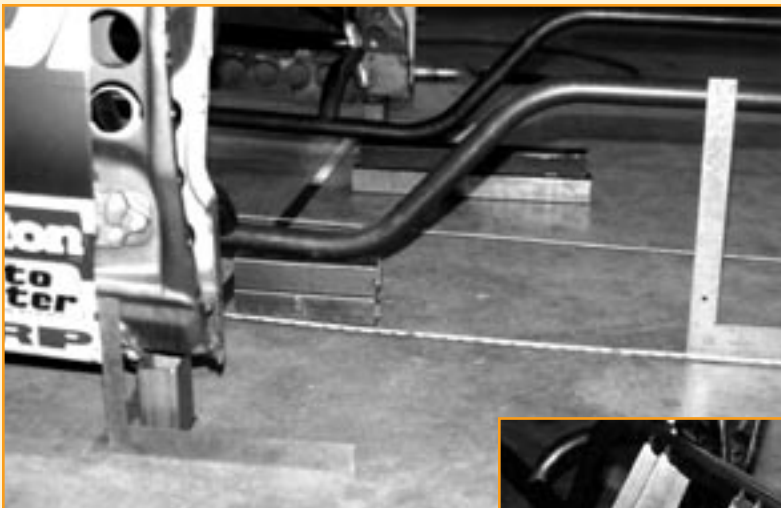
Chassisworks front-suspension kits are available to rectify this situation. Most of the components are designed, developed and manufactured in-house, while those parts that are purchased from other vendors (tubing, shocks, spindles, steering boxes, etc.) must be of the very highest quality to be included.

After years of selling his parts and kits to successful backyard mechanics and car builders throughout the world, Chris Alston is well aware of how hesitant some folks are about cutting off the front of a car. The assumption is generally that a chassis jig is required to get everything back together in the right places, and it's no mystery where this impression comes from.

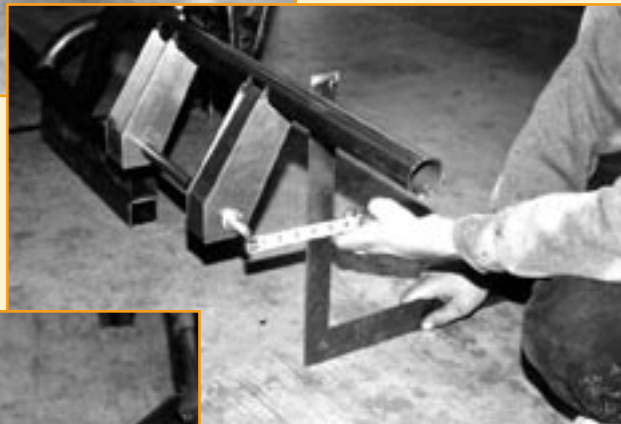
"All of us who read car magazines have seen



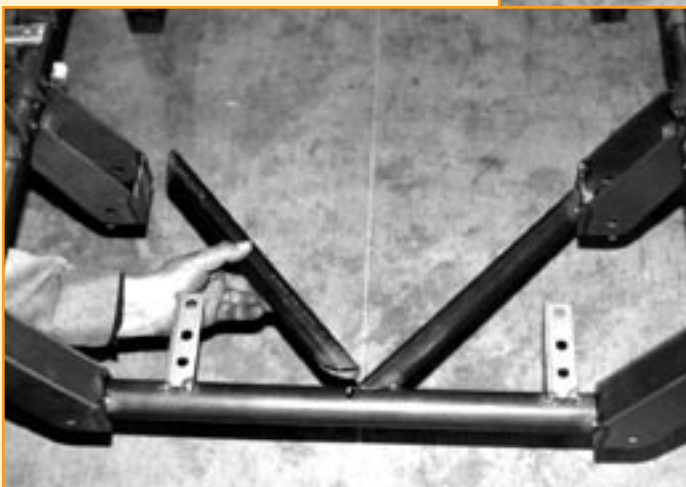
After the frame rails are in the car, they must be attached to the roll cage. Shown here is the Chassisworks cage-side-extension loop, which is cut in half to yield a brace for each side. The rise in the tubing allows for maximum header clearance under the car.



With the frame rails and braces welded in place, small squares are set on the floor up against the rocker panels, and a straightedge is placed between them, under the car. A tape measure is then run from the straightedge forward, and a large square is set against the frame rail at the recorded distance between the rocker panel and the original spindle center line. The frame rail is marked at this spot, providing the reference point for all suspension brackets.



The lower A-arm brackets are attached to the Chassisworks assembly fixture and tacked to the frame rail as specified in the instructions. (This fixture not only assures correct spacing and alignment of both upper and lower brackets, but, after assembly, it can be returned undamaged to Chassisworks for a 50-percent refund.)



After the rack-and-pinion crossmember is installed and the rack-and-pinion mounts attached, the front support tube is positioned between the crossmember and the lower rear A-arm bracket.

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countless cars being built on jigs," Chris stated, "and it might seem to be the only way it's done. We do this in our chassis shop, but that's because we build a lot of cars. If you're only building one car, it just doesn't make sense to do it any other way than the 'string' method we recommend."

And just what is the "secret of the string"? It's actually so simple that it appears to be truly revolutionary.

With the car sitting on a level floor at the desired ride height and the stock front end removed, an ordinary piece of string is tied onto the exact center of the rear crossmember

The last remaining step in assembling the front framework is attaching the forward struts from the frame rails to the cage. If the stock dash is being retained, holes will have to be cut to allow the tubing to pass through; if it is to be replaced with an after-market dashboard (such as the Chassisworks aluminum dash, Number 6607), this is a good time to cut out the original.

Next, the rear support tube is installed between the A-arm bracket and the frame, tying the entire front end together with minimum weight and maximum strength.



Now this Olds is beginning to look like a race car! All of the front-end structural tubing is in place, and it's time to start installing the suspension components.



To accept the larger Chassisworks tie-rod end, the tapered hole in the stock spindle must be welded up and drilled out to accept a 1/2-inch bolt, which facilitates bump-steer adjustment as well. Also seen here is the tie-rod adapter that allows the tie rod to be cut and sized as needed; its wrench-friendly hexagonal shape is useful for setting toe-in during alignment.



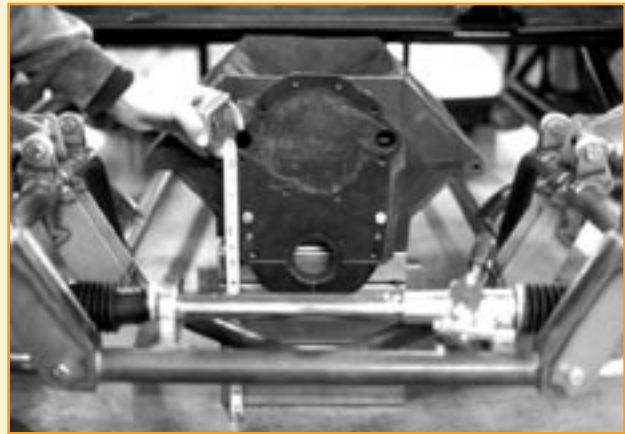
The A-arm suspension is just about complete. The shock simulator is set at ride height for the initial installation, and will be replaced by an externally adjustable coil-over shock absorber with the properly rated Chassisworks spring.

of the car. This string is then brought forward a bit past the now-phantom front of the car, pulled tight, and positioned precisely in the middle of the span between the rocker panels.

At this point, the front of the string is taped to the floor and, assuming that the car doesn't get moved around, you now have a precise center line from the back of the car to the front. It is from this string line that all subsequent measurements are taken, and parts are positioned.

There is no doubt that the string

With all the new frame and suspension pieces in place, the next step is the engine installation. The crank center lines (horizontal and vertical) are scribed onto the timing cover; the motor is then centered within the frame rails and blocked up off the ground at the predetermined center-line height of 10 inches.



Chris Alston determined that the Oldsmobile motor should run two degrees uphill (to the rear) to assure proper pinion angle; a machinist's level set at two degrees is placed on a straightedge positioned on top of the block, and the back of the engine is raised and shimmed at the correct height.



Once the motor is exactly located, a piece of cardboard (from the motor-plate shipping carton) is bolted to the motor and cut to fit. It is then used as a template for fabricating the front motor plate.



With the front plate trimmed, drilled and bolted to the motor, a small piece of tubing is installed between the frame rail and the forward frame-support tube. Positioned against the back of the motor plate, the upper plate-mounting tabs are welded to this brace, while the bottom tab is welded onto the lower-A-arm bracket.



Chassisworks manufactures predrilled front and rear (or "mid") motor plates for popular V8s, now including early Oldsmobile engines. At the time this car rolled through the in-house chassis shop, however, Olds-specific motor plates had yet to be added to the product line. That's why the installer is shown adding four holes to a Chevy midplate to adapt the powertrain. The midplate is also inverted to accommodate the Olds starter, which is on the opposite side of a Chevrolet's.



To size the midplate, measure from the dowel holes on the back of the block down to the frame; mark that location for cutting on the predrilled midplate, and notch the lower corners to fit on the frame rails.

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method works. The project presented on these pages went from start to finish without getting anywhere near the shop jigs that are used to build everything from street rods to the six-second, 200-mph Pro Mod monsters that have made Chassisworks famous. And, as usual, the entire process is clearly explained in the excellent installation instructions that accompany all Chassisworks components.

It was during discussions concerning the problems that may be encountered by the home builder that Chris mentioned the most common cause: the simple failure to follow the directions. As an example, he mentioned the process of setting the ride height.

"When you buy our frame kit," he said, "the assembly drawings and instructions tell you exactly where everything is in relation to the ground. If you determine where you want the car to ride before you put anything on it, and block it off the ground at that height,

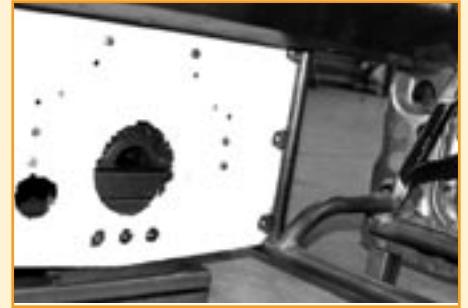


Adjustment of this Chassisworks travel limiter controls the amount of front-end travel, resulting in better reaction times. A clevis is welded to the forward frame-support tube to mount the adjustment plate, and the cable is looped through a 3/16-inch hole drilled in the lower shock mount.

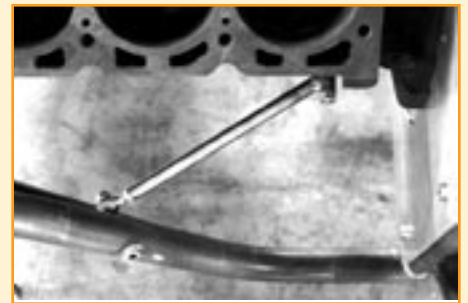
After bolting the midplate to the back of the block, it's time to install the midmount bar, so the plate will have something to bolt up to. This crosstube spans the two forward frame-support tubes, and is located with the use of a straight-edge placed on the back of the midplate, as shown.



As viewed from inside the car, the vertical midmount-support tube and tabs are welded in place, providing a solid backing to keep the motor and trans from leaping out of the car.



Anytime motor plates are installed in a car, there should be some means of keeping the motor from moving front to rear during high-horsepower launches. This Chassisworks torque limiter attaches the block solidly to the frame rail on the driver's side, preventing any movement due to flexing of the motor plates.



The torque limiter permits the use of a rubber transmission mount, which helps prevent broken trans cases. The removable Chassisworks transmission crossmember lets you pull the trans out from under the car, if necessary, and the extra cross bracing stiffens the car. For safety, Chris Alston recommends two driveshaft loops. The shifter platform mounts to the top of the front loop, and both are held in place with quick-release pins.



After cutting the dash to the proper length, the windshield contour is traced onto the panel, which is then trimmed to fit. For the relatively inexperienced home builder, the cardboard shipping box can be cut and used as a template for this operation.

then you know exactly how high the suspension will be off the ground when you're done.

"But some people refuse to first block up the car at ride height, and then build the chassis. They think they have to set it up on a table of some sort. What happens then is, you wind up building a car, and then trying to figure out how to get it to sit where you want it. Instead, you should figure out where the car is going to sit before you start, and then make the frame hold it up there.

"If you already have your car where you want it in relation to the ground, you really can't mess it up. But you can certainly get into trouble if you try to build it up in the air.

"Also, the shocks installed here are 9-7/8 inches long at ride height, and we used the springs to get them there. If the finished car weighs more, put in a heavier spring; if it weighs less, put a lighter spring in it. Use the threaded adjuster on the coil-over housing to dial in that optimum shock length, and when you stand back, the car will be sitting precisely where it should be. It's actually fairly simple to set it all up right, if you just follow the directions."

This theme came up again when the topic was the front-end alignment. When asked how long one could expect to spend adjusting the upper-A-arm threaded rod ends to set the camber and caster, Chris replied, "If you build it carefully to all the instructions, you can adjust it out in an hour or so, because it will be close to start with. But if something is messed up, you'd better be prepared to work on it for quite a while to get it aligned properly."

Bump steer is the result of the A-arms traveling in one arc as the suspension goes up and down, and the tie-rod ends traveling in another, pushing and pulling the spindles with them. While these arcs will never be identical, there is a mathematical relationship between them that basically says: "If the arcs aren't close, the steering turns drastically, if not disastrously."



To provide mounting points for the seat belt and shoulder harness, holes are drilled through the frame in the correct locations under and behind the seat, and a threaded boss (shown) is installed and welded into each hole.



A quick-release steering-wheel hub is included in the Chassisworks steering-column assembly, along with all the tubing, bushings, U-joints and hardware that are needed for a clean and trouble-free installation.



Dzus fasteners are used to attach the dashboard to the chassis, with the tube-end Dzus plates welded onto the two support tubes that run from the midmount bar to the back of the dash.



This shows how the frame and brackets are fabricated to mount onto the seat. Chris Alston recommends positioning everything so that the bottom of the seat itself actually sits on the car floor, to gain every available inch of head room.

With the seat in the driving position, a seat-frame tab slides onto each side of the frame tubing, and is then aligned and welded onto the rear crossmember. These tabs positively locate and secure the back of the seat in the chassis.



With the rear of the seat mounted, a Chassisworks folded clevis is welded to each side of the front of the seat frame, in a location that allows the attachment of the clevis tab to the chassis.



Unless the driver is very short or very tall, Chassisworks recommends locating the steering shaft about 22 inches from the floor, as measured from just in front of the seat. The shaft is suspended from the top of the cage with wire or string for adjustment while positioning the rest of the steering components.

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Chris weighed in once again with the value of following directions: "If you build everything at the dimensions we give you, it will be very close to spec and, usually, just a couple of shims either way on the rod ends will make it work. This is one of the reasons we don't use the stock, tapered tie-rod ends, because you can't take the bump steer out of it. We weld up and drill out the tapered holes on the spindles to accept a half-inch bolt, which lets us shim the tie rods. However, if the installation is inaccurate, it may be necessary to shim the rack-and-pinion unit itself to compensate, or even



One U-joint is installed on the shaft of the rack-and-pinion steering box, and the other one is positioned back near the firewall area. The lengths and angles of the two pieces of tubing that comprise the steering shaft will depend on chassis and header clearance; these can only be determined with the engine and cylinder head (removed for photo) installed in the car.



With the steering-shaft angles set, the column tubing is cut to length. The flanged polymer bushings are placed in the ends of the column, which slides over the steering shaft and is then welded into position. Here, the column is tacked to the vertical midmount-support tube and braces attached between the midmount bar and the column, positioned to clear the dash.



After the steering column and shafts are installed, the front motor plate is notched to provide clearance.



This Wilwood dual-master-cylinder assembly is teamed with a Chassisworks brake-pedal kit to provide superior stopping ability.



A tube loop is installed between the midmount bar and the midmount-support tube to provide an attachment point for the Chassisworks gas pedal. In addition to being positioned so the top end of the assembly pulls straight back on the throttle linkage, the pedal must clear the transmission and the steering-column support tube; there also must be room for the driver's foot to operate freely.



Before the assemblies are welded up, the height, clearance, and travel of the pedals are checked.



After adding a brace to the brake-mount tube, the dual-master-cylinder assembly is mounted to the frame. It is very important to keep the lowest part of the assembly higher than the bottom of the frame rail, to keep it from getting ripped out of the car on bumps and trailer ramps.



remount the rack in the worst cases.

"Ideally, you don't want more than 1/8-inch toe change, top of shock travel to bottom. If you have to have a little excessive toe-in, that's fine, but it cannot toe-out under any circumstances. Toe-out is the kiss of death; the car will be undriveable in high gear, it will steer itself, and if you don't fix it you will end up upside-down. In the old days, nobody paid much attention to this, and that's why a lot of the early cars handled so poorly."

The original plan was for the Olds to

The components provided in the Chassisworks switch-panel kit include heavy-duty switches, front-access fuse holders, and all the necessary electrical connectors.



The body of the switch-panel case is made of steel, to allow direct welding to the roll cage, and the front panel is removable to allow access to the electrical connections. Here, the switching unit is positioned up out of the line of sight, but within reach of the strapped-in driver. Visible at the upper left are the quick-release pin and mounting clevis for the window net.



With all interior components in place, Jimmy tries out the driving position. His right hand is simulating the location of the shifter lever after setting the height of the removable shifter platform.



The first step in mounting the new, one-piece, fiberglass nose clip is to install the "tube wedges" on the rack-and-pinion crossmember. Next, "wedge ramps" are welded onto the main tube, both to facilitate nosepiece alignment when putting it back on the car and to keep the nose clip from moving side to side. The tube is rotated 180 degrees, with the wedges on the bottom, when in use.



This angle shows how the support tubes are attached to the main tube and arrayed to reinforce the top, sides, and front of the nose; care must be taken to assure the support tubes don't interfere with the tires. The body plates are fastened to the body with reusable Cleco clips, which are replaced with rivets when everything fits correctly. These plates are then 'glassed onto the nose clip for strength, while Dzus fasteners are used to attach the trailing edge of the nose to the cowl.



Before the nosepiece is removed once again, measurements are taken so this Chassisworks tow point can be fabricated. Just the business end of the assembly will protrude through the bodywork, providing a discreet, strong and handy attachment point for tow ropes. Also visible are the short pieces of tubing used as sleeves for the radiator mounts, tacked into place on the crossmember.

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receive a simple transplant of the Chassisworks Number-7105 subframe and A-arm suspension. However, the owner was so pleased by the form and function of the upgrade that he quickly realized the rest of the car suffered in comparison. A couple more requests were made, then a couple after that. Before too long, an essentially brand-new 1965 Oldsmobile was rolled back outside and onto its trailer.

By that time, not much remained of the original except for the ladder-bar rear suspension, the roll cage, and the exterior body panels from the windshield to the trunk. New interior framework and tin, dashboard, seat, window net, pedals, master cylinder, front disc brakes, switch panel, firewall, shifter platform, radiator, nose clip and tow-point mounting were all pulled off the Chassisworks shelves and installed under the watchful eye of our cameras. Now, as shown in these photos, this new-old Olds has a fresh lease on life ■



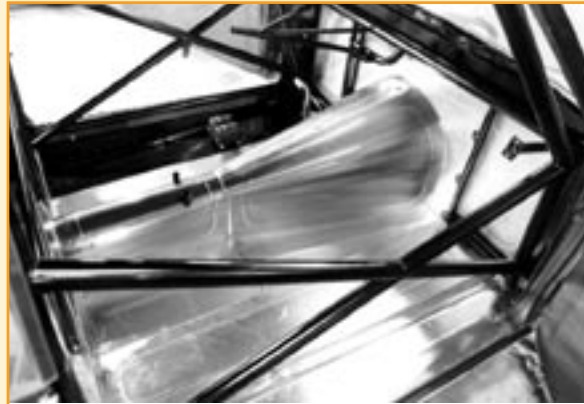
Chassisworks' firewall kit includes the steel panels used to form the A-pillar and cowl caps, which are trimmed to fit and welded into position. The aluminum firewall is then cut to shape and fastened to the steel panels. Here, Cleco clips hold the firewall in place prior to being riveted; the contour at the bottom of the firewall provides greater header clearance. Also visible are the Dzus brackets used to hold the nose clip in place.



The mid-tunnel kit comes in three pieces: the driver's and passenger's floor pieces and the driveshaft tunnel itself, which comes taller and longer than necessary. At this point, measurements are taken and the tunnel is cut down to size. Openings are also cut to allow access to the shifter-platform mounting tubes.



With the mid-tunnel trimmed and positioned, the two transmission tunnel pieces, which come with the floor portion attached, undergo the same procedure.



Here's the finished interior. The combination of the Chassisworks tin kit and careful craftsmanship has resulted in a highly functional, show-quality driver's compartment.



Waiting for the final installation of the engine block, radiator, coil-over shocks, new noseclip, and wheels and tires, the complete Chassisworks frame and suspension components are revealed in all their glory. Disc-brake assemblies and brake-line kits are also in stock at Chassisworks.



With the Oldsmobile about to be rolled back into the daylight and onto its trailer, Chris Alston tries out the driver's seat and controls while consulting his checklist, making sure for the umpteenth time that everything has been done to perfection.