

# Street & Performance

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## **LS-1 6 Speed in a 1970 Chevelle.**



The engine as it is at the beginning of this installation is a 2002 Camaro LS-1, low mileage, 6 speed pullout, purchased from Street & Performance. If you purchase your engine from another source, be sure that you also receive the computer, mass air flow sensor and oxygen sensors.

The first problem we encountered is that the oil pan will not clear. We had expected this, but we set the engine in place to provide our readers with this photo.



Of course, no one will want to cut the cross member to clear the pan, so the option here is to have S&P provide a modified oil pan.

One of the Street & Performance master fabricator's modifies the stock LS-1 oil pan to be installed into the 1970 Chevelle.





Shown here is the pan with the fabrication completed. S&P can also modify this pan for any application.

You can send S&P your pan to be modified or S&P can provide you a modified pan and you send yours back in for a core credit.



**Stock LS-1 IROC Oil Pan**

S&P keeps a complete line of LS-1 type pans and components in stock for your application.



**Truck**

**Vette**

**IROC**

Pictured here is the difference in the pickup tubes which also must be modified to relocate the pickup to the rear of the sump pan. S&P will modify the pick up tube when modifying your pan.





After we installed the new oil pan, we found that the boss located on the drivers side of the 6 speed transmission would hit the transmission hump opening. We chose to use a sawz-all to remove the boss from the transmission right in the car.

The next was that the reverse lock out assembly on the tail housing would hit the drive shaft tunnel. At the same time we saw that the stock alternator would hit the power steering gear box and the air compressor was going to hit the A-Frame .See Photos below. This is not a problem for us because we had decided to use the S&P Vette/Camaro brackets on this installation and a plug which, is also provided by S&P, to replace the reverse lock out assembly.



Street & Performance LS-1 motor mount plates comes with metric and standard bolts for mounting original rubber mounts to the LS-1 which, places the engine in the proper location.





Once we removed the alternator and the air compressor, we were able to set the engine down on the mounts and locate the opening in the transmission hump for the shifter opening. Note the motor mount plate that the motor mount is bolted too. These plates are provided by Street & Performance and are used to relocate the early type GM rubber mounts forward on the LS-1 block which will allow the engine to set on the original stands. Motor Mounts came from a 67-72 Chevelle with a 307 engine.

With the motor located on the motor mounts mark the trans hump to cut the opening for the shifter.



We found that our transmission opening would be cut out 10 1/2" to 17 1/2" from the floor board seam and 4" wide centered on the transmission hump. This may not be the same on you vehicle, Always measure twice.



We suggest that you cut your hole small and then raise the transmission back into place and trim the opening to fit.



With the stock cross member in place we found that the bolt hole location was not correct.



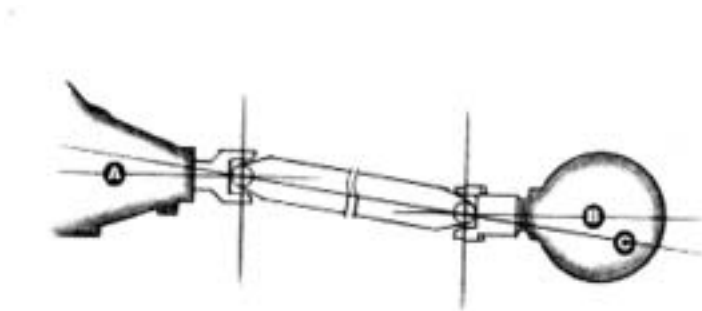
We trimmed the original mounting perch off to be relocated.



We bolted the cross member back in with the transmission mounts. The transmission mount came from a 70-73 Chevelle with a 307 engine.



We then trimmed the transmission mount and turned it up side down. We then bolted it to the mount to locate it to the cross member.



Drive shaft angle is important for strength and reliability. The transmission **MUST** be angled 1 to 5 degrees low on the yoke, but + or - 2 degrees is idea for performance applications. To check the drive line, hold the angle finder against the tail shaft and locate the transmission mount bracket to the cross member.



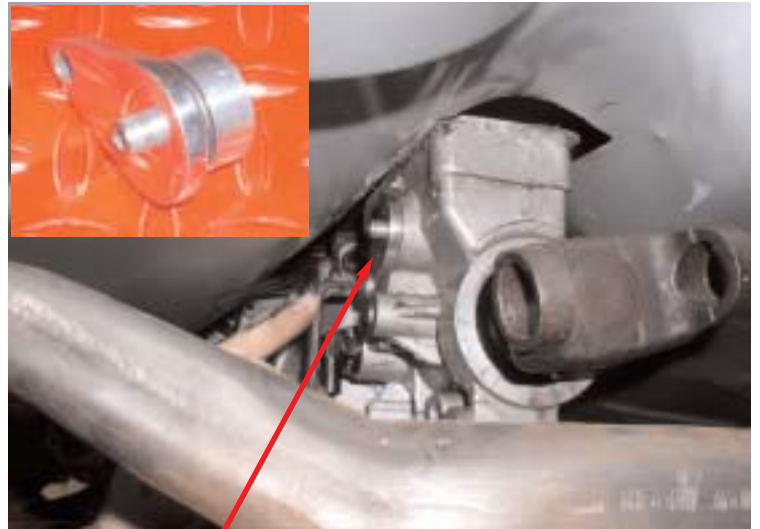
Tack weld mount to the cross member.



We then removed the cross member from the vehicle and finished welding the transmission mount support to the cross member.



We reinstalled the cross member for a final check to insure a proper fit before detailing the finished product. Everything fit perfect.



Street & Performance offers this plug to insert where the reverse lock out assembly was formally located. This plug has a rubber O-ring for sealing and comes with a 8-16 mm bolt to secure it to the T-56 transmission.



This photo shows the factory shifter in place. While this shifter is a good shifter, we wanted to replace it with the B&M Short Throw Sport Shifter Part # 45052 for a 93 - 2003 T-56 Transmission. Remove the 4 bolts holding the factory shifter in place and pry up on the shifter base plate.



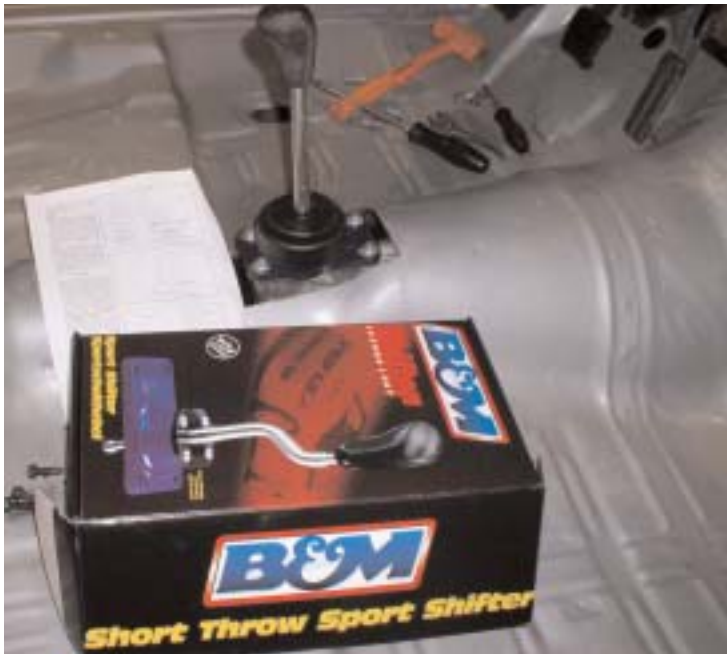
After the factory shifter has been removed. NOTE the socket at the end of the shaft. This is where the end of the shifter shaft locates. Remove old sealer from the mounting surface.



Apply a thin layer of RTV sealer to the top surface of the shifter housing.



Install the B&M Shifter per the instructions included.



The B&M Short Throw Sport Shifter installed. You could not ask for an easier task to complete.

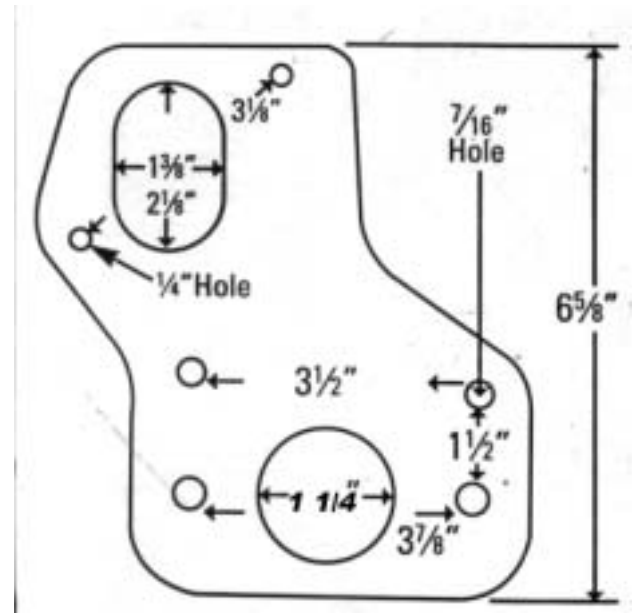
This car was originally an automatic, so we had to replace the pedal assembly with a 1970 factory manual clutch and bracket pedals. This assembly bolts into the same place as the automatic pedals.





Left, shows the hydraulic clutch cylinder assembly, needed to operate the T-56 Clutch.  
GM Part #12570277

Using the diagram to the right we machined the bracket to hold the hydraulic clutch cylinder assembly.



When we had finished cutting and drilling the bracket, we had to bend a 10 to 12 degree angle outward from the firewall. This angle is to match the mounting flange on the hydraulic master cylinder.



Insert the clutch rod through the oval hole in the bracket with the reservoir hose pointing up as shown and bolt the assembly to the bracket with 1/4-20 x 3/4 inch bolts.

This 1970 Chevelle was an automatic car and we found that we had to make the clutch rod opening bigger to fit the cylinder assembly through the firewall. Street & Performance now offers this mounting bracket.



Slide the bracket over the existing brake cylinder studs.



Now bolt the brake master cylinder assembly to the firewall as you normally would and find a suitable location on the firewall above the clutch cylinder to bolt the clutch reservoir.

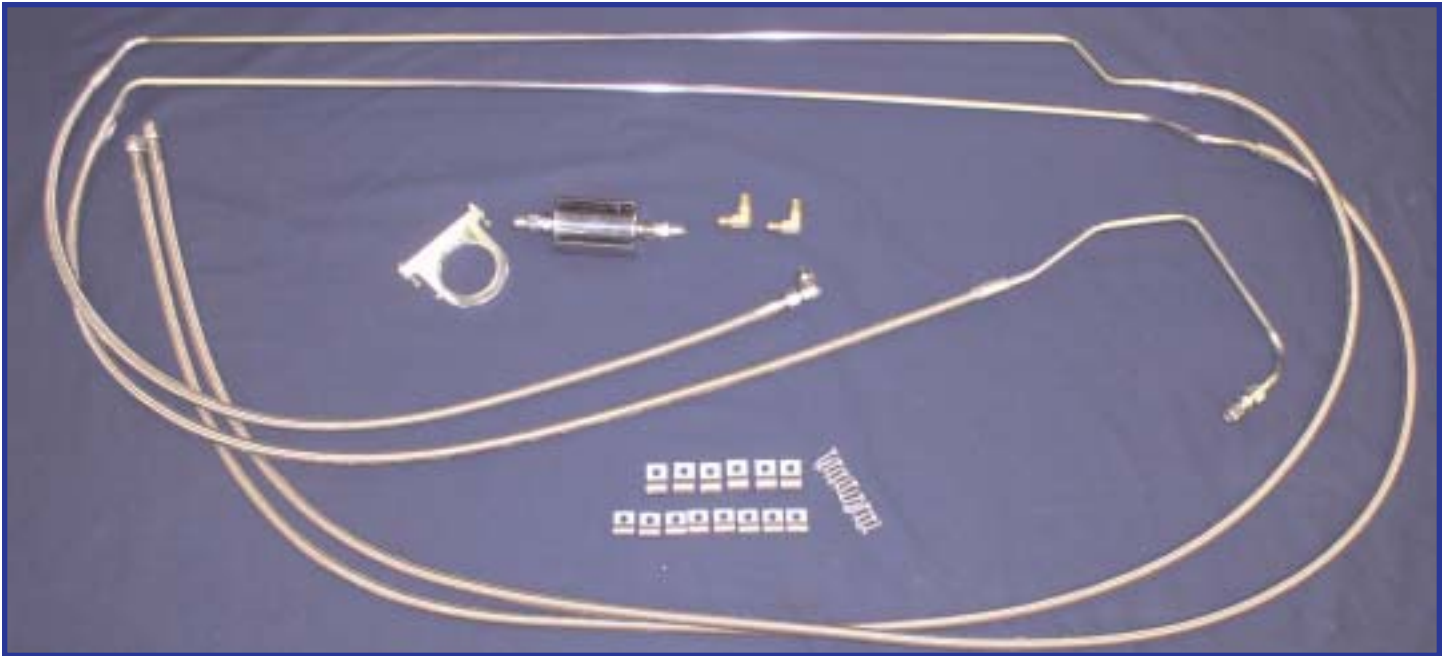


LOKAR has provided us with their aluminum pedal covers, These covers really add the finishing touch.



After setting the engine we installed a set of bare headers to check the fit. Now that the headers have been checked for clearance we will thermal coat them inside and outside.

# **Tank to Engine Fuel Line Kit From S&P and Tube Tech 1968 - 1972 Chevelle**



This fuel line kit is designed for a quick and easy installation with trouble free performance. It comes with everything that you will need to plumb your 1968 to 1972 Chevelle. Each part is clearly marked and comes with photos and detailed instructions for whichever GM fuel injection engine that you have chosen. These lines are pressure tested and cleaned before shipping, but please flush the lines before installation begins.



Passenger side fuel line. Pass the tank connection end of your return line over the new transmission support and between the old transmission support bracket and the frame.

Move the line to the rear enclosed part of the frame and go through the opening in the top and continue pushing the line over the top of the wheel well until the tube nut is visible in the 1 1/8" diameter hole behind the rear end.





Using needle nose pliers, reach through the hole and pull the flex line through until the hard stainless lines fit neatly into the open part of your frame in the center of the vehicle. Slide the rubber grommet over the rear flex hose and install in the hole around your flex line. Use 4 of the 3/8" single tube clamps to secure your hard line to the frame rail.

Pass the front end of your return line up into the engine compartment and install onto your fuel rail. DO NOT disassemble the compression fitting. Just slide in onto your fuel rail until the tube bottoms in the fitting. Hold the fitting body with a back up wrench and tighten the tube nut 1 1/4 turns. A complete set of instructions for these fittings are included in this kit.



Follow the same procedure for your driver side supply line and connect the 90 degree compression fitting to your fuel rail. Secure the 2 front flex lines to your frame or firewall with the clamps provided. Keep them away from your exhaust and any moving parts that may damage them. On 97-98 two lines were used through the plastic top covers, 99 and later with modified fuel rails had the return line exiting out the side of the cover and the feed line running under the cover.

Select a safe and accessible location for your fuel filter in front of your fuel tank where it will not be damaged by up and down movement of the rear end components or heat from the exhaust. Make sure that your hoses will reach this location and your tank connection. The rounded edge of the filter has to be connected to the tank side and the sharp edge must go to the engine.





Install the (2) two 90 degree 1/4 pipe x 06 AN fittings into your fuel tank. Use teflon paste or tape on the pipe threads and any type oil on the male flair ends to insure proper sealing. Connect the short rear hose to the PU connection on the tank. Connect the return line on the passengers side to the RTN marked fitting and raise the tank into position and install your tank straps. Attach the drivers side fuel line and the short hose from the tank to the filter, ( use oil on the male ends of the filter fittings.)

Secure the slack in the flex hoses to under side of the body using the clamps provided. Leak check your entire system before attempting to start your vehicle. Depending on which engine you have selected, your fuel pressure required to start your engine will be between 30 and 60 PSI. A fuel pressure gauge available from Street and Performance will be needed to verify proper fuel pressure for starting your engine. Keep in mind that your fuel pump will only run 2 seconds on initial start up. Turning the key on and off a few times will pressurize your system and allow you to perform a leak check and verify fuel pressure requirements.

Attach the short braided line included with the fuel line kit to the fitting marked PU. Then attach wire pigtail's to your fuel level sensor and fuel pump. Use color coded wires that will hang below the tank so that when the tank is mounted into the car you will know which wire is what and have easy access to connect into the wiring harness.



Since the tank was old and rusty, we decided to use the Rock Valley tank with the fuel pump already installed. If you can use your existing tank, you should install a AC EP 381 pump and sock.

Right, shows the stainless steel tank straps that came with the Rock Valley tank. Mount these straps and loosely tighten the bolts.





Place tank into position and with the front of the tank tilted down hook up the return line. Next push the tank up and form the stainless steel strap around the tank and install mounting bolts through the strap and into the existing tank mounting tabs. Tighten all four bolts to secure the tank into position.



Here we used the polished stainless fuel filter kit from S&P. The kit comes with a polished GM stainless steel filter, aluminum mounting bracket and two 16mm O-Ring to AN6 male fittings. Place the fuel filter into the bracket and tighten the set screw in the bracket to secure the filter. Attach the feed line from the engine to the seamed edge of the filter.



Attach the braided line from the tank to the rounded edge side of the filter. Always use some oil on the threads when fastening the nuts to the threads.

# Bracket Installation



To install the LS-1 crank cover for the IROC/TA you must drill and tap 3 holes to attach the cover to the pulley. If you have a Vette pulley you only have to tap the existing holes. Begin by lining up the cover with the pulley, checking to make sure that there is a equal spacing all the way around the cover.

While holding the cover in the proper position, place a transfer punch through the hole in the cover and punch the pulley. **ONLY PUNCH THE FIRST HOLE.**



Drill the hole into the pulley using a letter "H" drill and then tap the hole with a 8mm 1.25 bottom tap.



Place the cover over the pulley and tighten one of the bolts provided with the cover.



Make sure that the cover is still evenly spaced on the pulley and center punch the second hole. Drill and tap the second hole just as you did the first, then install the second bolt. Again, check the alignment of the cover to the pulley and drill and tap the third hole.



After tapping the third hole remove all of the bolts and apply anti-seize compound to the threads of the bolts. Street & Performance recommends anti-seize on every bolt that you use to install any of our products.



1. Vette Balancer (shortest)
2. IROC/TA Balancer (3/4" longer than Vette)
3. C/K Truck Balancer (1.5" longer than Vette)



Remove the alternator bracket from the package and apply anti-seize to the threads on the 10mm 1.25 bolts. Place the bracket onto the driver side head and screw the bolts into the head. NOTE: The LS-1 IROC Engine uses a wider bracket than the Vette, and the 5.3 or the 6.0 use a wider bracket than the IROC due to balancer length.

Torque alternator bracket bolts to 37 ft lbs. The photo to the right shows the proper installation of the LS-1 alternator bracket.



Mount the air compressor bracket the using the same procedure that you have just performed to mount the alternator bracket.

Pictured to the right shows how the Vette style alternator and air brackets should appear after proper installation.



LS-1 IROC-T/A Idler brackets use 1/2" stainless steel spacers were in a Vette application you will not use the spacers.

Remove the upper water pump bolts with a 10mm socket.



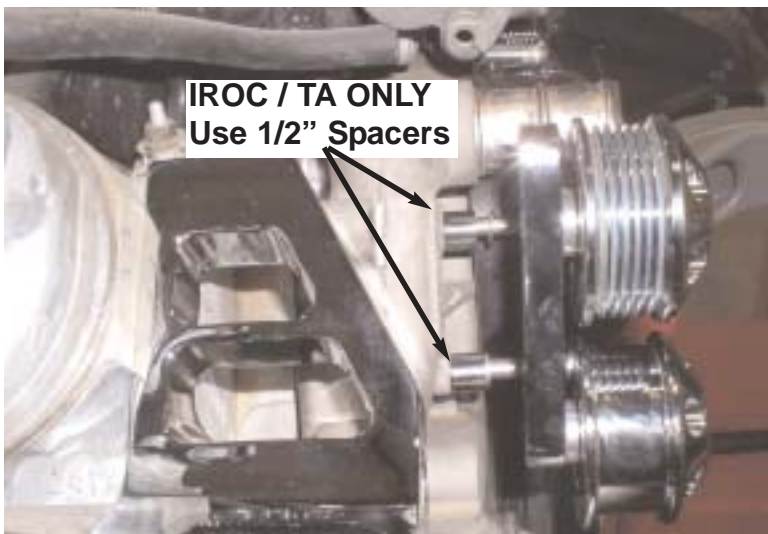


Place the bolts provided with your idler bracket through the bracket. (If your engine is a IROC/TA , slide the spacers over the bolts.) Apply anti-seize to the bolts and insert into the water pump bolt holes.

Torque each idler bolt to 11 ft lbs, and then torque again to 22 ft lbs. NOTE: The idler kits shows that the pulleys go to the outside of the engine and the bracket is toward the pump. The ribbed pulley should be on the top and the smooth pulley on the bottom.



Repeat the driver side idler kit procedure on the passenger side. Remove the upper water pump bolts out with a 10mm socket.



Place the bolts provided with your idler bracket thru the bracket. (If your engine is a IROC/TA , slide the spacers over the bolts.) Apply anti-seize to the bolts and insert into the water pump bolt holes.

The Chevelle uses a new power steering bracket just for the Chevelle to clear the large gear box. Put the bolts provided with the kit thru the bracket then place the spacer over the bolt. Apply anti-seize to the threads on the bolt and screw into the block as show in the photo to the right. Torque bolts to 37 ft lbs.



Take one of the 3/8 bolts provided and place it on you Allen driver and apply anti-seize to the threads. Place the pump with the bracket between the pump pulley and the pump body. Rotate the pump pulley so that you can insert the bolt through the pulley then through the bracket and thread into the pump body.



Rotate the pulley to insert the bolt into the bottom of the pump body. Tighten both bolts to 18 ft lbs.



Insert the 16mm O-Ring fitting into the top port of the pump. This is the pressure side of the pump and the line from this fitting will go to the pressure side of the gear box.

Installing the driver side alternator with a 10mm bolt provided with the bracket.  
Using a small GM CS130 10:00 Alternator.



Alternator adjusting bar bolts to the back idler bracket using a 3/8" bolt and spacer provided with the kit.

Mount the Sanden 508 compressor to the bracket with the 10mm bolts included with the bracket kit.



The air compressor adjusting bar will bolt to the back of the idler bracket just like you have already done with the alternator bracket using 3/8" bolts and a stainless steel spacer.

Now we can install the 508 Compressor front dress up cover. The bolts included with the cover screw into the existing threaded holes in the clutch of the compressor.





After checking all idler pulley bolts to insure that they are tight, you can insert the idler dress up buttons. Apply a light weight oil to the O-Ring on the button and tap them in with a RUBBER mallet. Be sure to place a rag over the button to make sure not to scratch the surface of the button.



Pictured to the left is the completed Vette/Camaro bracket and pulley set-up for the 1970 Chevelle. A Gates belt #K061120 was used on this bracket setup.



Above shows the the stock Mass Air Flow unit. To the right, the S&P air filter incorporates the Mass Air Flow unit into the air filter. The right hand photo is the S&P air filter with the Mass Air Flow sensor mounted. The filter assembly mounts to the throttle body with two set screws and o-ring seal. Be sure to check for clearance of the throttle linkage when installing the air filter.



We removed the stock waterneck because it points to the passenger side fender.



The new Street & Performance 360-45 degree O-Ring waterneck. This waterneck swivels 360 degree's to allow the neck to be positioned in any direction.



Mount the new waterneck to the engine the stainless steel bolts that are included. S&P also offers a straight version of this waterneck and both versions come with the O-Ring and new GM thermostat.



We mounted the new Griffin aluminum cross flow radiator which is offered for the LS-1 that incorporates the top inlet and bottom outlet on the passenger side of the radiator.



We used a Gates #20416 for the lower radiator hose. We had to trim 6 1/2 " off the long end and 1 1/2" off of the short end.



For the upper hose we used a Gates #21438 radiator hose and trimmed 1 3/4" from the long end of the hose.



Install a S&P fan control switch into the driver side bottom port of the radiator which Griffin has provided. This will tie into the high pressure switch of the A/C system so that on a hot day, when the radiator is not hot the A/C will activate the fan to pull cool air through the condenser. If you control the fan from the engine or computer the fan will come on as soon as the engine gets hot and the radiator is not hot, which will run the fan even though the radiator is not hot and will cause over heating.

Shown here is how the radiator hoses run to the Griffin LS-1 radiator using the S&P 360-45 degree waterneck.



S&P NEW LS-1 Aluminum billet throttle cable bracket uses Lokar LS-1 braided throttle cable. If you would like to run a cruise control you can hook it up to the pin on the side of the throttle arm.



The oil by pass plug that comes on all LS-1/LS-6 engines. You can remove this and drill and tap it to install the oil pressure tree from S&P to mount the oil pressure sending unit and move it away from the header.



The 12mm plug located at the rear of the passenger side head can be removed to provide a locating to install a sending unit for your coolant gauge (VDO ECT.) The head can be drilled and tapped for a pipe thread or S&P can provide you with a bushing to go from 12mm to a pipe thread.



**98 IROC/TA  
97-98 Vette**

**Service # 16238212**



**99-2002**

**IROC/Vette/C/K Truck  
Computer**

**99-00 Service # 09354896**

**2001 Service # 52369718**

**2002 Service #12200411**

**S&P can reprogram your LS-1 computer on a exchange basis. We can change you gear ratio and tire diameter as well as removing the anti theft. Emissions on 1974 & earlier vehicles can be removed and the engine will still run clean.**

**We must know Year, tire diameter, gear ratio and transmission type.**



S&P motor mount adapters allow you to use the frame stands and stock motor mount and will locate the LS-1 in the proper location. If using rack and pinion steering, or stock suspension, oil pan will need to be modified.



**Modified LS-1 oil pan for the 1970 Chevelle.**

**Rock Valley**

Stainless steel fuel tanks w/high pressure pump installed  
1-800-344-1934  
www.rockvalleyantiqueautoparts.com

**Tube Tech**

Custom made stainless steel fuel lines  
479-394-6466

**Griffin Thermal Products**

Aluminum cross flow radiators  
1-800-722-3723  
www.griffinrad.com

**Lokar Performance Products**

Throttle pedals and cables  
1-865-966-2269  
www.lokar.com

**Henry Charest**

**Weldcraft Welding and Fabrication**  
**T-56 Tail Housing**  
**(Manual Speedometer)**  
1515 E. Acequia Unit 'E'  
Visalia, Calif. 93292  
559-732-2109

**Street & Performance**

Engine and accessories  
479-394-5711  
www.hotrodlane.cc

**B&M Racing & Performance**

9142 Independence Ave,  
Chatsworth, CA 91311  
1-818-882-6422  
www.bmracing.com



**S&P LS-1  
6 Speed harness**

The S&P engine harness with 4 wire hook-up, plugs into the engine and transmission. Red wire to key, orange wire to starter, black to ground and brown to fuel pump. All wires are labeled and color coded with instruction sheet. Harness also includes relays, Vats by pass, and diagnostic link. Harness for all LS-1 type engines (5.3, 5.7, 6.0, 8.1 big block) with automatic or manual transmissions are available. If using a 6 speed transmission a 4.11 gear ratio is usually the best choice. Automatic overdrive's usually run's a 3:40 to a 3:70 gear. S&P's website at [www.hotrodlane.cc](http://www.hotrodlane.cc) has a gear ratio chart located on the **ONLINE TECH** page to help you make your best selection.



**Harness for the 4L60E transmission.**



Made with stainless steel flanges, comes with bolts, gaskets, collectors with O2 bunnis. Available in Coated, Chrome



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**2 1/2 Hours**  
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**Fuel systems,**  
**transmissions,**  
**installations**  
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