



Street & Performance 1960 Biscayne LS1/T-56 Installation.

Noel Vivion of Sulphur, LA. brought his 1960 Chevy Biscayne to S&P with a '98 LS-1/ T-56 6-speed that he wanted installed. The '98 Engine and Transmission came from a friends wrecked Camaro. This would be the engine and transmission that you could find in a salvage yard. When purchasing an LS engine you could save several hundred dollars by getting the computer, Mass Air Flow and the O2 sensors with it.



The empty engine compartment is ready to drop in the LS-1. The original V-8 motor mount stands are left in the stock location because we will be using the S&P motor mount plates to mount the LS-1 back to the original 283 mounts.



The stock LS-1 motor mount locates the engine mount back toward the bell housing. S&P provides a mounting plate which moves the mount forward to relocate the rubber mount over the Biscaynes factory stands in the correct location. S&P also offers this plate to allow the mounting 1" toward the rear of factory if needed for other applications.



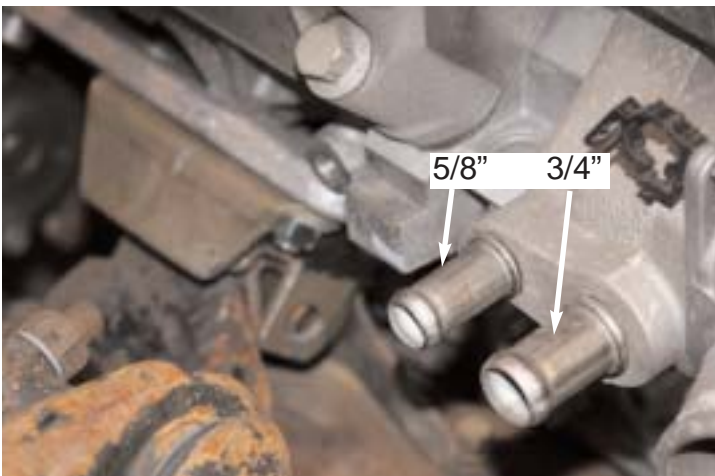
After bolting the plates to the block, the rubber mount is then bolted to the plate. Complete instructions come with the mounting plates. The plate are labeled on the back as to which side they are to be bolted on.



With new mounts up front, it is always best to replace the trans mount as well. A measurement made before setting the engine and trans into the car shows that the trans mount will have to be moved.



With all new mounts installed it is time to lower the power plant into the engine compartment to check and see if the stock IROC oil pan will clear the cross member.



When the engine was lowered into the engine compartment, the S&P motor mount plates positioned the rubber mount right onto the factory V-8 mount stands. Also note the water pump hose bibs, the smaller 5/8 bib is to the heater and the larger 3/4 bib is the return. S&P provides AN fittings to replace these slip-on bibs and also has 90 degree fittings for close frame applications.



The S&P motor plates not only moved the rubber mounts forward, but also raised the engine so that the stock IROC oil pan would clear the cross member. '58 to '64 Chevy passenger cars can use the IROC oil pan without modifying. '55-'57 and '67 up cars will need to have the modified oil pans.



Truck 99-UP

Vette 97-04

LS2 05-UP

IROC 98-02



Shown above is cutting the factory trans brackets loose from the frame. We will relocate the brackets and fabricate a new trans cross member.



Once the old cross member had been removed, we measured the distance between the frame rails and center the trans mount.



Divide the distance between the frame rails by two and transfer this measurement on to the transmission Cross member member from the center of the mount bracket.



Cut the cross member at the measurements



Because this car has the X-frame, the bracket must be mounted at an angle to fit flush with the frame. We used a die grinder to grind the bracket to fit over the cross member at the angle of the frame.



Each end of the cross member is marked in place and tack welded, it is then placed back into position and checked for fit before the final welding.



The finished cross member ready to bolt in. If all the measuring cutting and welding is something you do not want to do, Street & Performance now offers this 6-speed cross member and also has an 4L60E version. This cross member comes in a 2", 4", 6" or 8" Drop for various vehicle applications.



Bolt the cross member to the trans mount, 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. We used a center punch to mark all of the hole locations to the frame. Note that there is very little room to work here.



With a angle head drill and a short bit, we were able to drill the holes through the inside of the frame. We were not able to drill the lower rear hole due to the cross member being in the way.



After removing the cross member we were able to drill the lower rear hole on both sides with our 90 degree drill.



A longer drill bit is used to drill through the outside of the frame using the inside holes as a guide.



The cross member bolted in place, note that the bolts go through both sides of the frame for more strength.



This '60 Bicyane has an X-frame that comes from the factory with a two piece drive line that runs through a tunnel in the frame. Wiles Racing Drive Shafts of Paris, TN. supplied us with a one piece drive shaft that will fit through the tunnel. We found that we had to pull down on the rear bumper when installing the drive shaft to move the rear end up and out of the way.

Note the opening at the front of the drive line tunnel. Pay very close attention to the clearance of the drive shaft when positioning the transmission cross member. The drive shaft for the 6-speed transmission was built by Wiles Racing Driveshafts.



Since the tank was old and rusty, we decided to have Rock Valley modify a new steel replacement tank to allow the installation of a LS-1 pump and sock. Install the (2) two 90 degree 1/4 pipe x 06 AN fittings into your fuel tank. Use liquid teflon paste 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 50 and 60 PSI. A fuel pressure gauge available from Street and Performance or your local parts store 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.



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. Use Anti-seize compound on all treads.



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 sea-men edge of the filter. Replacement GM filter GF-481



James Miller of Tube Tech installs new 3/8 stainless steel lines that are run on the outside of the frame. The '97-'98 Vettes requires the use of a supply line as well as a return line. '98-up IROCs and '99 up Vettes use a single line with a Vette fuel filter / Regulator (GM# GF-822) which allows the use of one line to engine. Filter will regulate and return excess fuel to tank.



We used 3/8 fuel line, fittings and clamps for both lines to simplify the installation. GM uses a 3/8 line to feed and a 5/16 line for the return. Shown above is attaching the S&P rear exit fuel line kit to the passenger side stainless hard lines. The rear exit fuel line kit is available for the driver or passenger side and in single or double fuel line systems.



The left photo shows the rear exit fuel lines connecting to the 3/8 tubing on the passenger side frame rail at the firewall. Right photo show connecting the fuel lines to the modified fuel rails which allows us to have a feed and return line and a vacuum fuel regulator like a '97-'98 Vette. S&P offers the modified fuel rail to convert from a single to double line. S&P converted the single line IROC fuel rail to a dual line system like a '97-'98 Vette to allow cool fuel to be regulated at engine.

When checking for leaks you can also check for 50 to 55 lbs of pressure by attaching a fuel pressure gauge to the schrader valve on the front driver side of the fuel rail.



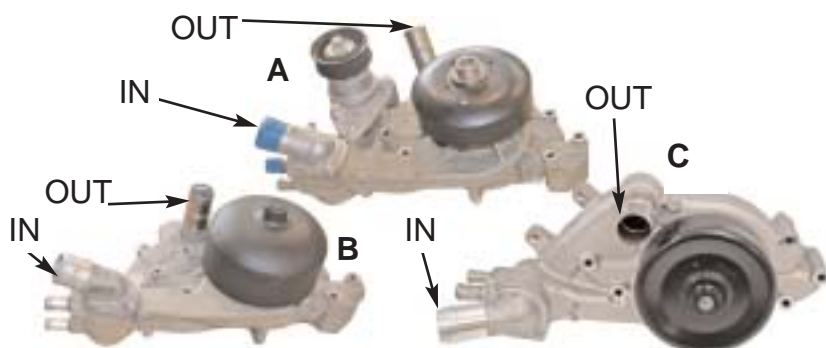
The balancer that is on your engine is what will determine what type of brackets that you will have to use. You can see the visual difference in the photo to the left.

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

A. Truck water pump. Top water passage is off of the top of the casting, pulley is shorter and the pump is 3/4" longer than the IROC/Vette

B. IROC/Vette water pump. Water passage is for the front, pulley is wider both pumps use the same casting but different pulleys and passage location.

C. LS-2 water pump is 1 3/4" shorter than the LS-1



LS-2 style water pump inlet/thermostat sets 5/8" higher than the LS1. All of the LS style engines has the thermostat on the suction side of pump.

Tech Note:

The late model water neck (right) was redesigned to accept a simpler, drop-in style thermostat compared to the difficult to disassemble earlier version to the left. The late thermostat is used on '04-up models and the early style was use on '97 to '03 models. S&P offers a straight and swivel style neck.



Before installing the accessory brackets we removed the water pump to install a 1/4" 90 degree pipe fitting for a steam line. We used a 7/16" drill to drill a hole into the boss of the pump and then tapped it with a 1/4" pipe tap. This provides a much cleaner solution than having to tie into the upper radiator hose with a "T". You can also install a fitting into the upper tank of the radiator.



Apply thread sealer to the threads of the 1/4" pipe 90 slip-on hose bib fitting and screw the fitting into the threaded hole. The pump can now be placed back on the front of the engine. Do not put the upper factory mounting bolt back in, the brackets come with longer bolts to replace the shorter factory ones.



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. Torque alternator bracket bolts to 37 ft lbs. The photo to the right shows the proper installation of the LS-1 alternator bracket. 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. S&P makes a bracket kit for Vette, IROC/TA 4.8, 5.3 and 6.0 engines.



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



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



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.



Repeat the driver side idler kit procedure on the passenger side.



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.



Take one of the 3/8 bolts provided and place it on your allen driver and apply anti-seize to the threads. Place the pump 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. S&P offers a power steering kit for "G" body early Vettes and vehicles that need a higher mounted pump to clear gear boxes and frames.

Put the bolts provided with the kit through the bracket then place the spacer over the bolt. Apply anti-seize to the threads on the bolt and screw into the block as shown in the photo to the right. Torque bolts to 37 ft lbs.



Mount the Sanden 508 compressor to the bracket with the 10mm bolts with self locking nuts which are 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 with self locking nuts and a stainless steel spacer.



Installing the driver side alternator with a 10mm bolt provided with the bracket, using a small GM CS130 10:00 alternator. It is recommended that you have S&P increase the CS-130 alternator to 140 amps to allow for the extra amp load of the electric fans. The alternator adjusting bar bolts to the back of the idler bracket using a 3/8" bolt and spacer provided with the kit.





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.

With the Goodyear Gatorback belt (#4061145) installed we can now 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.



Since the EGR will not be used on early non emission vehicle, we blocked the EGR port with a S&P block off plate. Be sure to apply a small bead of silicone around the O-ring to hold the block off plate in position incase of engine back fire. '01 and '02 IROC/TA and Vette engines do not have the EGR port at this location. S&P also makes name plates for LS-1 and LS-6 engines that do not need the block off plug.

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. This bracket also comes in a cruise control version.





Above shows that a large power brake booster will hit the coils and valve cover.



A small brake booster will clear the coils and valve cover but we will need to modify the valve cover vent to allow the engine to breathe.



S&P custom made this mounting bracket for the clutch slave cylinder. This bracket mounts behind the brake booster. S&P offers this bracket for a variety of applications.



With the bracket and brake booster mounted we then installed the slave cylinder reservoir to the fire wall.



An aftermarket adapter plate allowed the mounting of a 605 gear box.



The Griffin radiator came with a Spal fan already mounted and the 1 1/4" inlet on top and a 1 1/2" return on the bottom passenger side for the LS-1 engine.



Note:
Fitting tied into
steam line

We installed the S&P adjustable radiator fan control in the radiator drain. This will connect to the high pressure switch of the AC to turn on the fan when the AC builds head pressure. A infra red heat gun is an excellent tool to adjust the temperature for the fans to come on at 175 to 185 at the bottom of the radiator.

Once the radiator hoses were install (upper Gates #22322 and lower Goodyear # 60867) we installed the S&P air cleaner which has the MASS air flow and air temp sensor (GM# 10096136) built into it. S&P offers air cleaners for the 5 pin MASS air flow that is used for the late factory Vettes and Truck applications.



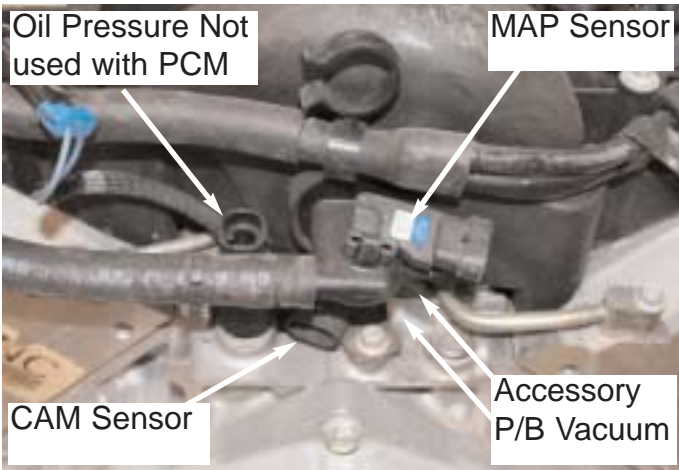
The oil by pass plug that comes on all LS-1/LS-6 engines. You can remove this and drill and tap it to install the oil pressure tree from S&P to mount the oil pressure sending unit and move it away from the header.



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.



GROUNDS ARE THE MOST IMPORTANT PART OF A FUEL INJECTION INSTALLATION
All connections must be clean, NO PAINT, BARE METAL!
From the battery to the engine or transmission.
Engine or Transmission to the frame.
Engine or Transmission to body.
All Three connections are a MUST.



At the back of the intake is where you will find the sensors listed above. Here you will also find a harness from underneath which are the knock sensors.



The crank sensor is located behind the starter solenoid.



S&P offers Chromex Thermal coated headers to fit '58-'64 X-Frame. Headers come with bolts, gaskets and four bolt collectors with O2 buns. Replacement O2 Sensor GM # 25312197 AC Delco # AFS-98



When using S&P headers, Taylor TA2326 Spark Plug wire for 5.7 engines and TA2795 for Truck 4.8, 5.3 and 6.0 engines for clearance of the header tubes. Several colors available.

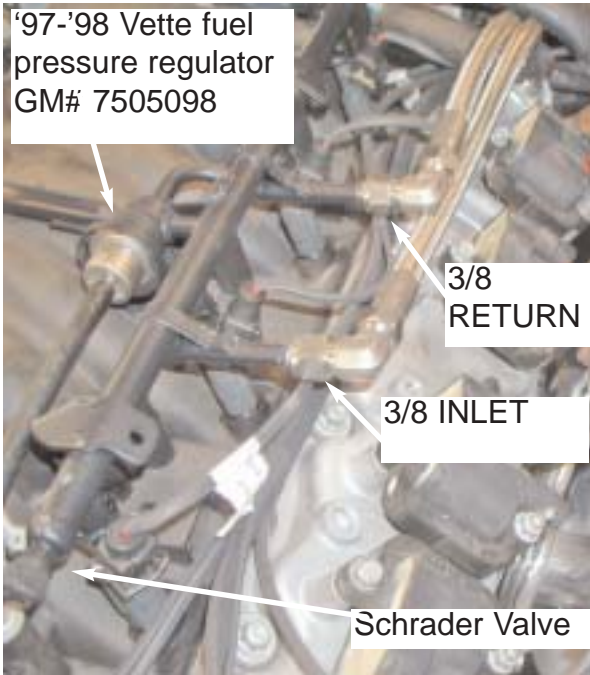
Note:
The hydraulic clutch line runs to the side of the bell housing



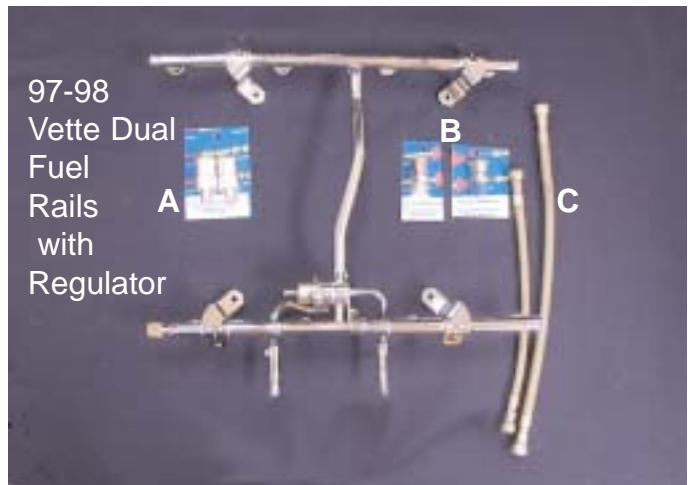
The two front O2 sensors is all that will be used since this is a NON EMISSION VEHICLE and S&P has reprogrammed the computer. The reprogramming also removes the VATS (anti theft), rear O2s and other options not needed. Automatic vehicles need to recalibrate the gear ratio and tire size for proper shifting.



The reprogrammed computer was mounted under the passenger side fender to conserve room for the AC which will be added later under the dash. Right shows that the engine harness main fuse panel is mounted to the fire wall. LS computers are weather resistant but they should be mounted so any moisture can drain away from the plugs. The fuse block and computer can also be mounted inside or outside. Since S&P engine harnesses are hand crafted, any length can be made for mounting the computer anywhere you like.



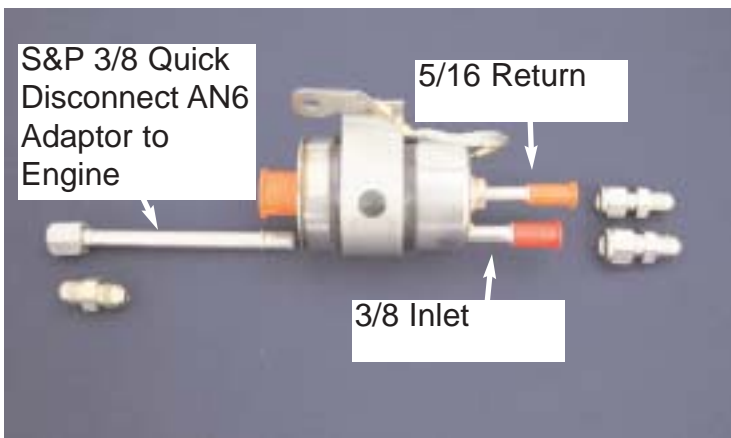
'98-'02 Modified IROC/TA
'99-'04 Modified Vette
Regulator needs to have manifold vacuum supply



A. Alum. Quick disconnect to # AN
B. S.S Compression to #6 AN
C. 97-98 Factory Fuel Hose (Pair)



Custom Smooth LS Top Covers Paintable.



Single Fuel Line Filter / Regulator Kit

GM # 10299146
AC Delco GF822



S&P Chrome Dual Line Filter Kit

GM # 25055052
AC Delco GF481



Installing the Lokar throttle cable. You must drill out the stock bracket to accept the Lokar throttle cable adjustable housing. S&P offers a billet cable bracket with one or two hole configurations.



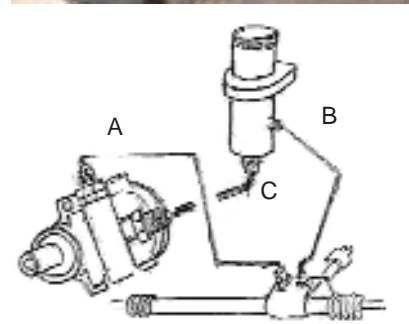
Lokar provided the TC-1000LS1 throttle cable and a BAG-6096 Camaro Billet gas pedal for a '67-'69 Camaro which install right into the Bicayne.



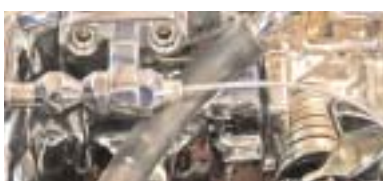
All S&P wiring harnesses come with all GM connectors marked for easy installation. Instructions are provided with the harness and can be downloaded from the S&P Website. More LS tech and projects are also on the Web.



S&P S.S Braided P/S lines and P/S Reservoir. Return line must be rated for 20-27 in. vacuum



Notice...Type II Pumps also are available with 3/4" Shaft. But we don't use these pumps because they just have a front bushing and not a bearing.



S&P offers a 1 or 2 hole billet throttle bracket.

A...#6 Pressure Line to Rack or Gear Box
B...Return #6 or 3/8 from Rack or Gear Box to side of reservoir.
C...#8 or 5/8 Return from reservoir to pump



LS-1 4L60E WIRING HARNESS (DRIVE by CABLE)

LS-1 are designed for easy of installation, come ready to plug in with only 4 wires to hook-up. All harness are available with full emission.

- 16238212 **97 - 98 LS-1** Vette/IROC/TA 5.7 Wiring Harness complete for 4L60E
- 9354896 **99 - up LS-1** Vette/IROC/TA 5.7-6.0 Wiring Harness complete for 4L60E
- 9354896 **99 - up LS-1 Truck Wiring** (4.8-5.3-6.0-8.1) Harness for 4L60E/4L80E



LS-1 MANUAL 6-SPEED WIRING HARNESS

LS-1 are designed for easy of installation, come ready to plug in with only 4 wires to hook-up. All harness are available full emission and compatible with other manual transmissions.

- 16238212 **97 - 98 LS-1** Vette/IROC/TA Wiring Harness complete for Manual 6-speed
- 9354896 **99 - up LS-1** Vette/IROC/TA Wiring Harness complete for Manual 6-speed
- 9354896 **99 - up LS-1 Truck Wiring Harness** for Manual Transmission



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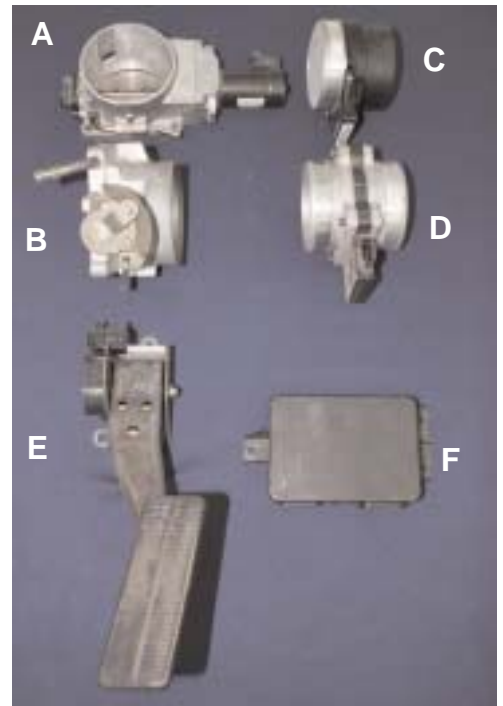
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Wiles Racing Driveshafts

Driveshafts

Paris, TN

731-642-2777



- A. Drive by Wire Throttle Body
- B. Drive By Cable Throttle Body
- C. Five pin MASS Air Flow
- D. Three pin MASS Air Flow
- E. Drive by Wire Throttle Pedal
- F. Drive By Wire TAC Module

LS-1 Automatic or Manual Harness (DRIVE by WIRE)

S&P DRIVE by WIRE Harnesses are designed for easy of installation, come ready to plug in with only 4 wires to hook-up. All harness are available full emission and compatible with other manual transmissions.

[97-Up Tac Module and Drive by Wire throttle pedal are needed and available trough S&P.](#)