



Holley GM GEN V LT Lo-Ram Modular Intake Manifold Kits

Holley P/N	Engine Application & Induction Configuration
300-710	LT Lo-Ram, Base Manifold Kit, Top-Feed Plenum, Direct-Injection Only, Satin Finish (As Shot-Blast Aluminum)
300-710BK	LT Lo-Ram, Base Manifold Kit, Top-Feed Plenum, Direct-Injection Only, Black Matte Powder Coat Finish
300-711	LT Lo-Ram, Base Manifold Kit, Top-Feed Plenum, w/ Port-Injection & Fuel Rails, Satin Finish (As Shot-Blast Aluminum)
300-711BK	LT Lo-Ram, Base Manifold Kit, Top-Feed Plenum, w/ Port-Injection & Fuel Rails, Black Matte Powder Coat Finish
300-712	LT Lo-Ram, Base Manifold Kit, Front-Feed Plenum, Direct-Injection Only, Satin Finish (As Shot-Blast Aluminum)
300-712BK	LT Lo-Ram, Base Manifold Kit, Front-Feed Plenum, Direct-Injection Only Black Matte Powder Coat Finish
300-713	LT Lo-Ram, Base Manifold Kit, Front-Feed Plenum, w/ Port-Injection & Fuel Rails, Satin Finish (As Shot-Blast Aluminum)
300-713BK	LT Lo-Ram, Base Manifold Kit, Front-Feed Plenum, w/ Port-Injection & Fuel Rails, Black Matte Powder Coat Finish
300-715	LT Lo-Ram Complete Intake Manifold Kit, Satin Finish (As Shot-Blast Aluminum): - Base Intake Manifold – Top-Feed Plenum, Direct-Injection Only - Plenum Top – Hi-Ram EFI, 1 x 105mm LS Throttle Body (longitudinal mount)
300-715BK	LT Lo-Ram Complete Intake Manifold Kit, Black Matte Powder Coat Finish: - Base Intake Manifold – Top-Feed Plenum, Direct-Injection Only - Plenum Top – Hi-Ram EFI, 1 x 105mm LS Throttle Body (longitudinal mount)
300-716	LT Lo-Ram Complete Intake Manifold Kit, Satin Finish (As Shot-Blast Aluminum): - Base Intake Manifold – Front-Feed Plenum, Direct-Injection Only - Plenum Top – Lo-Ram Front-Feed, Standard - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body
300-716BK	LT Lo-Ram Complete Intake Manifold Kit, Black Matte Powder Coat Finish: - Base Intake Manifold – Front-Feed Plenum, Direct-Injection Only - Plenum Top – Lo-Ram Front-Feed, Standard - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body
300-717	LT Lo-Ram Complete Intake Manifold Kit, Satin Finish (As Shot-Blast Aluminum): - Base Intake Manifold – Front-Feed Plenum, Direct-Injection Only - Plenum Top – Lo-Ram Front-Feed, w/ Integral Burst Panel Flange - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body
300-717BK	LT Lo-Ram Complete Intake Manifold Kit, Black Matte Powder Coat Finish: - Base Intake Manifold – Front-Feed Plenum, Direct-Injection Only - Plenum Top – Lo-Ram Front-Feed, w/ Integral Burst Panel Flange - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body
300-718	LT Lo-Ram Complete Intake Manifold Kit, Satin Finish (As Shot-Blast Aluminum): - Base Intake Manifold – Top-Feed Plenum, w/ Port-Injection - Fuel Rail Kit – Auxiliary Port Fuel Injection - Plenum Top – Hi-Ram EFI, 1 x 105mm LS Throttle Body (longitudinal mount)
300-718BK	LT Lo-Ram Complete Intake Manifold Kit, Black Matte Powder Coat Finish: - Base Intake Manifold – Top-Feed Plenum, w/ Port-Injection - Fuel Rail Kit – Auxiliary Port Fuel Injection - Plenum Top – Hi-Ram EFI, 1 x 105mm LS Throttle Body (longitudinal mount)
300-719	LT Lo-Ram Complete Intake Manifold Kit, Satin Finish (As Shot-Blast Aluminum): - Base Intake Manifold - Front-Feed Plenum, w/ Port-Injection - Fuel Rail Kit – Auxiliary Port Fuel Injection, Black Anodized - Plenum Top – Lo-Ram Front-Feed, w/ Integral Burst Panel Flange - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body
300-719BK	LT Lo-Ram Complete Intake Manifold Kit, Black Matte Powder Coat Finish: - Base Intake Manifold - Front-Feed Plenum, w/ Port-Injection - Fuel Rail Kit – Auxiliary Port Fuel Injection, Black Anodized - Plenum Top – Lo-Ram Front-Feed, w/ Integral Burst Panel Flange - Throttle Body Adapter – LT Lo-Ram Front Feed, 1 x 105mm LS Throttle Body

INSTALLATION INSTRUCTIONS 199R12207

(BEFORE INSTALLATION, PLEASE READ THESE INSTRUCTIONS COMPLETELY)

NOTE: Holley EFI LS main harnesses have a map sensor connector designed for use with an LS1/2 style map sensor. The 558-416 is an adapter harness that can be used to adapt any LS harness that uses a LS1/2 MAP sensor connection to a LS3 MAP, which is recommended for these base manifolds.

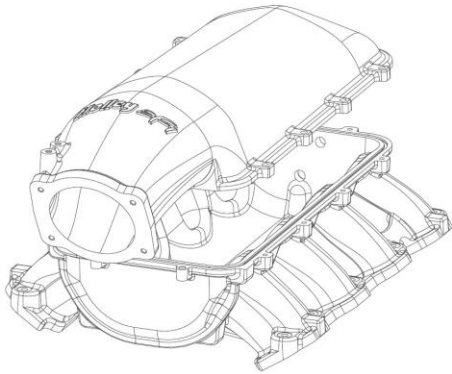
APPLICATIONS:

The Holley LT Lo-Ram intake manifold kits are designed for GM Gen V LT engines equipped with GM Gen V LT (rectangular port) cylinder heads. These intake manifolds will work with OE or aftermarket cylinder heads as long as the head is made with the intake flange bolt pattern and intake port opening locations matching the OE Gen V LT rectangular port configuration.

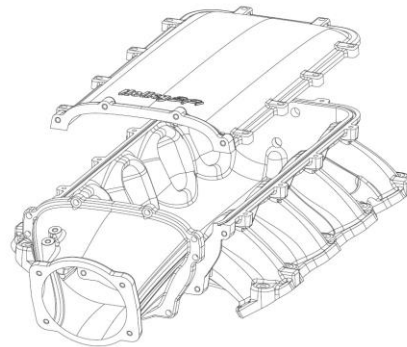
The Lo-Ram intake manifolds are designed mainly for forced induction (supercharged or turbocharged) engine applications. The base intake manifold is designed with a low height to aid the packaging of a plenum mounted air-to-water intercooler in a top-feed configuration or to fit under a stock or mildly modified hood in the front-feed configuration.

Due to the modular design of the LT Lo-Ram intake manifold, there are different configurations that can be built-up depending on the customer requirements. Among the configuration options are:

Top-Feed or Front-Feed – The LT Lo-Ram base intake manifold is supplied in two plenum entry configurations. The Top-Feed plenum entry configuration is designed to allow currently available and future Hi-Ram plenum tops to be fitted to a low-profile base intake manifold. The short runner, low-profile base intake manifold intended for forced induction applications was conceived to package with an air to water plenum mounted intercooler with a shorter overall height than possible with other existing intake manifolds.



Lo-Ram with Top-Feed Plenum



Lo-Ram with Front-Feed Plenum

The Lo-Ram Front-Feed plenum entry was configured to provide the lowest modular intake manifold suitable for turbocharged or centrifugally supercharged engines. Along with the currently available and future throttle body adapters, the front entry plenum flange allows the design and fabrication of special throttle body adapters or inlet ducts for custom engine installations.

Direct-Injection Only or With Auxiliary Port-Injection – The LT Lo-Ram base intake manifold is available in a direct fuel injection only configuration or a version fitted for auxiliary port fuel injection. A fuel rail kit with brackets is supplied with base intake manifolds fitted for the port fuel injection. The port fuel injection can be used in a situation deleting the OE direct fuel injection system or to add fuel on top of the OE direct-injection, to support boosted or nitrous-oxide power adders still maintaining OE style fuel metering at idle and part throttle conditions.

The fuel rail kit supplied is compatible with standard EV1 length fuel injectors or short length Pico or LS7 fuel injectors.

Front-Feed Plenum Top Without or With a Burst Panel Flange – The front-feed plenum top casting can be machined for a 6-1/8" x 3-1/8" burst panel. The plenum top is available with this flange machined or left un-machined. A billet aluminum burst panel exit duct is also available. Billet aluminum burst ducts are available in clear anodized or brite-dip black anodized finishes.

Satin or Black Matte Powder Coat Finish – The intake manifold castings are available either in a satin (as-shot blasted), or a black matte powder coat finish. The billet burst panel exit duct is available in clear or black anodized finishes.

EMISSIONS EQUIPMENT:

Holley Lo-Ram intake manifolds do not accept any emission-control devices. This part is not legal for sale or use for motor vehicles with pollution-controlled equipment.

DIMENSIONS:

NOTE: All heights measure to the lifter valley cover flange on the engine block.

NOTE: Unless otherwise stated, the dimensions and information applies to the Gen V LT Lo-Ram application.

- Lo-Ram Base Intake Manifold Plenum Top Mounting Flange Height – 6.45"
- Total Height:
 - Top-Feed Plenum Configuration w/105mm Long. Mount EFI Plenum Top – 10.35" (without an intercooler installed)
 - Top-Feed Plenum Configuration w/105mm Long. Mount EFI Plenum Top, w/an intercooler installed – 10.35"+ the intercooler thickness
 - Front Feed Plenum Configuration w/105mm Throttle Body Adapter – 8.14"
- Port Size – 1.98" Height x 1.53" Wide.
- Mounting Flange Gasket Type – 3/32" Round Viton O-Rings, Size 2-142, 2.362" I.D. (included with the int. man. install kit).
- Plenum Top Gasket Type – 3/32" Round Viton O-ring Cord (included with the intake manifold installation kit).
- Throttle Valve Flange Location:
 - Top Feed Plenum Configuration with 105mm Long. Mount EFI Plenum Top: Height – 6.45", Longitudinal Location – 4.53" (forward from engine block front flange), Lateral Location – On-Center, Angle – 25 deg. (down from vertical)
 - Front-Feed Plenum Configuration w/105mm Throttle Body Adapter: Height – 4.29", Longitudinal Location – 2.11" (forward from engine block front flange), Lateral Location – On-Center, Angle – 18 deg. (down from vertical)
- Runner Length – Average-3.78", Shortest-3.73", Longest-3.97"
- As-Cast Runner CSA - Tapered, 4.36 in² at the entry to 2.79 in² at the port flange.

BASE INTAKE MANIFOLD INSTALLATION KIT CONTENTS:

- ❑ 1 – 4.5 ft – O-ring Cord, 3/32" Dia. Round Section Viton, Plenum Flange Seal, Holley Service P/N 508-21
- ❑ 8 – O-Ring, 3/32" Dia. Round Sect. Viton, Size 2-142, 2.362" I.D., Port Flg Seals, Holley Service P/N 508-25
- ❑ 2 – 1/4 NPT Hex Steel Pipe Plug
- ❑ 1 – 3/8 NPT Hex Steel Pipe Plug
- ❑ 10 – Stud, M6 x 1.0 Threads, Intake Manifold to Cylinder Head Mounting
- ❑ 10 – Hardened Flat Washer, M6 x 13mm O.D x 2mm Thick, Intake Manifold to Cylinder Head Mounting
- ❑ 10 – Flanged Nut, M6 x 1.0 Threads, Intake Manifold to Cylinder Head Mounting
- ❑ 1 – Installation Instructions

PORT FUEL INJ. RAIL KIT CONTENTS:

AUXILARY PORT SINGLE INJECTOR PER CYLINDER – FUEL RAIL KIT P/N 534-269

- ❑ 2 – Fuel Rail, High Volume, Configured with 3/4-16 O-ring Ports (AN-8)
- ❑ 4 – Bracket, Fuel Rail Mounting, (for standard EV1 type injectors)
- ❑ 4 – 5/16-24 UNC x 5/8" Long Hex Head Cap Screws, Zinc Plated, Fuel Rail Bracket to Manifold Mounting
- ❑ 4 – 5/16-24 UNF x 1.47" Long Hex Head Cap Screws, Zinc Plated, Fuel Rail to Bracket Mounting
- ❑ 4 – 5/16 Washer, Steel AN960, .562" O.D. X .060" Thick, Zinc Plated, Fuel Rail
- ❑ 4 – 5/16 Washer/Spacer, Aluminum, .63" O.D. X .188" Thick, Fuel Rail Mounting for Short Injector Type

TOP-FEED PLENUM TOP INSTALLATION KIT CONTENTS:

- ❑ 1 – Gasket, 105mm LS Throttle Body, Holley Service P/N 508-24
- ❑ 12 – 1/4-20 UNC x 1" Long 12-Point Head Cap Screws, Zinc Plated, Plenum Top and Throttle Body Adapter Mounting
- ❑ 12 – Flat Washer, 1/4" I.D. x 0.468" O.D. x 0.063" Thick, Plenum Top and Throttle Body Adapter Mounting

FRONT-FEED PLENUM TOP INSTALLATION KIT CONTENTS:

- ❑ 1 – 2 ft. O-ring Cord, 3/32" Dia. Round Section Viton, Throttle Body Adapter Flange Seal
- ❑ 18 – 1/4-20 UNC x 1" Long 12-Point Head Cap Screws, Zinc Plated, Plenum Top and Throttle Body Adapter Mounting
- ❑ 18 – Flat Washer, 1/4" I.D. x 0.468" O.D. x 0.063" Thick, Plenum Top and Throttle Body Adapter Mounting

FRONT-FEED THROTTLE BODY ADAPTER INSTALLATION KIT CONTENTS:

- ❑ 1 – Gasket, 105mm LS Throttle Body, Holley Service P/N 508-24
- ❑ 1 – 2 ft. O-ring Cord, 3/32" Dia. Round Section Viton, Throttle Body Adapter Flange Seal

BURST PANEL EXIT DUCT INSTALLATION KIT CONTENTS:

- ❑ 24 – 10-32 UNC x 3/4" Long Socket Head Cap Screws, Zinc Plated, Burst Panel Exit Duct Mounting

INSTALLATION INSTRUCTIONS:

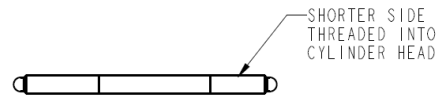
Installation on Modified Engine Components –

These LT Lo-Ram intake manifolds are designed to provide maximum performance for racing engines. The intake manifold will have the best fitment when the engine block and cylinder heads are machined to standard OE dimensions. If the engine block or cylinder head deck surfaces have been milled significantly, the alignment of the mounting bolt holes and the port flange openings to the cylinder head may be shifted and not match-up satisfactorily. If your engine has had the cylinder head or engine block deck surfaces milled, the following may be necessary for proper intake manifold installation.

- The bolt holes in the intake manifold would have to be slotted to allow each fastener to properly pass through the manifold mounting holes. The mounting fasteners must freely thread into the cylinder head while passing through the mounting holes or the manifold may not seat properly onto the cylinder head surfaces when the fasteners are tightened.
- As the O-ring grooves are located in the intake manifold mounting flanges, material may not be removed from the intake manifold mounting flanges without jeopardizing the sealing of the manifold. Any material removal required to align the port flange openings should be removed from the cylinder head not the intake manifold.
- When port matching the intake manifold port openings to the cylinder head openings, care should be taken not to break into or damage the O-ring groove or the O-ring seal will not be effective. The intake manifold mounting surfaces on the cylinder heads should be in good condition, free of nicks or scratches, where the sealing O-rings will seat to ensure proper sealing.

Installation of the Base Intake Manifold –

1. Before installing the base intake manifold, perform a test fit of the intake manifold without the O-rings installed. Make sure that the mounting studs supplied thread freely into the cylinder head. The threaded intake mounting holes in most LT cylinder heads are blind holes. When installing the studs into the cylinder head, make sure that the side of the stud with the shorter length of threads goes into the cylinder head, the ball end of the stud should bottom in the blind threaded holes. Using thread locker on stud threads when installing the studs in the heads is not recommended. A drop of engine oil is all that is needed. Hand tighten only to prevent damage to cylinder head threads. The intake manifold should slide over the studs freely into place so that the manifold mounting flanges seat properly on the cylinder head flanges. Be sure that there is no interference between the base intake manifold and the engine valley cover or engine block preventing the manifold from seating down fully.

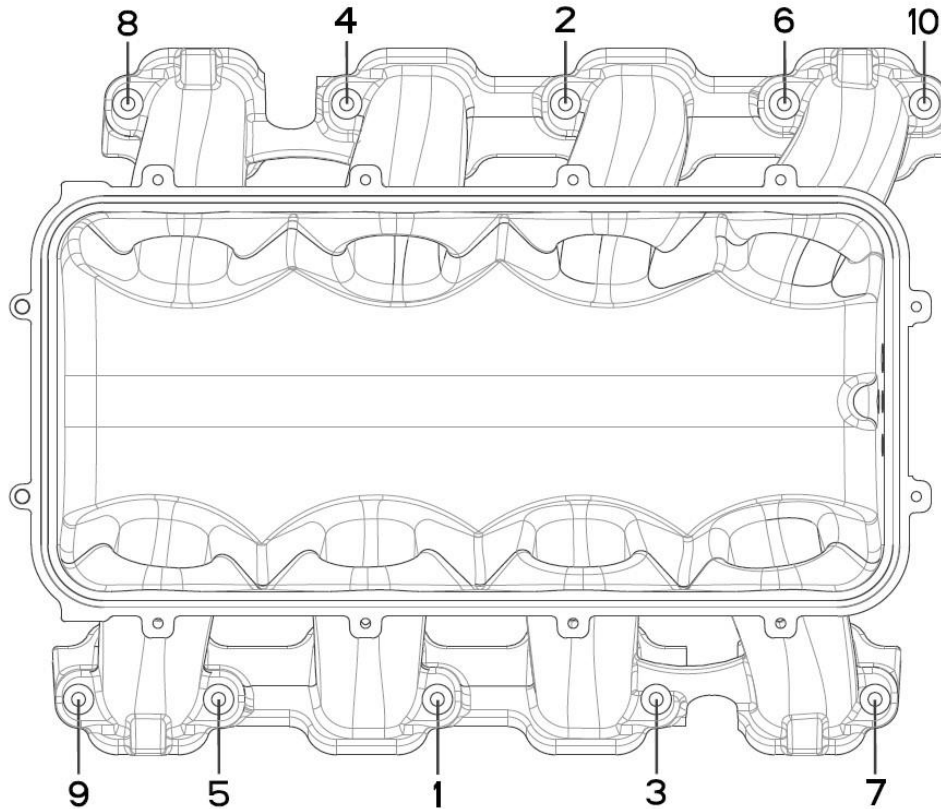


(NOTE: If it is desired to reverse the orientation of the plenum top, then the orientation of the base intake manifold will also need to be reversed, putting the sensor flange towards the “front” of the engine. The plenum tops recommended for the LT Lo-Ram base intake manifold use a “bolt-down through design” for the plenum attachment fasteners. For the top-feed plenum tops, all of the 12-point capscrews except at the two “front” bosses thread into the flange on the manifold through the bosses on the plenum top. At the two “front” bosses, the cap screws thread into the plenum top up through the bosses on the manifold.)

2. Check the port opening alignment. Test fit the mating parts, such as intercooler, plenum top, throttle body adapter, injectors, fuel rails, fuel and vacuum plumbing, throttle linkage, wiring, etc. to ensure there are not any fit issues before performing the final intake manifold installation.
3. For installation, apply a light coat of bearing grease or preferably silicone brake lube to the eight mounting flange O-rings provided. The O-ring grooves in the mounting flanges are of a dove-tail design. Be careful when inserting the O-rings into the grooves to not cut the O-ring on the leading edges of the groove. Gently stretching length-ways the section of the O-ring being inserted into the groove will shrink the cross-section of the O-ring and allow it to more easily slip into the groove.
4. Install the manifold base into place on the mounting flanges. Be sure that all of the O-rings are still in the grooves and are not being crushed between the flanges.

WARNING! The M6 x 1 threads in the aluminum cylinder head will not withstand abuse. Care must be taken to have proper thread engagement and to tighten the fasteners to the proper specifications.

5. Install the washers and nuts provided. Engine oil should be applied to the threads and nut flange faces. Gently tighten the nuts working side to side and out from center (see the tightening sequence diagram below), until manifold is seated on the mounting flanges and the O-rings have been compressed. In two steps, tighten the mounting nuts first to 50 in-lbs and then to 106 in-lbs following the tightening sequence diagram below.



Base Manifold Tightening Sequence

6. There is a flange on the rear of the base manifold for vacuum sources and a GM LS style MAP sensor. On these manifolds, there is a 3/8 NPT port, two 1/4 NPT ports, and a port for a GM LS3 style MAP sensor (grommet seal on the nipple and retained with a single bolt).

NOTE: Holley EFI LS main harnesses have a map sensor connector designed for use with an LS1/2 style map sensor. The 558-416 is an adapter harness that can be used to adapt any LS harness that uses a LS1/2 MAP sensor connection to a LS3 MAP, which is recommended for this manifold.

LS3 MAP sensor, GM P/N 12591290, will cover naturally aspirated (1 bar) applications; an LS9 MAP sensor (post blower), GM P/N 12592525 (red label) should cover forced induction applications up to 3 Bar (28.8 psig of boost). The LS3 MAP sensor does not have the same absolute pressure measurement to voltage output range as a LS1 or LS2 MAP sensor. An ECU set up for the manifold absolute pressure to voltage output of the LS1 or LS2 MAP sensor will need to recalibrate to properly operate the engine with the LS3 MAP sensor. Consult the ECU manufacturer or tuner for the proper ECU MAP sensor calibration for the MAP sensor that you plan to use.

If the use of a GM bolt-on type MAP sensor is not desired, the MAP port can be tapped 1/4 NPT, and a fitting used in the port to plumb a hose to a MAP sensor mounted at some other location. The GM LS type sensors can be mounted with a simple hand-made sheet metal bracket and a hose connected to the nipple that is on the MAP sensor with the grommet seal removed.

MAP sensors and pressure transducers of varying maximum pressures are available at <https://www.holley.com>

Installation of the Top-Feed Plenum Top –

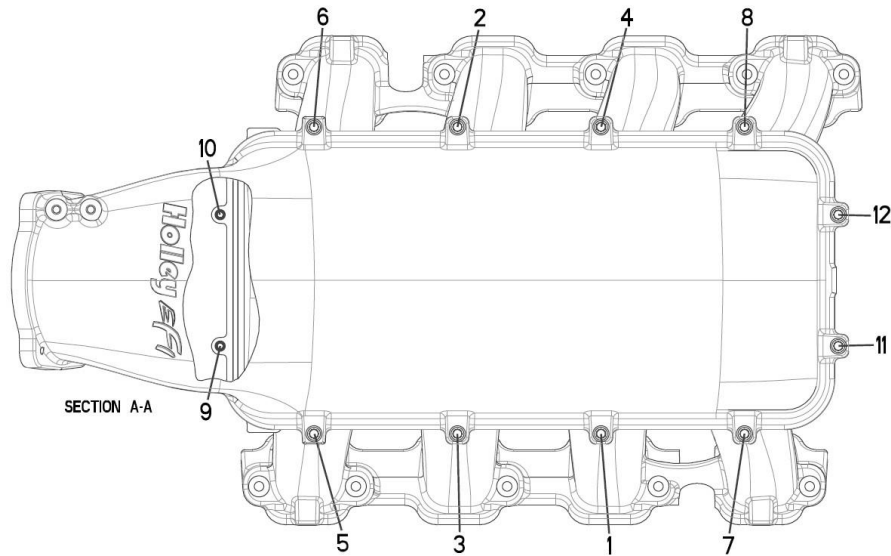
NOTE: If an air to water plenum-mount intercooler is being used, follow the intercooler manufacturer's instructions for its installation.

1. Before installing the plenum top, the supplied O-ring cord (4.5-feet long) will need to be cut to length and glued together.
 - Lay the O-ring cord into the groove on the plenum flange of the base manifold with the free ends overlapped.
 - Mark the position of the cut to be made across both O-ring cord ends.
 - Lay the O-ring cord on a flat surface with the ends overlapped and the marks aligned as they were when the marks were made.
 - With a sharp razor blade, cut through both ends of the O-ring cord at the mark simultaneously.
 - With a drop of super glue (Cyanoacrylate), bond the ends of the O-ring cord together. The glued joint should be smooth, not offset or kinked.
 - To ensure sealing at the glued joint, apply a thin film of silicone sealer around the O-ring at the glued joint, allowing the silicone to partially cure before installation of the joined O-ring cord in the groove.

2. Install the glued O-ring cord in the groove on the base intake manifold plenum top mounting flange. Place the plenum top in place.

As previously noted, if it desired to reverse the orientation of the plenum top, then the orientation of the base intake manifold on the engine will also need to be reversed, putting the sensor flange towards the "front" of the engine. For the carbureted type tops (2 x 4500 and 2 x 4150), the side with the three bosses would go towards the side for the throttle linkage (normally on the driver's side of the car).

3. Using the supplied 1/4" flat washers, apply a drop of engine oil to, and thread in the supplied 1/4-20 x 1" long 12-point capscrews through the plenum top and into the base manifold plenum flange (10 places) and through the base manifold into the plenum top from the underside (2 places).
4. Gently tighten the fasteners evenly - starting from the middle of the sides, crossing side to side, and moving towards the ends until the plenum top is seated and the O-ring is compressed. Tighten the fasteners in two steps using the tightening pattern shown in the figure below. Tighten to 75 in-lbs for the first step and 130 in-lbs for the second step.

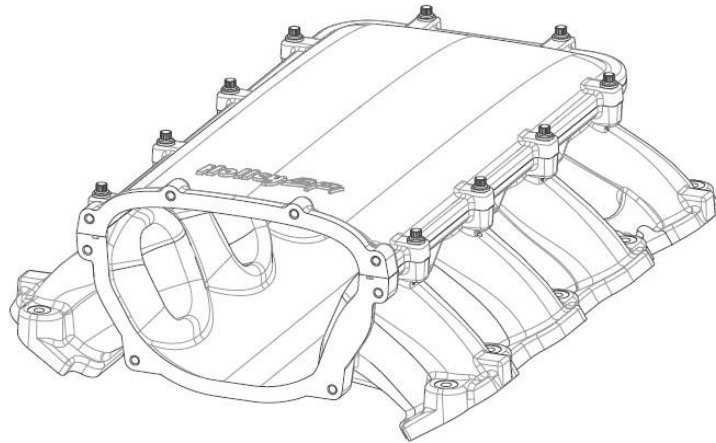


Plenum Top Tightening Sequence

Installation of the Front-Feed Plenum Top and Throttle Body Adapter –

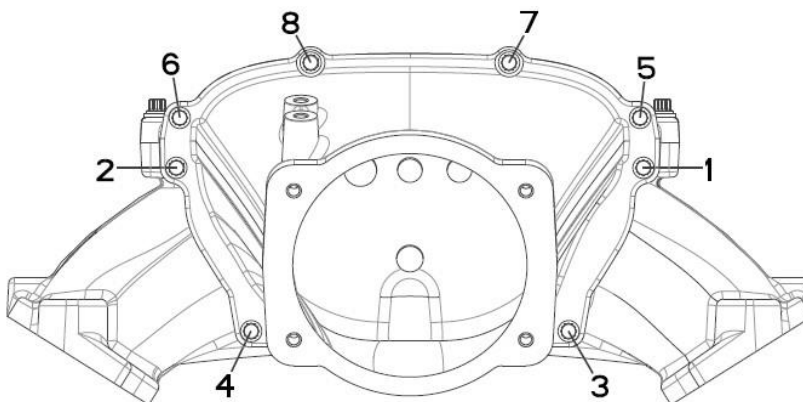
1. Install the supplied O-ring cord in the groove on the base manifold plenum flange so that the ends of the O-ring cord extend out of the groove at the throttle body adapter flange. Place the plenum top in place.
2. Using the supplied 1/4" flat washers, apply a drop of engine oil to, and thread in the supplied 1/4-20 x 1" long 12-point capscrews through the plenum top and into the base manifold plenum flange (10 places). Without regard to the alignment of the throttle body adapter flange, gently tighten the fasteners evenly until the plenum top is seated on the intake manifold plenum flange and the O-ring is fully compressed.

3. Using a sharp razor blade, trim-off the two ends of the O-ring cord flush to the throttle body adapter flange on the base intake manifold. Once the O-ring cord ends are trimmed, loosen the plenum top fasteners enough that the plenum top throttle body adapter flange can be aligned to the base intake manifold throttle body adapter flange by doing a preliminary install of the throttle body adapter.
4. Make sure the O-ring seal is not installed in the throttle body adapter during the preliminary installation of this part. Using the supplied 1/4" flat washers, apply a drop of engine oil to, and thread in the supplied 1/4-20 x 1" long 12-point capscrews through the throttle body adapter into the throttle body adapter flange formed by the base intake manifold and then into the plenum top flange (8 places). Lightly tighten the TB adapter fasteners until the throttle body adapter flanges of the base intake manifold and the plenum top are aligned. There may need to be several iterations of loosening and re-tightening the fasteners of the plenum top to make sure the TB adapter flanges are aligned as one flange and the plenum top is seated on the intake manifold with the O-ring compressed. Once the plenum top is properly in position with the fasteners tight enough to retain it in position, remove the throttle body adapter.



Plenum Top Mounted on the Base Intake Manifold

5. The supplied O-ring cord, 2-foot long, to seal the throttle body adapter needs to be cut to length and the ends glued together.
 - Insert the O-ring cord into the groove on the mounting flange of the throttle body adapter with the free ends overlapped.
 - Mark the position of the cut to be made across both O-ring cord ends.
 - Lay the O-ring cord on a flat surface with the ends overlapped and the marks aligned as they were when the marks were made.
 - With a sharp razor blade cut thru both ends of the O-ring cord at the marks simultaneously.
 - With a drop of super glue (Cyanoacrylate), bond the ends of the O-ring cord together. The glued joint should be smooth, not offset or kinked.
 - To ensure sealing at the glued joint, apply a thin film of silicone sealer around the O-ring cord at the glued joint, allowing the silicone to partially cure before installation of the joined O-ring cord in the groove.
6. Install the glued O-ring cord in the groove on the throttle body adapter mounting flange. The O-ring groove in the throttle body adapter mounting flange is of a dove-tail design. Be careful when inserting the O-ring into the groove to not cut the O-ring on the leading edges of the groove. Stretching length-ways the section of the O-ring being inserted into the groove will shrink the cross-section of the O-ring and allow it to more easily slip into the groove. The joined area of the O-ring should be positioned in the groove to be opposite of the area where fluid is most likely to gather in a pool at the flange.
7. Before installing the throttle body adapter, apply a dab of silicone sealer on the mating flange, (2 places), where O-ring seal groove for the plenum top mounting flange intersects throttle body adapter mounting flange. Using the supplied 1/4" flat washers, apply a drop of engine oil to, and thread in the supplied 1/4-20 x 1" long 12-point capscrews through the throttle body adapter and first into the throttle body adapter flange formed by the base intake manifold and after the plenum top flange (8 places). Gently tighten the eight fasteners for the throttle body adapter evenly until the O-ring seal is fully compressed and the adapter is seated on the mating flange.
8. Using the plenum top tightening sequence (disregarding 9 & 10 in the figure), tighten to plenum top fasteners to 75 in-lbs for the first step. Then following the throttle body adapter tightening sequence, tighten the TB adapter fasteners to 75 in-lbs. Repeat the tightening procedure at 130 in-lbs for the second step, tightening first the plenum top fasteners and then the TB adapter fasteners in sequence.



Throttle Body Adapter Fastener Tightening Sequence

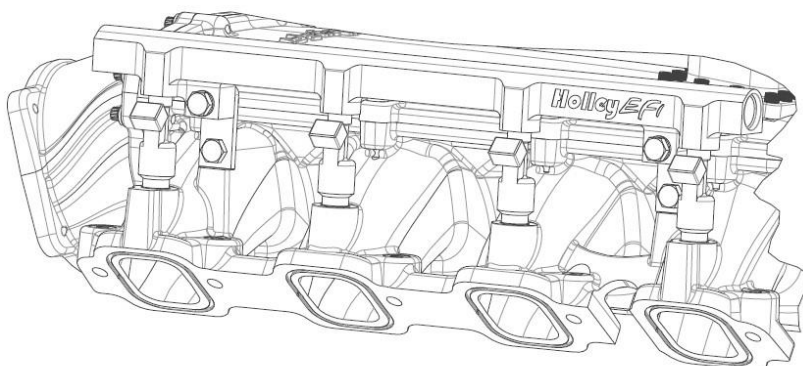
Installation of the Fuel Rails –

LT Lo-Ram intake manifold kits fitted with auxiliary port fuel injector contain a fuel rail kit.

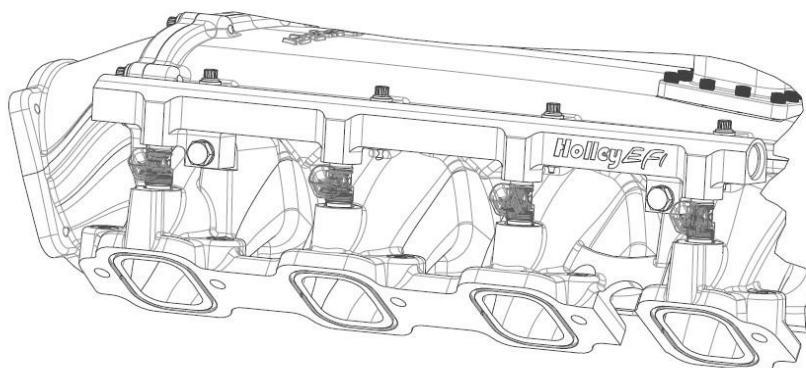
LT Lo-Ram IM Kits including the port-injection fuel rail kit are P/N's:

300-711 & 300-711BK
300-713 & 300-713BK
300-718 & 300-718BK
300-719 & 300-719BK

The fuel rail kits have hardware for the mounting of the fuel rails for both standard length Bosch style EV-1 fuel injectors or for the shorter length LS7 or Pico style fuel injectors. See both Fuel Rail & Injector Installation illustrations below. Injectors with flow volumes as much as 220PPH, and both standard and short lengths, are available from Holley. See <https://www.holley.com>



Fuel Rail & Injector Installation, Standard Tall Injector



Fuel Rail & Injector Installation, Short Injector

Installation Steps

1. For the standard longer length fuel injectors there is a bracket which attaches to each of the fuel rail mounting bosses on the intake manifold using the supplied 5/16-24 x .625" long hex head bolt. The fuel rails will attach to the brackets using the 5/16 AN washers and the 5/16-24 x 1.47" long hex head bolts.

For the short length fuel injectors the brackets will not be used. The fuel rail will attach directly to the fuel rail mounting bosses on the intake manifold using the .188" thick aluminum spacers between the fuel rail and mounting boss and the 5/16-24 x 1.47" long hex head bolts with the 5/16 AN washers.

2. Depending on the injector length, with or without the brackets in place. Apply a silicone lubricant to the O-ring on the inlet end of fuel injectors and insert the fuel injectors into the ports of the fuel rail. To insert each injector without tearing the O-ring, gently rock the injector in the inlet of the port while applying pressure to insert the injector.
3. Position the injectors to properly orient the wiring plugs, apply silicone lubricant to the injector outlet end O-rings. Place the fuel rail into position, inserting all four injectors into the injector bosses in the base intake manifold applying gentle downward pressure on the fuel rail. The proper orientation for the fuel rail is with the logo facing outward away from the plenum.
4. Once the injectors are inserted into the intake manifold and the fuel rail is in position, apply a drop of oil to the threads of the 5/16-24 x 1.47 hex bolts.

For the long injectors insert the hex bolts with the washers installed through the fuel rail and thread the bolts into the threaded lug on the brackets. Tighten the hex bolts to 15-18 ft-lbs.

For the short injectors insert the hex bolts with the washers installed through the fuel rail and through the spacers located between the fuel rail and the manifold mounting bosses. Thread the bolts into the mounting bosses. Tighten the hex bolts to 15-18 ft-lbs.

5. Check and make sure each injector is floating on the O-rings. Rotate the injectors back and forth to confirm that there are no loads on any of the installed fuel injectors.
6. Repeat the installation for the second set of fuel rail and injectors.

The fuel rail is designed to provide enough flow and volume to dampen fuel pressure oscillations and variations at the inlet of the fuel injectors. The fuel rails are machined to receive an adapter fitting for 3/4-16 (AN-8) O-ring port.

Available Earl's -6AN & -8AN male flare to 3/4"-16 AN O-ring port adapter fittings are:

Standard 7/8" wrench hex

P/N – 985068ERL – Adapter, Earl's -6AN male to 3/4"-16 (AN8) O-ring Port – Blue Anodized Aluminum
P/N – AT985068ERL – Adapter, Earl's -6AN male to 3/4"-16 (AN8) O-ring Port – Black Anodized Aluminum
P/N – 985008ERL – Adapter, Earl's -8AN male to 3/4"-16 (AN8) O-ring Port – Blue Anodized Aluminum
P/N – AT985008ERL – Adapter, Earl's -8AN male to 3/4"-16 (AN8) O-ring Port – Black Anodized Aluminum

Reduced Size 3/4" wrench hex

P/N – 991959ERL – Adapter, Earl's -6AN male to 3/4"-16 (AN8) O-ring Port – Red Anodized Aluminum
P/N – AT991959ERL – Adapter, Earl's -6AN male to 3/4"-16 (AN8) O-ring Port – Black Anodized Aluminum
P/N – 991958ERL – Adapter, Earl's -8AN male to 3/4"-16 (AN8) O-ring Port – Red Anodized Aluminum
P/N – AT991958ERL – Adapter, Earl's -8AN male to 3/4"-16 (AN8) O-ring Port – Black Anodized Aluminum

Available Earl's 3/4"-16 -8AN O-ring port plugs (if needed) are:

Low Profile internal wrench hex

P/N – 981308ERL – Plug, Earl's -8AN Port Plug w/ O-RING Seal – Blue Anodized Aluminum
P/N – AT981308ERL – Plug, Earl's -8AN Port Plug w/ O-RING Seal – Black Anodized Aluminum

Fuel Plumbing Recommendations (assuming only port fuel injection being used):

- For power levels below 700-750HP, AN-6 (3/8") plumbing to and from the fuel rails should be sufficient.
- For power levels above 750HP, AN-8 (1/2") plumbing is recommended.
- It is always recommended to only use tubular hose ends when a non-straight hose end is required.
- The best configuration for plumbing the fuel rails is to split from the supply line with a "Y" type distribution block or fitting, then feed into the inlet end of each fuel rail. The hoses from the exit end of each fuel rail would then feed into each inlet port of a fuel pressure regulator with two inlet ports or into another "Y" type distribution block or fitting connecting to a hose leading to the fuel pressure regulator.

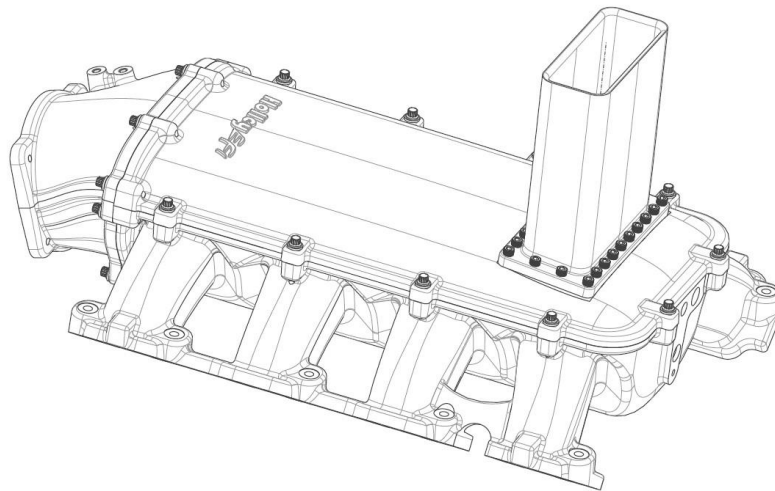
Installation of the EFI Throttle Bodies –

1. When installing the throttle bodies and the connecting throttle linkage, check to be sure that all throttle levers and linkage components have adequate clearance from the intake manifold and plenum top components.
2. The plenum tops for the 2 x 4500 and 2 x 4150 carburetor flange configurations have bosses for the mounting of throttle linkage. The three bosses are positioned for the mounting of heim joints that would carry a throttle linkage motion transfer shaft.
3. The EFI 1 x 105mm LS throttle body plenum tops and throttle body adapters provide bosses near the throttle body flange for the mounting of a throttle cable bracket. Holley throttle cable brackets are available for the Hi-Ram EFI plenum top (P/N 20-149) and for the Lo-Ram 105mm throttle body adapter (P/N 20-154). These brackets are configured for a GM throttle cable from 98-02 Camaro/Firebird, GM P/N 12563339, and various GM cruise control cables from the same vehicle application. For other cable configurations, a custom bracket may need to be fabricated by the user for their throttle cable and throttle body configuration. It should be noted that the throttle body flange on the Lo-Ram intake manifolds plenum top may fit a GM LS 4-bolt flange drive-by-wire throttle body.

Installation of the Burst Panel and Exit Duct –

LT Lo-Ram intake manifold kits 300-717/300-717BK, 300-719/300-719BK, and plenum top kits 300-605/300-605BK are machined for a standard “large” 6-1/8” x 3-1/8” burst panel. Burst panels, burst panel frame sets, and gaskets may be purchased from various manufacturers – some are listed in the service parts section shown later in this instruction sheet.

Holley offers a billet aluminum burst panel exit duct, 300-608 (clear anodized) & 300-608BK (black anodized). The burst panel flange on the plenum top is configured to receive the burst panel and the exit duct flange is made to clamp the burst panel in place. Twenty-four 10-24 x 3/4” socket head capscrews are included with the exit duct. The burst panel exit duct is approximately six inches long. It is intended to be long enough to pass through the body panel above the intake manifold and to be shortened to a desired length.



Burst Panel & Exit Duct Installation

Installation Steps

1. The burst panel should be installed on the plenum top flange so the raised area of the panel is oriented up. There is a 10-24 threaded hole in the center of the burst panel flange. A 10-24 button head screw (not included) should be threaded into this hole and spaced up with washers under the screw head to a height that the button head will just touch the underside of the panel when the panel is seated in place. The button head will support the burst panel when there is high manifold vacuum in the plenum. Be sure the center button head screw is tight.
2. Either gaskets supplied by burst panel manufacturer or an anaerobic flange sealer such as Loctite 518 should be used to seal the burst panel to the plenum top flange. The gasket or sealant should only be applied between the plenum top flange and the burst panel. With a gasket or the flange sealant in place, put the burst panel in place.
3. With the burst panel in place, place the exit duct on top of the burst panel. Thread-in three or four of the 10-24 socket head capscrews through the exit duct and into the plenum top until finger tight. Now that the exit duct is located and seated on the burst panel flange, thread-in the rest of the 10-24 socket head capscrews.

4. Working from the middle out tighten the 10-24 socket head capscrews to 50 in-lbs. Clean any excess sealer that may have squeezed out of the flange as the fasteners were tightened.

LO-RAM & HI-RAM PLENUM TOPS, THROTTLE BODIES, AND SERVICE PARTS AVAILABLE SEPARATELY:

Plenum Tops

Top-Feed Plenum Configuration

NOTE: The Lo-Ram is designed as an EFI intake manifold, the plenum is not designed for carbureted applications, these plenum tops should only be mated with the Lo-Ram Top-Feed Base IM's to accommodate EFI throttle bodies only.

NOTE: The plenum top attachment for the LS1/2/6 Lo-Ram Intake Manifold uses a "bolt-down through design". Except for the front two plenum bolt holes, the plenum bolts thread into the base intake manifold passing through clearance holes in the plenum top. Plenum tops from earlier Hi-Rams used a "bolt up through the base manifold threaded into the plenum top" configuration. The earlier plenum tops would require modification to mate with a LT Lo-Ram Top-Feed base intake manifold.

NOTE: The side-throttle-body-mount plenum tops 300-302, 300-302BK, 300-304, and 300-304BK are not compatible with the LT Lo-Ram IM's using the auxiliary port fuel injection unless the plenum top is spaced upward from the base manifold, 1.25" with a standard tall injector and .25" with the short injector. This may be not an issue with a sandwich mount intercooler of sufficient thickness installed. The proximity of the throttle body with the rocker cover and rocker cover mounted coils could also create an interference that may require a custom rocker cover and coil mounting.

300-207	2 x 4150, up to 1.75" bores, sideways mount 4150, in-line mount 4160, (note: bolt-down through design)
300-207BK	2 x 4150, up to 1.75" bores, Black, sideways mount 4150, in-line mount 4160, (note: bolt-down through design)
300-208	Blank Flange Configurable Top, (note: bolt-down through design)
300-208BK	Blank Flange Configurable Top, Black, (note: bolt-down through design)
300-239	2 x 4500, up to 2.25" Throttle Bores, (note: bolt-down through design)
300-245	1 x 95mm LS Throttle Body, Longitudinal Mount (note: bolt-down through design)
300-245BK	1 x 95mm LS Throttle Body, Longitudinal Mount, Black (note: bolt-down through design)
300-246	1 x 105mm LS Throttle Body, Longitudinal Mount (note: bolt-down through design)
300-246BK	1 x 105mm LS Throttle Body, Longitudinal Mount, Black (note: bolt-down through design)
300-302	1 x 95mm LS Throttle Body, Side TB Mount (note: bolt-down through design)
300-302BK	1 x 95mm LS Throttle Body, Side TB Mount (note: bolt-down through design)
300-304	1 x 105mm LS Throttle Body, Side TB Mount (note: bolt-down through design)
300-304BK	1 x 105mm LS Throttle Body, Side TB Mount (note: bolt-down through design)

Front-Feed Plenum Configuration

300-604	Front-Feed Plenum Top, Standard (no burst panel flange)
300-604BK	Front-Feed Plenum Top, Standard (no burst panel flange), Black
300-605	Front-Feed Plenum Top, with Burst Panel Flange
300-605BK	Front-Feed Plenum Top, with Burst Panel Flange, Black

Throttle Body Adapters (Front-Feed Plenum Configuration)

300-714	Throttle Body Adapter, LT Lo-Ram, 105mm GM LS Throttle Body
300-714BK	Throttle Body Adapter, LT Lo-Ram, 105mm GM LS Throttle Body

Fuel Rail Kits

534-269	GM Gen V LT Lo-Ram Fuel Rail Kit, Single-Injector per Cylinder, 3/4-16 O-ring Port (AN-8) Connection
534-249	GM Gen V LT Lo-Ram Fuel Rail Bracket & Fastener Mounting Kit

Throttle Bodies

112-578	2000 CFM 4500 Dominator Flange Throttle Body, 4 x 2.25" Throttles, Clear Anodized
112-587	1000 CFM 4150 Flange Throttle Body, 4 x 1.75" Throttles, Hard Core Gray
112-588	1000 CFM 4150 Flange Throttle Body, 4 x 1.75" Throttles, Polished
112-581	Billet 105mm LS Throttle Body, w/Low-RPM Tapered Throttle Bore
112-583	Billet 105mm LS Throttle Body, w/Straight Throttle Bore

Burst Panel Exit Ducts & Burst Panel

300-608	Billet Burst Panel Exit Duct, 6-1/8" x 3-1/8" Panel x 6" Long, Clear Anodized
300-608BK	Billet Burst Panel Exit Duct, 6-1/8" x 3-1/8" Panel x 6" Long, Black Anodized
Burst Panel 6-1/8" x 3-1/8", SFI Approved	Purchase from various suppliers:
Specialty Fasteners	P/N BP, 909-393-3999, https://www.specialty-fasteners.com
Blower Shop	P/N 2585, 208-985-7655, https://theblowershop.com
Allstar Performance	P/N ALL26310, 269-463-8000, https://allstarperformance.com

Fabrication Flanges

300-220	Hi-Ram Plenum Fabrication Flange, 0.50" Billet Machined Aluminum Plate
300-221	Hi-Ram 92mm LS Throttle Body Fabrication Flange, 0.50" Billet Machined Aluminum Plate
300-222	Hi-Ram 102mm LS Throttle Body Fabrication Flange, 0.50" Billet Machined Aluminum Plate
300-610	Lo-Ram/Hi-Ram 105mm LS Throttle Body Fabrication Flange, 0.50" Billet Machined Aluminum Plate
300-731	LT Lo-Ram Front-Feed Throttle Body Adapter Mounting Fabrication Flange, 0.50" Billet Machined Alum. Plate

Service Parts

20-149	Throttle Cable Bracket Kit, LS Hi-Ram/Mid-Rise/Top-Feed Lo-Rise Intake Manifolds using the 92, 95, & 105mm Throttle Bodies on a Hi-Ram EFI Plenum Top
20-154	Throttle Cable Bracket Kit, LS1/2/6 Lo-Ram Front-Feed Intake Manifold Kits
300-613	Fastener & O-ring Cord Kit, Lo-Ram Plenum Top & Throttle Body Adapter Mounting
300-614	Fastener Kit, LS1/2/6 Lo-Ram Burst Panel Duct Mounting
300-730	Stud Kit, GM Gen V LT Lo-Ram Base Intake Manifold Mounting
508-20	Throttle Body Gasket, 92/102mm LS Throttle Body
508-21	Hi-Ram Plenum O-ring Cord, 3/32" Round, Viton, 4.5' Long (use for plenum or throttle body adapter flange seal)
508-24	Throttle Body Gasket, 105mm LS Throttle Body
508-25	GM Gen V LT Hi-Ram/Lo-Ram Port Flange O-rings, 3/32" Round, Size 2-142, Viton, set of 8
534-104	Fuel Injector O-rings, set of 16 (O-ring supplied in LS7 fuel injector adapter mount kit 300-230)

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199R12207
Date: 3-11-21



Throttle Body Installation Instructions for GM LS Race Series

860007-1 (Silver) & 860008-1 (Black) – 90MM
860001-1 (Silver) & 860004-1 (Black) – 92MM
860002-1 (Silver) & 860005-1 (Black) – 102MM

Kit Contents:

- Throttle Body
- (4) Throttle Body Mounting Bolts
- Installation Instructions

Installation Instructions:

1. Please read through the entire instruction sheet to familiarize yourself with the parts of the vehicle the installation will cover.
2. Disconnect the negative battery terminal.
3. Remove the air inlet tube, all vacuum hoses, and electrical connectors from the stock throttle body. Mark all hoses and wires to ensure that they are installed correctly on the new throttle body.
4. Disconnect the throttle linkage by opening the throttle manually and slipping the cable from the cam groove on the linkage.
5. Remove the (x4) nuts securing the throttle body to the intake manifold and remove it.
6. Attach the IAC (**Holley replacement part # 543-34**) and TPS (**Holley replacement part # 870001**) to the new throttle body. Make sure each O-ring is in the groove and does not slip out while installing. Torque bolts to **18 in/lbs (1.5 ft/lbs)**.
7. Make certain the gasket-mating surface on the intake manifold is clean and free of debris. Using the included bolts, attach the throttle body to the intake manifold. Torque nuts and bolts down to **89 in/lbs (7 ft/lbs)**.
8. Slip the throttle cable on the linkage arm.
9. Observe the throttle body (while an assistant presses and releases the gas pedal) to ensure that the throttle blade opens and closes while also operating smoothly.
10. Re-attach the air inlet tube, all vacuum hoses, and electrical connectors on the new throttle body.
11. Re-connect the negative battery terminal.
12. Start the engine and check for loose connections or vacuum leaks, etc.
13. After the engine is warmed up, check the idle speed (refer to owner's manual).
14. Double-check all fasteners, clamps, and electrical connections to ensure they are all secure.

Any questions?

Please contact Technical Service: **1-866-464-6553** or **270-781-9741**.

For online help, please refer to the website: **www.holley.com**.

LIMITATION OF LIABILITY – DISCLAIMER:

The regulation of emissions production, noise levels, and safety standards is undertaken by the federal government, each of the fifty state legislatures, and by many local municipalities, towns, and counties.

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199R11409

Revision Date: 4-3-18



Injector Off Times to use with Terminator X and Terminator X Max ECUs

MPFI Injectors	Rated Flow per Injector (lb/hr)	Rated Injector Pressure (psi)	Minimum Injector Opening Time (msec)	Injector Off Time (msec)																
				8.0V	8.8V	9.6V	10.4V	11.2V	12.0V	12.8V	13.6V	14.4V	15.2V	16.0V	16.8V	17.6V	18.4V	19.2V	20.0V	
Term X 42 lb/hr	42.5	60.0	1.20	1.35	1.17	0.90	0.82	0.69	0.51	0.43	0.35	0.34	0.23	0.21	0.11	0.09	0.05	0.02	0.00	
Term X 76 lb/hr	76.2	60.0	1.20	2.12	1.85	1.39	1.20	0.96	0.86	0.71	0.65	0.57	0.50	0.38	0.35	0.33	0.26	0.24	0.21	
Term X 100 lb/hr	100.0	60.0	1.20	3.05	2.18	1.73	1.34	1.17	0.99	0.83	0.74	0.63	0.56	0.49	0.42	0.37	0.30	0.26	0.23	
Term X 120 lb/hr	120.0	60.0	1.20	2.78	2.21	1.94	1.65	1.43	1.30	1.15	0.99	0.92	0.88	0.81	0.73	0.70	0.67	0.64	0.62	
Term X 220 lb/hr	220.0	43.5	1.20	2.96	2.19	1.84	1.56	1.32	1.12	0.96	0.83	0.72	0.63	0.55	0.47	0.41	0.35	0.30	0.25	
Accel 150830 30 lb/hr	28.8	43.5	1.00	1.85	1.42	1.16	0.98	0.83	0.71	0.60	0.50	0.42	0.34	0.28	0.23	0.18	0.13	0.09	0.04	
Accel 150832 32 lb/hr	31.5	43.5	1.00	1.98	1.51	1.23	1.04	0.89	0.76	0.63	0.54	0.46	0.37	0.30	0.23	0.17	0.12	0.08	0.03	
Accel 150844 44 lb/hr	43.5	43.5	1.00	1.63	1.33	1.08	0.92	0.81	0.75	0.59	0.51	0.43	0.35	0.29	0.23	0.18	0.14	0.16	0.06	
Accel 151845 45 lb/hr	47.0	43.5	1.00	1.98	1.04	0.81	0.74	0.63	0.54	0.45	0.37	0.31	0.25	0.20	0.15	0.11	0.08	0.05	0.02	
Accel 151848 48 lb/hr	49.8	43.5	1.00	2.52	0.81	0.62	0.53	0.44	0.34	0.25	0.18	0.13	0.08	0.04	0.00	-0.04	-0.07	-0.09	-0.12	
Accel 151853 53 lb/hr	58.1	43.5	1.00	2.99	2.14	1.75	1.50	1.29	1.12	0.98	0.86	0.75	0.65	0.58	0.51	0.45	0.38	0.31	0.25	
Accel 151861 61 lb/hr	63.9	43.5	1.00	1.89	1.45	1.21	1.03	0.87	0.73	0.62	0.55	0.48	0.39	0.31	0.23	0.16	0.10	0.05	0.02	
Accel 74620L 62 lb/hr	64.0	43.5	1.00	1.63	1.29	1.12	0.93	0.77	0.65	0.55	0.45	0.37	0.28	0.21	0.15	0.10	0.06	0.02	-0.02	
Accel 151880 80 lb/hr	77.0	43.5	1.00	1.74	1.41	1.21	1.03	0.87	0.75	0.67	0.59	0.50	0.43	0.35	0.28	0.23	0.18	0.13	0.10	
19LB Holley 522-198	19.0	43.0	1.00	1.48	1.24	1.02	0.85	0.72	0.62	0.53	0.46	0.40	0.35	0.30	0.26	0.22	0.19	0.15	0.12	
24LB Holley 522-248	24.0	43.0	1.00	1.33	1.09	0.87	0.70	0.56	0.46	0.37	0.29	0.22	0.16	0.10	0.06	0.01	0.01	0.01	0.01	
30LB Holley 522-308	30.0	43.0	1.00	1.73	1.46	1.22	1.03	0.87	0.75	0.65	0.56	0.49	0.43	0.37	0.32	0.26	0.22	0.19	0.16	
36LB Holley 522-368	36.0	43.0	1.00	1.59	1.34	1.12	0.93	0.79	0.67	0.57	0.48	0.41	0.35	0.31	0.27	0.23	0.19	0.15	0.11	
42LB Holley 522-428	42.0	43.0	1.00	1.69	1.42	1.18	0.98	0.83	0.72	0.61	0.51	0.43	0.36	0.30	0.24	0.20	0.15	0.11	0.07	
48LB Holley 522-488	48.0	43.0	1.00	1.47	1.24	1.02	0.84	0.70	0.59	0.50	0.42	0.35	0.29	0.23	0.18	0.13	0.09	0.06	0.03	
Mopar - RL032713AB	27.3	43.5	1.00	2.43	2.01	1.70	1.45	1.28	1.13	0.98	0.86	0.78	0.70	0.63	0.55	0.48	0.41	0.34	0.29	
Mopar - 4591851AB	26.8	43.5	1.00	2.53	2.08	1.75	1.50	1.33	1.17	1.04	0.91	0.83	0.75	0.69	0.62	0.56	0.49	0.43	0.37	
Mopar - 5037479AA	31.5	43.5	1.00	2.40	2.03	1.74	1.51	1.32	1.16	1.01	0.92	0.84	0.75	0.67	0.60	0.52	0.44	0.38	0.33	
Mopar - 5038337AB	35.0	43.5	1.00	2.65	2.12	1.81	1.54	1.34	1.19	1.04	0.92	0.83	0.74	0.67	0.59	0.52	0.45	0.39	0.33	
Mopar - 68170238AB	52.0	43.5	1.00	1.35	1.10	0.89	0.70	0.62	0.53	0.44	0.37	0.32	0.26	0.21	0.16	0.11	0.07	0.03	0.00	
Mopar - 5038838AA	61.0	43.5	1.00	2.00	1.83	1.53	1.32	1.15	1.01	0.89	0.79	0.70	0.63	0.56	0.51	0.45	0.40	0.36	0.32	
Ford 19 lb/hr Yellow Big Body	19.0	43.5	1.00	1.83	1.46	1.24	1.06	0.93	0.82	0.73	0.65	0.58	0.51	0.45	0.40	0.36	0.30	0.25	0.21	
Ford 24 lb/hr Blue Big Body	24.0	43.5	1.00	1.78	1.40	1.17	0.99	0.86	0.73	0.65	0.58	0.51	0.45	0.40	0.35	0.30	0.26	0.21	0.18	
Ford 30 lb/hr Red Big Body	30.0	43.5	1.00	2.25	1.73	1.42	1.21	1.06	0.95	0.85	0.76	0.68	0.60	0.53	0.47	0.42	0.37	0.32	0.27	
Ford - BR329F593A	34.0	43.5	1.00	2.02	1.65	1.40	1.20	1.05	0.93	0.82	0.71	0.62	0.55	0.48	0.42	0.36	0.31	0.25	0.27	
FRPP M-9593-LU47	51.0	43.5	1.00	2.31	1.69	1.50	1.35	1.18	1.03	0.82	0.82	0.72	0.64	0.56	0.50	0.44	0.39	0.34	0.29	
FRPP M-9593-G302	51.0	43.5	1.00	2.95	2.10	1.77	1.53	1.33	1.17	1.04	0.92	0.82	0.73	0.65	0.59	0.52	0.47	0.41	0.36	
FRPP M-9593-MU52	59.6	43.5	1.00	3.27	2.21	1.88	1.65	1.44	1.27	1.13	1.01	0.91	0.82	0.73	0.66	0.60	0.54	0.48	0.43	
FRPP M-9593-LU60	64.0	43.5	1.00	1.94	1.46	1.17	0.99	0.85	0.71	0.58	0.49	0.42	0.35	0.29	0.22	0.16	0.10	0.04	0.00	
FRPP M-9593-LU80	77.8	43.5	1.00	1.86	1.54	1.28	1.11	0.97	0.83	0.69	0.62	0.55	0.49	0.42	0.35	0.28	0.22	0.17	0.12	
LS3 12576341	41.1	60.0	1.00	1.80	1.49	1.21	1.00	0.84	0.73	0.63	0.54	0.46	0.40	0.34	0.29	0.24	0.20	0.15	0.10	
GM 12580426 5.3 Flex Fuel	35.9	60.0	1.00	1.67	1.37	1.11	0.90	0.76	0.64	0.54	0.45	0.37	0.32	0.27	0.22	0.18	0.14	0.10	0.05	
GM 12580681	29.6	60.0	1.00	0.95	0.80	0.66	0.54	0.45	0.36	0.32	0.27	0.23	0.20	0.17	0.14	0.12	0.10	0.08	0.06	
GM 17113698	24.4	60.0	1.00	0.70	0.59	0.48	0.38	0.31	0.23	0.19	0.15	0.12	0.09	0.06	0.04	0.02	0.00	-0.02	-0.03	
GM 25317628	24.4	60.0	1.00	0.70	0.59	0.48	0.38	0.31	0.23	0.19	0.15	0.12	0.09	0.06	0.04	0.02	0.00	-0.02	-0.03	
GM 17113553	24.7	60.0	1.00	0.72	0.59	0.46	0.37	0.31	0.25	0.19	0.14	0.10	0.06	0.03	0.01	-0.01	-0.03	-0.05	-0.06	
GM 25323974	24.7	60.0	1.00	0.72	0.59	0.46	0.37	0.31	0.25	0.19	0.14	0.10	0.06	0.03	0.01	-0.01	-0.03	-0.05	-0.06	
GM 25320288	24.7	60.0	1.00	0.72	0.59	0.46	0.37	0.31	0.25	0.19	0.14	0.10	0.06	0.03	0.01	-0.01	-0.03	-0.05	-0.06	
GM 89017586	33.3	60.0	1.00	1.80	1.52	1.24	1.03	0.88	0.74	0.65	0.56	0.48	0.41	0.35	0.30	0.25	0.21	0.18	0.14	
GM LS3 12576341	41.0	60.0	1.00	1.80	1.49	1.21	1.00	0.84	0.73	0.63	0.54	0.46	0.40	0.34	0.29	0.24	0.20	0.15	0.10	
GM 12580426 5.3 Flex Fuel	35.9	60.0	1.00	1.67	1.37	1.11	0.90	0.76	0.64	0.54	0.45	0.37	0.32	0.27	0.22	0.18	0.14	0.10	0.05	
GM 12594512	36.9	60.0	1.00	1.79	1.53	1.26	1.07	0.93	0.79	0.72	0.64	0.57	0.51	0.45	0.40	0.35	0.31	0.28	0.25	
GM 12609749	48.2	60.0	1.00	2.00	1.69	1.39	1.16	1.00	0.84	0.75	0.66	0.58	0.51	0.45	0.40	0.34	0.30	0.26	0.22	
GM 12613411	36.4	60.0	1.00	1.80	1.52	1.24	1.02	0.88	0.74	0.65	0.56	0.48	0.42	0.36	0.32	0.27	0.23	0.19	0.16	
GM 12587																				