



## INSTRUCTIONS

**FAST® LSX<sub>RT</sub>™ 102mm Intake Manifold**  
**Part #146602 / #146602B GM 4.8/5.3/6.0L Cathedral Port (LS1 Style)**  
**Part #146105 GM 6.0/6.2L Rectangle Port (LS3 Style)**



**BEFORE YOU START:** Be sure you have any required installation kits for your throttle body and fuel rails as described in these instructions.

**Application years are to be used as a guideline only.**

GM is known to make changes in the middle of a production year. For example, 2002 GM trucks/SUVs can have a cable driven or electronic throttle body, along with other differences. The 2007 production year has both the “Classic” and “New” body styles, which have many differing parts.

**Warning:** Please review the packaging contents to ensure you have all hardware and read the complete instructions, especially the torque specs, before installation. **Safety glasses are required throughout this installation.**



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Part #FAST4-164  
 Revised 11/22/19



# INSTRUCTIONS

## Package Contents 146602B (Cathedral Port Street Manifold)

<b>Hardware Included With 146602B In Packet #146602M-H (CF007-583)</b>	
2	Self-Tapping Screw (Canister purge valve nipple hold down)
4	M6 x 40mm Socket Head Cap Screws (OEM Electronic Throttle Bodies)
1	M4 x 20mm T-20 Torx Head Screw (MAP sensor hold down)
5	10mm x 20mm long, Self-Tapping Screws (Canister purge valve hold down, throttle cable hold down, EGR)
10	M6 x 110mm Socket Head Cap Screws (Bolts manifold to cylinder heads and upper shell)
13	M6 x 16.5mm O.D. x 3.5mm Thick Flat Washer (Manifold to cylinder head bolts, throttle cable hold down)
10	M8 x 30mm Button Head Cap Screws (Replacement OEM valley plate bolts)
<b>Hardware Pre-Installed In LSXRT™ Manifold #146602 / #146602B</b>	
3	M6 x 16mm Socket Head Cap Screws (Rear upper shell hold down)
2	M6 x 40mm Socket Head Cap Screws (Front upper shell hold down)
8	M4 x 20mm T-20 Torx head screw (Runner hold down)
<b>O-Ring Gasket Included in Package</b>	
1	Nipple (Fuel rail mounted canister purge valve)
1	102mm Seal (Throttle body)
3	Rubber Bumpers (Bottom of manifold)
2	Vacuum Plugs (Brake booster ports)
8	Fuel Injector O-Rings (GM truck fuel injector lower o-rings)
8	Intake Port seals (Cylinder head to manifold)
1	90-Degree Barbed Elbow
1	Rubber Grommet
1	Hose Clamp



# INSTRUCTIONS

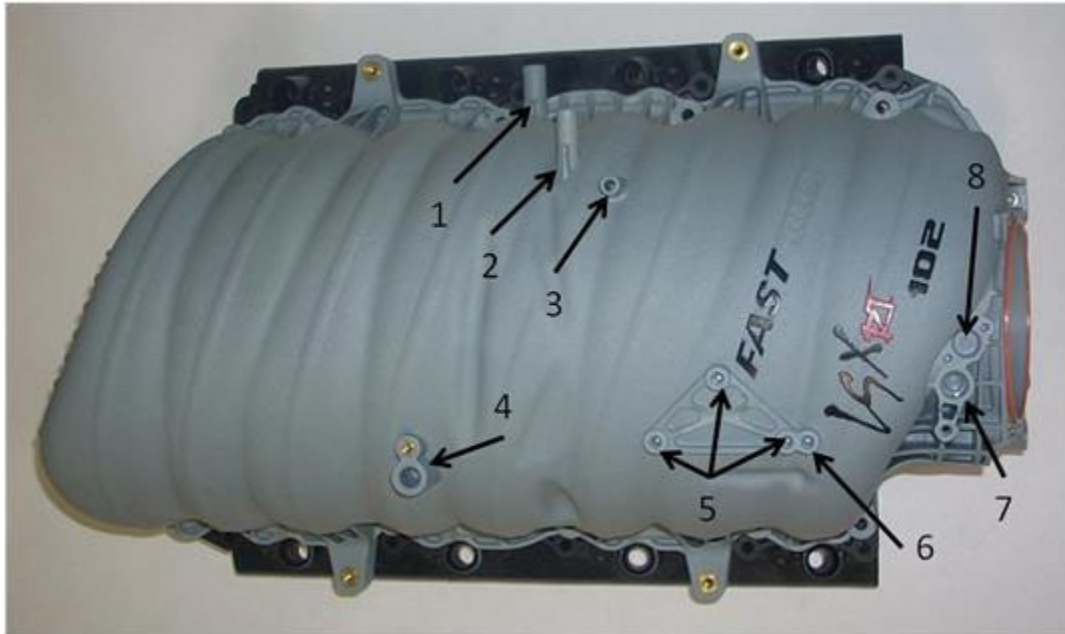
## Package Contents 146105B (Rectangle Port Race Manifold)

<b>Hardware Included With 15105B In Packet #146102M-H (CF007-638)</b>	
4	M6 x 40mm Socket Head Cap Screws (OEM DBW Throttle Bodies)
1	M4 x 20mm T-20 Torx Head Screw (MAP sensor hold down)
1	LS3 Camaro Accessory Tensioner Spacer (29mm O.D. 2.75mm thick)
10	M6 x 110mm Socket Head Cap Screws (Bolts manifold to cylinder heads and upper shell)
10	M6 x 16.5mm O.D. x 3.5mm Thick Flat Washer (Manifold to cylinder head bolts)
10	M8 x 30mm Button Head Cap Screws (Replacement OEM valley plate bolts)
2	M6 x 15mm Socket Head Cap Screws (OEM throttle cable attachment)
2	Phillips Head Self Tapping Screw
4	M6 x 12mm Cap Screw Bolts (OEM fuel rail hold down)
<b>Hardware Pre-Installed In LSXRT™ Manifold #146105B</b>	
3	M6 x 16mm Socket Head Cap Screws (Rear upper shell hold down)
2	M6 x 40mm Socket Head Cap Screws (Front upper shell hold down)
5	M6 x 10mm Wide x 5mm Tall Hex Nuts (Upper shell hold down)
8	M4 x 20mm T-20 Torx Head Screw (Runner hold down)
8	M4 x 20mm T-20 Torx Head Self-Tapping Screw (LS3 Runner insert hold down)
5	6mm x 12mm O.D. x 1.5mm Thick Flat Washer (Upper shell front and rear hold downs)
2	Phillips Head Self Tapping Screw (Vacuum nipple)
<b>O-Ring Gasket Included In Package With Manifold #146105B</b>	
3	Rubber Bumpers (Bottom of manifold)
1	102mm Seal (Throttle Body)
1	Optional Vacuum Nipple (PCV)



## INSTRUCTIONS

### Overview of Attachment Points and Ports:



1. **Optional front brake booster vacuum port** – Open to plenum, seal with supplied cap if not used. There is another brake booster port in the rear of the intake.
2. **PCV** – Open to plenum, seal if not used.
3. **Fuel pressure regulator vacuum** – Sealed, drill through if applicable.
4. **Optional front MAP sensor location** – Sealed, drill through if applicable. There is another MAP sensor port in the rear of the intake.
5. **Throttle cable bracket hold down** – If applicable, must use the supplied self-tapping screw & washer combo along with extra thick washer.
6. **Intake resonator attachment** – If applicable, must use supplied self-tapping screw & washer combo along with extra thick washer.
7. **Canister purge valve direct mount** – Sealed, drill through if applicable.
8. **Fuel rail mounted canister purge valve port** – Sealed, drill through if applicable.



## INSTRUCTIONS

### Not pictured:

- 1) **Rear MAP sensor port** – Sealed, drill through if applicable.
- 2) **Rear brake booster port** – Open to plenum.
- 3) **Small rear vacuum port** – Open to plenum. Seal if not used.
- 4) **EGR port** – Passenger side of throttle body, sealed, open if applicable.

### Stock Manifold Disassembly:

- 1) Allow engine to cool, disconnect the negative battery cable and remove engine covers, if applicable. Relieve fuel pressure by depressing the Schrader valve on the fuel rail. Cover with a towel to absorb lost fuel.
- 2) Clean off any excess dirt and debris around the intake manifold that could become dislodged and fall into your engine during removal.
- 3) Disconnect fuel line from rail by using quick-connect separator tool (J37088-A). Place shop towels around connection to catch additional gasoline. Some earlier applications have a separate return line that also needs to be disconnected.
- 4) Unplug MAF connector and remove air cleaner assembly.
- 5) Remove or unplug MAP sensor, depending on application it may be located in the front or the rear of the manifold.
- 6) Disconnect any PCV hoses, vacuum lines, EGR, canister purge valve, brake booster line and fuel pressure regulator. Take note of positions for reinstallation.
- 7) If your application uses a cable driven throttle body, disconnect the Throttle Position Sensor (TPS), Idle Air Control (IAC) and Intake Air Temp sensor (IAT).
- 8) If your application uses an electronic throttle body, disconnect it.

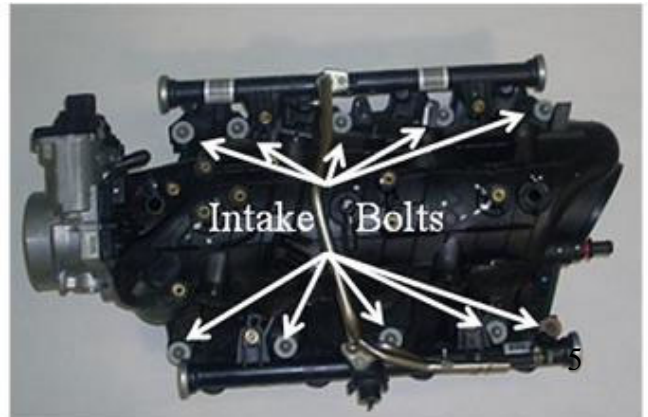






## INSTRUCTIONS

- 9) Unplug all 8 fuel injectors.
- 10) Loosen all 10 intake manifold bolts (8mm hex).
- 11) The stock manifold is ready to be removed, carefully lift the manifold and remove it.
- 12) Clean any remaining dirt and debris that may dislodge and enter the engine.
- 13) Cover the open cylinder head ports with a clean, lint free rag to prevent anything from entering your engine.
- 14) Remove the 4 fuel rail mounting bolts and the stock fuel rail and injectors as an assembly.
- 15) Remove injector clips using a screwdriver to gently pry them off.
- 16) Remove injectors from the fuel rail, remembering that the fuel rail is still full of fuel. Take precautions to contain the excess fuel that will leak out. Rubber gloves and safety glasses are required.





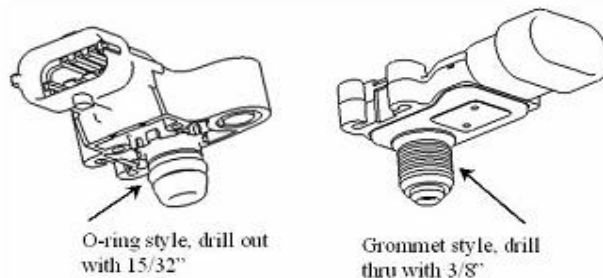
## INSTRUCTIONS

### Required Modifications:

- 1) **IMPORTANT: Replace 10 valley plate bolts with the button head cap screws provided. Torque to 18 ft./lbs. Failure to replace these bolts could damage the LSX<sub>RT</sub><sup>TM</sup> manifold.**
- 2) Coolant crossover tube modification (slight bending) and/or replacement may be required, depending on application. If needed, use GM Part #12602544 front only crossover, and two (2) of Part #12602540 plugs.
- 3) Remove the upper shell from the LSX<sub>RT</sub><sup>TM</sup> manifold. There are five (5) upper shell hold-down bolts pre-installed, two (2) in the front near the throttle body and three (3) in the rear of the LSX<sub>RT</sub><sup>TM</sup> manifold.
- 4) Due to the wide range of applications the LSX<sub>RT</sub><sup>TM</sup> manifold was designed to fit, MAP sensor locations require drilling. There is a front and a rear location provided. Both are intentionally shipped plugged.
- 5) Find the MAP sensor location that will work with your specific application. It will then have to be drilled all the way through to allow the MAP sensor to read manifold vacuum. There are two different MAP sensors that can be used. If your MAP sensor is a grommet style, use a 3/8" drill bit. If your MAP sensor is o-ring style use a 15/32" drill bit. Remove all shavings left over from drilling.
- 6) A MAP sensor hold down insert and bolt has been added to the intake to help hold the MAP sensor securely in position. The MAP sensor bolt should not be tightened past 19 in./lbs.
- 7) There are also two canister purge valve locations. Again these are shipped sealed. Select the correct placement for your specific application and drill though the intake, then remove all shavings. See the canister purge valve section of the instructions for more detail.
- 8) If your vehicle is equipped with Exhaust Gas Recirculation (EGR), cut out the round EGR mounting hole on the passenger side of the LSX<sub>RT</sub><sup>TM</sup> manifold.
- 9) If your vehicle has a fuel pressure regulator mounted to the fuel rail and requires manifold vacuum, drill out the fuel pressure regulator vacuum port. It's labeled #3 in the picture at the beginning of these instructions. It points upwards out of the top of the LSX<sub>RT</sub><sup>TM</sup> manifold.



MAP Sensor Identification

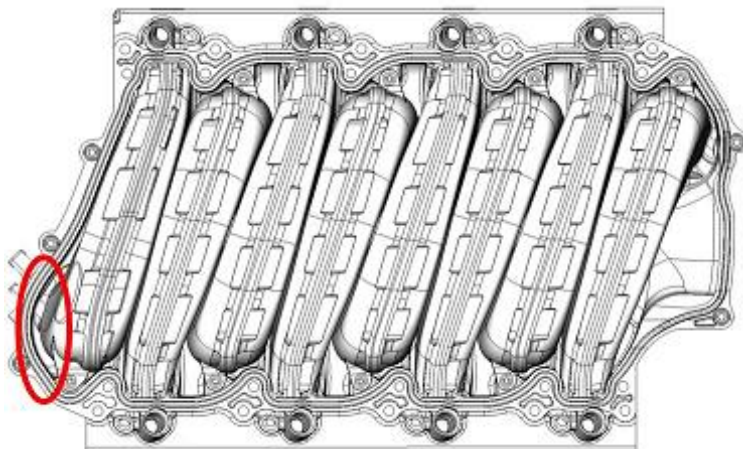




## INSTRUCTIONS

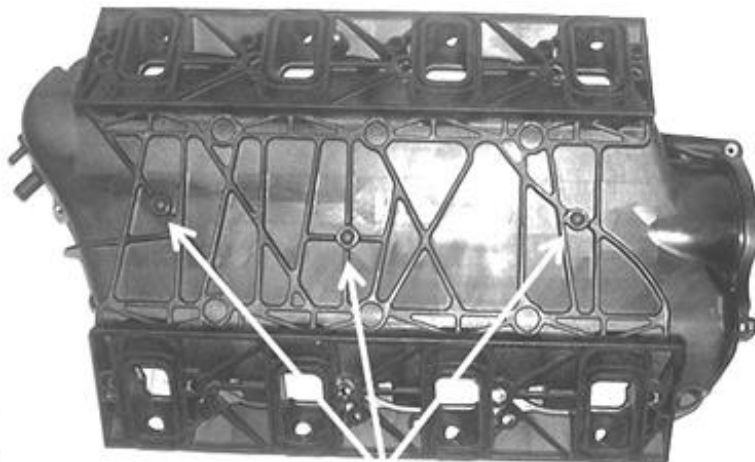
### Before Installation in Vehicle:

- 1) Before reassembly, reapply a small amount of RTV in the rear seal groove to ensure a proper reseat of the LSX<sub>RT</sub><sup>TM</sup> manifold upon reassembly.
- 2) Carefully reinstall the upper shell, making sure it is seated correctly into the lower shell all the way around. There are five (5) upper shell hold down bolts, two (2) in the front near the throttle body and three (3) in the rear of the LSX<sub>RT</sub><sup>TM</sup> manifold. Install the bolts using medium strength thread locker in the sequence pictured. Torque upper shell bolts to 70-89 in./lbs. These were installed prior to shipping and were removed during upper lid removal.

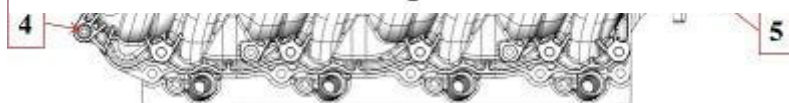


**IMPORTANT: Failure to properly align the upper shell to the lower shell could damage the LSX<sub>RT</sub><sup>TM</sup> manifold.**

- 3) Flip the LSX<sub>RT</sub><sup>TM</sup> manifold over. There are three circles molded into the base for self-adhesive rubber bumpers. Clean the circles with a suitable cleaner (such as isopropyl alcohol) and allow time for drying. Then stick the bumpers in place.
- 4) Inspect the LSX<sub>RT</sub><sup>TM</sup> manifold, ensuring there are no loose nuts or bolts that could fall into your engine.
- 5) Before reinstalling previously used injectors, inspect o-rings for damage. The OEM recommends new injector o-rings after disassembly, however replacement is not necessary if seals are not worn or damaged. Lubricate ALL o-rings with clean engine oil.



Rubber Bumpers Installed



- 6) OEM GM truck injectors require a lower injector o-ring swap to work with the LSX<sub>RT</sub><sup>TM</sup> manifold. These o-rings are included in your o-ring kit.





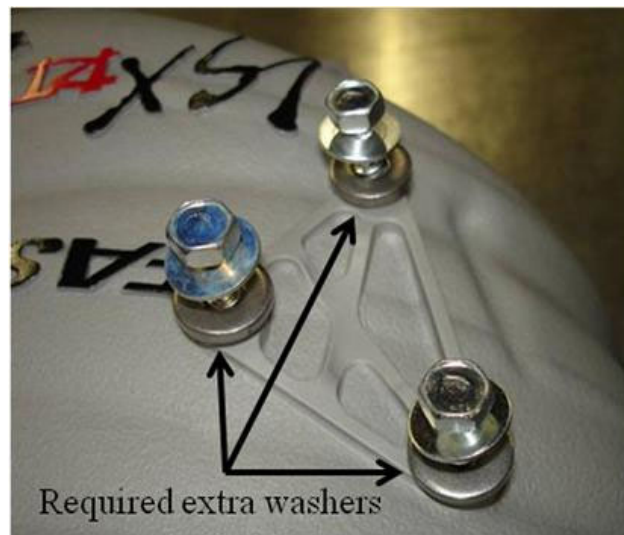
## INSTRUCTIONS

- 7) Install fuel injectors into your fuel rail and your fuel rail onto the LSX<sub>RT</sub><sup>TM</sup> manifold according to the instructions included with your fuel rail installation kit.

**IMPORTANT: Do not reuse OEM fuel rail mounting bolts. Failure to replace these bolts may damage the LSX<sub>RT</sub><sup>TM</sup> manifold.**

- 8) Install supplied intake port seals. Failure to install these seals will cause massive vacuum leaks, causing a rough idle and possibly a dangerously lean condition.
- 9) Install throttle cable bracket if applicable using supplied self-tapping screws and washers. You must also use the supplied M6 x 16.5mm O.D. x 3.5mm thick flat washers.

**WARNING: Failure to use the extra supplied washer may result in breaking through the LSX<sub>RT</sub><sup>TM</sup> manifold into the plenum.**



- 10) Install supplied PCV grommet and vacuum nipple if applicable. See the PCV Modification section of the instructions for more detail.

### Throttle Body Installation Kits:

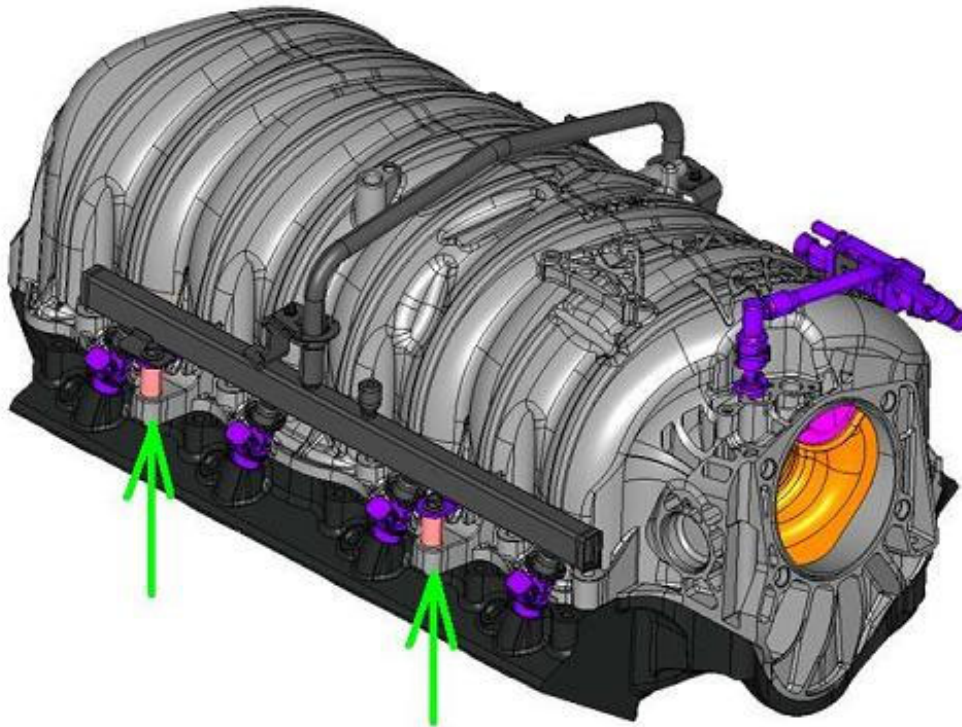
- 1) 3-bolt 75mm electronic or cable driven throttle body (1999-2007) – use Part #146029-KIT (75mm to 102mm adapter plate). A 2007+ throttle body cannot be used in place of an earlier throttle body. 2003-2004 trucks may require slight adjustments to the fan shroud for clearance when using the throttle body adapter plate.
- 2) 4-bolt 90mm electronic throttle body (2007+) – no extra parts needed.



## INSTRUCTIONS

### Fuel Rail Installation Kits:

- 1) Round plastic fuel rail (1999-2007) – use Part #146030-KIT.
- 2) Square metal fuel rail with *inboard* mounting points (2007+) – use Part #146031-KIT
- 3) Square metal fuel rail with *outboard* mounting points (2007+) – these rails will require four (4) 22mm tall cylindrical spacers to be fabricated to allow them to bolt onto the LSX<sub>RT</sub><sup>™</sup> manifold. The spacers go between the fuel rail mounting tabs and the LSX<sub>RT</sub><sup>™</sup> manifold. Longer 6mm bolts will be needed as well – approximately 40mm long. Alternately, Part #146031-KIT can be used to mount these rails. Some trimming of these fuel rails will likely to be required.





## INSTRUCTIONS

### Canister Purge Valves:

- 1) Mounted on intake manifold (1999-2007)

If your canister purge valve is mounted to your intake, use the hole on the left with the single bolt-down hole. Drill out the hole with a 15/32" drill bit and install your canister purge valve using the supplied self-tapping screw to secure it to the LSX<sub>RT</sub><sup>TM</sup> manifold.

There are two types of manifold mounted canister purge valves.



Style 1 GM#12582627



Style 2 GM#1997279



Intake Mounted Purge Valves

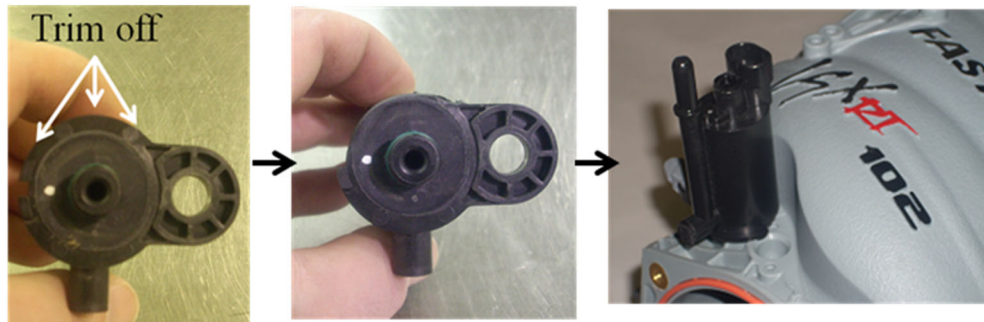
**Canister purge valve style #1, GM #12582627, will bolt on with no modifications.**





## INSTRUCTIONS

**Canister purge valve style #2**, GM #1997279, requires slight trimming of some extra material around the base of the canister purge valve as pictured before attaching it to the LSX<sub>RT</sub><sup>™</sup> manifold with the included self tapping screw.

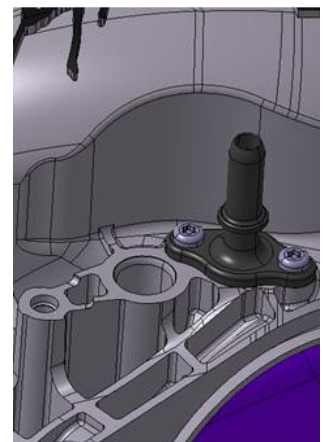
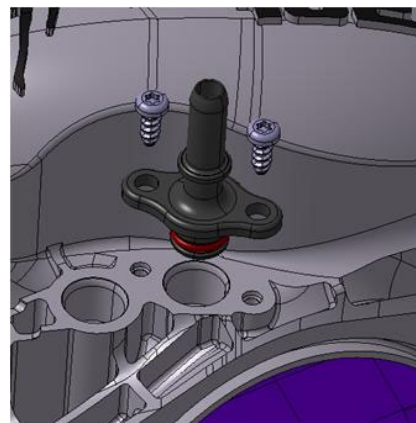


### 2) Mounted on fuel rail (2007+)

2007+ models have a square tube fuel rail with the canister purge valve mounted to it. The canister purge valve is connected via hose to the intake. If you have this style canister purge valve, use the hole with the pair of mounting screw holes around it. Drill out the hole with a 15/32" drill bit and install the nipple using the supplied self-tapping screws to secure it to the LSX<sub>RT</sub><sup>™</sup> manifold.



Fuel Rail Mounted Purge Valves







## INSTRUCTIONS

### Individual Runner Removal (Not Required):

- 1) Remove intake from engine if installed.
- 2) Remove the upper shell from intake (being sure to account for any loose hardware) to expose runners.
- 3) Using a T-20 Torx, remove the runner hold-down bolt for each individual runner.



### Individual Runner Reinstallation:

- 1) To facilitate assembly of the runner tube and to minimize potential damage to the o-ring, the customer should apply a light coating of soap-water solution to the o-rings. The soap-water solution can be made by mixing 1 tablespoon of gentle hand soap in with 1 cup of warm water.
- 2) Install the rear-most runner first and work your way to the front.
- 3) While holding the runner tube into the pocket of the lower shell of the LSX<sub>RT</sub><sup>™</sup> manifold, use light but firm force to install the runner into the pocket. Torque the M4 screws to 19 in./lbs. Tightening the screws beyond this can result in stripped fasteners or damaged inserts.
- 4) Thread-locker has been provided on the fasteners. Additional thread-locker should not be necessary, but can be reapplied if the thread-locker is removed through repeated installation/removal of the runners.
- 5) For best engine performance the runner tube o-rings should always be used. Should an o-ring require replacement, these can be ordered individually (Part #146006-1) or as a set of eight (Part #146006-8).

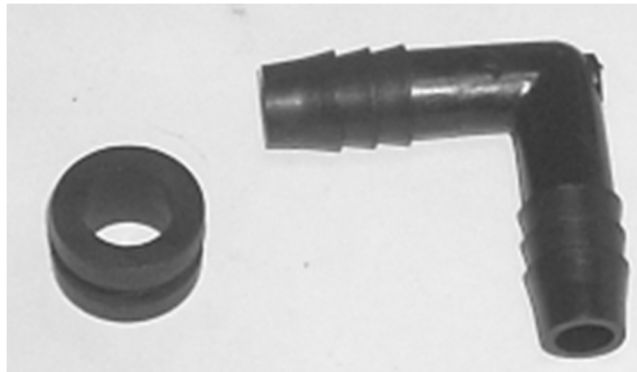
**Caution: Do not remove the upper lid to expose the individual runners while the intake is still on the engine. The nuts that were previously installed to hold the upper and lower together may fall into your engine and cause catastrophic engine failure.**



## INSTRUCTIONS

### PCV Modification:

The stock manifold on a 2002-2007 GM truck/SUV with electronic throttle body has a “Fresh/Makeup” air port on the passenger side-front of the intake manifold, just behind the throttle body. If you have this you must install the supplied rubber grommet and 90-degree barbed hose fitting in your intake system between your MAF sensor and your throttle body.



To install, select a spot between your MAF and throttle body that your factory PCV hose will reach and that you can reach with your hand from within the intake system.

- 1) Use a ½" drill bit to drill out a place to install the supplied grommet.
- 2) Install the grommet.
- 3) Reach inside the intake assembly and push the 3/8" hose barb through the grommet. Face the inside barb towards the MAF.
- 4) Reconnect the factory hose using the supplied hose clamp.



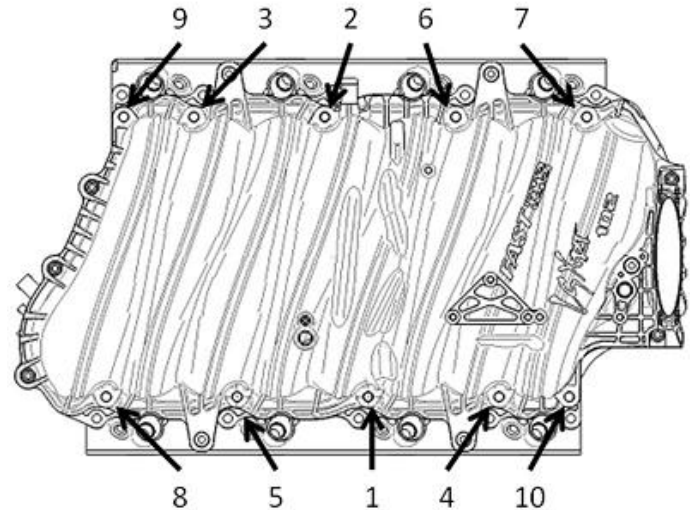


## INSTRUCTIONS

### Manifold to Engine Assembly:

- 1) Reconnect coolant crossover line hose. Torque crossover pipe bolts to 70-89 in./lbs.
- 2) Place LSX<sub>RT</sub><sup>TM</sup> manifold in valley but do not place it all the way rearward. Attach brake booster hose. Push in MAP sensor by sliding in small vacuum nipple and secure it using the supplied hold down bolt. Do not tighten past 19 in./lbs. Reconnect harness to MAP sensor.
- 3) Move LSX<sub>RT</sub><sup>TM</sup> manifold into position. **DO NOT SLIDE MANIFOLD ON CYLINDER HEAD** because seals could be damaged or become dislodged. Once in correct position, the bolt bosses will find counter bores in cylinder heads.
- 4) Add medium-strength thread-lock to all ten (10) intake bolt threads and hand start all ten (10) fasteners. Don't forget the fuel rail stop bracket(s), if required.

- 5) Tighten the bolts using two passes in the sequence shown. First pass (45 in./lbs), final pass (89 in./lbs). **Caution: over-tightening will damage the LSX<sub>RT</sub><sup>TM</sup> manifold and cause improper sealing.**



- 6) Ensure throttle body seal is installed. For 4-bolt throttle bodies, install throttle body using four (4) supplied M6 x 40mm bolts. For 3-bolt throttle bodies, use the hardware supplied in Part #146029-KIT. Torque to 70-89 in./lbs.

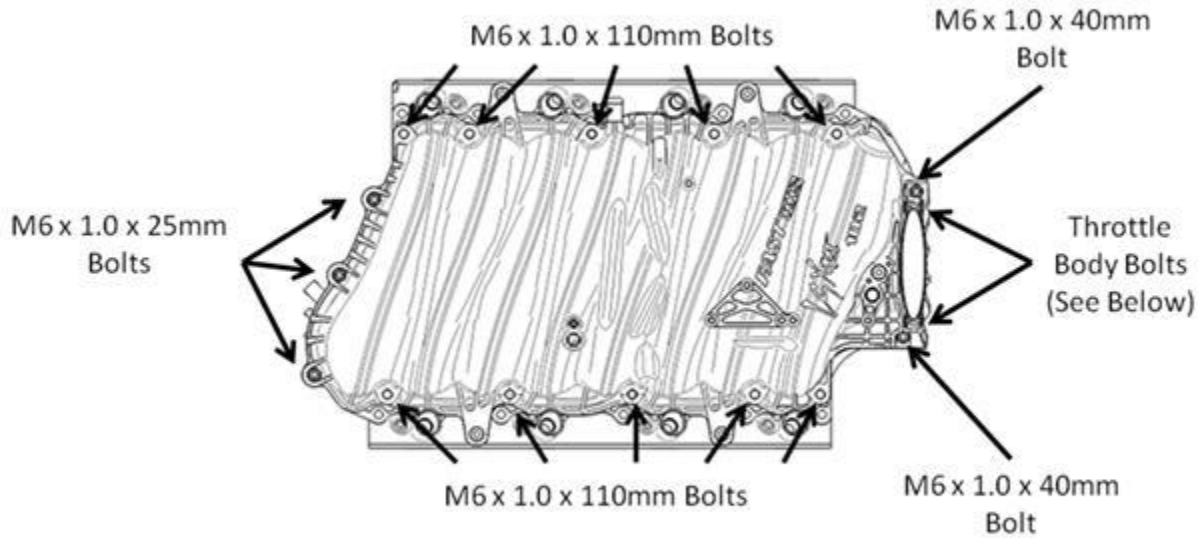
**IMPORTANT: Do not reuse your OEM throttle body bolts. Failure to replace these bolts could damage the LSX<sub>RT</sub><sup>TM</sup> manifold.**

- 7) Reconnect any hoses previously removed from manifold – PCV, canister purge valve, EGR, etc. Reconnect all wire connectors – fuel injectors, MAF, TPS, IAC, IAT, throttle body, canister purge valve, etc. Reconnect air induction system.
- 8) Add a few drops of clean engine oil to the male end of the fuel rail fitting and securely reconnect fuel line(s) to rail.
- 9) Reconnect the battery. Check for fuel leaks before starting the engine by cycling the key a few times to build pressure in the fuel system.
- 10) After the engine has started, recheck for any fuel leaks.



## INSTRUCTIONS

### FAST 102mm LSXRT Intake Manifold Bolt Placement For #146602 4.8L/5.3L/6.0L Cathedral Port



#### Throttle Body Bolts

OEM Drive By Wire 90mm Throttle Body use M6 x 1.0 x 40mm





## INSTRUCTIONS

### Replacement Parts:

The FAST<sup>®</sup> LSX<sub>RT</sub><sup>™</sup> Manifold can be purchased in individual components:

FAST <sup>™</sup> (Part #)	Description	QTY
146201	Lower Shell (Cathedral Port) for 146602B	1
146001	Lower Shell (Rectangle Port) for 146105B	1
146650	LSX <sub>RT</sub> <sup>™</sup> Cathedral Port Runner Set for 146602B	8
146070-8	LSX <sub>R</sub> <sup>™</sup> High-HP Runner Set for 146105B	8
146100	LSX <sub>RT</sub> <sup>™</sup> Upper Shell – 102mm	1
146004	Throttle Body Seal – 102mm	1
146203-1	Cylinder Head Port Seal (Cathedral Port)	1
146203-8	Cylinder Head Port Seals (Cathedral Port)	8
146003-1	Cylinder Head Port Seal (Rectangle Port)	1
146003-8	Cylinder Head Port Seal (Rectangle Port)	8
146006-1	Runner Seal	1
146006-8	Runner Seals	8

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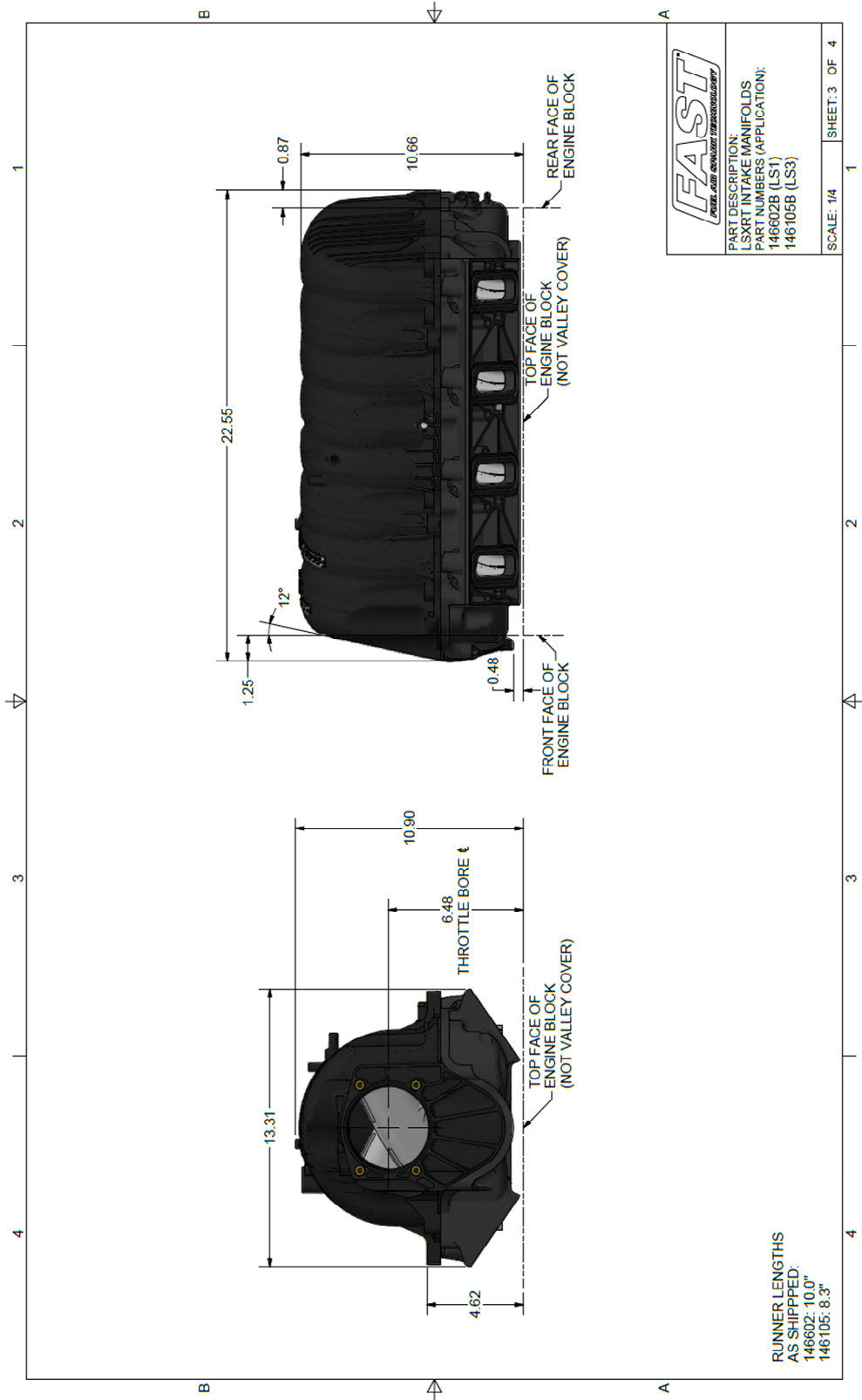


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## FAST™ LIMITED LIFETIME WARRANTY AND LIMITED WARRANTY

FAST® warrants that its EZ-EFI™ products are free from defects in material and workmanship for the lifetime of the product. This **Limited Lifetime Warranty** shall cover **only** the original purchaser. All other FAST™ products are covered by a **Limited Warranty** which covers defects in material and workmanship for a period of **one year** from the date of purchase.

**FAST's obligation under this warranty is limited to the repair or replacement of its product.** To make a warranty claim, the part must be returned directly to FAST® at the address listed below with a valid Return Merchant Authorization Number (RMA), freight prepaid. Items covered under warranty will be returned to you freight collect. To obtain an RMA, call 877-334-8355 to report the issue you are experiencing. At that time, FAST® will attempt to trouble shoot your issue.

**It is the responsibility of the installer to ensure that all of the components are correct before installation. We assume no liability for any errors made in tolerances, component selection or installation.**

**There is absolutely no warranty on the following:**

- A. Any parts used in racing applications or subject to excessive wear;**
- B. Any product used in marine applications, unless that product is listed by FAST® as a specific marine product;**
- C. Any product that has been physically altered improperly installed or maintained;**
- D. Any product used in improper applications, abused, or not used in conjunction with the proper parts.**

**There are no implied warranties of merchantability or fitness for a particular purpose.** There are no warranties which extend beyond the description of the face hereof. **FAST® will not be responsible for incidental and consequential damages, property damage or personal injury damages.** Where required by law, implied warranties or merchantability and fitness are limited to terms outline above.

This warranty gives you specific legal rights and you may also have other legal rights which vary from state to state.



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