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Inside Sealing
GM 3.1L/3.4L Engines

Who: For shop owners and technicians

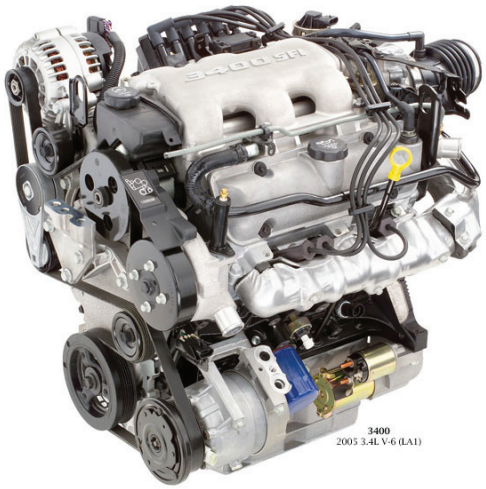
What: Tips for engine sealing repairs

Where: Visit www.felpro-only.com for more information

Why: Leverage the expertise of the Fel-Pro engineering team to grow your engine sealing business

Highlights:

- Intake manifold gasket selection and fit
- Facts about engine hardware
- Push rod length considerations
- Correctly installing PTFE rear main seals
- Other sealing repair opportunities



GM 3.1L, 3.4L

Application	Engines in Service
1993-1999 VIN "M" 3.1LV6	4,401,054
1999-2005 VIN "J" 3.1L V6	1,316,031
1999-2004 VIN "E" 3.4L V6	3,997,966

A Closer Look at a GM Workhorse

One of the most common engines on the road today, the General Motors 3.1L/3.4L V6 represents a large service and repair opportunity for engine professionals. This platform was established in the 1980s as a 2.8L engine. In the early 1990s, GM engineers increased the displacement and applied the two larger engine models to an extensive range of applications, from the Chevrolet Citation and Camaro to the Oldsmobile Silhouette and Pontiac Transport minivans and Pontiac Aztec SUV.

The technical recommendations and products featured in this bulletin are based on extensive customer input to Federal-Mogul's engine sealing team. In addition, Fel-Pro product engineers in Skokie, Ill., work closely with engine specialists within the company's global network of technical research facilities to develop innovative solutions to the latest sealing challenges encountered in the repair environment.

Common Leaks

Among the most commonly reported GM 3.1L/3.4L sealing issues are (1) premature failure of nylon-type intake manifold gaskets, (2) head gasket failure, (3) rear main seal leakage, and (4) oil pump drive O-ring failure.

Fel-Pro Solutions

1.) PermaDryPlus® intake manifold gaskets

2.) PermaTorque® & PermaTorqueSD® head gaskets

3.) PTFE rear main seal

4.) Distributor mounting O-ring

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Intake Manifold Gasket Repairs

Check for Pitting of Gasket Mating Surfaces

Technicians and rebuilders have reported that many 3.1L/3.4L cylinder heads exhibit moderate to severe pitting around the coolant ports. While new Fel-Pro PermaDryPlus intake manifold gaskets are capable of sealing a wide range of surface imperfections, in cases of extreme pitting the casting should be repaired or replaced before continuing.

Getting it Tight: Facts About Intake Manifold Bolts

When performing an intake manifold sealing repair on a GM 3.1L or 3.4L engine, it is a good idea to replace the intake manifold bolts. Any loss of torque could lead to a repeat sealing issue and potentially severe engine damage, according to Fel-Pro Senior Engineer Jerry Rosenquist.

Fel-Pro offers a complete line of replacement intake manifold bolts when required for the repair. The Fel-Pro bolts for GM 3.1L/3.4L engines are ideally suited for use with PermaDryPlus intake manifold gaskets as well as the standard gasket set offering for these engines. (See parts listing below.)

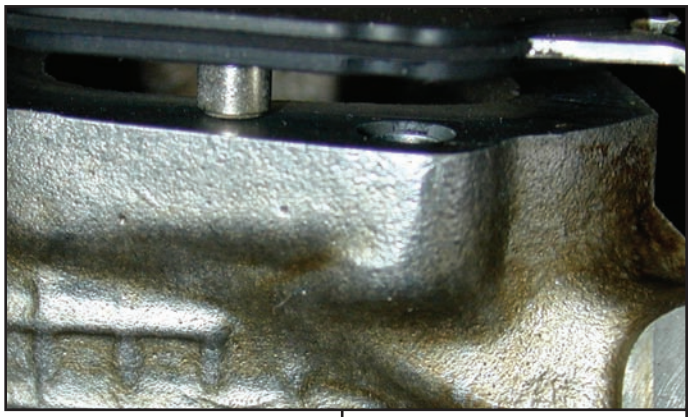
Always follow the manufacturer's latest torque specifications. Fel-Pro includes torque specifications on the "I-Form" installation instructions packaged with gasket sets and with the bolts themselves.

Fel-Pro Intake Manifold Bolt Sets

	YEARS	PART #	DESCRIPTION
GM V6, 189 (3.1L) 1999-2005 (VIN Codes "J" & "M")	05-01	ES 72225	VIN Code "J"
	00	ES 72225	VIN Code "J"; Exc. "Malibu" model
	00	ES 72226	VIN Code "J"; "Malibu" model
	99	ES 72225	VIN Code "J"
	99-93	ES 72225	VIN Code "M"

	YEARS	PART #	DESCRIPTION
GM V6, 207 (3.4L) 1996-2005 (VIN Codes "E"; Car & Truck)	05-01	ES 72226	VIN Code "E"; Car and Truck
	00	ES 72226	VIN Code "E"; "Alero" & "Grand Am" models
	00	ES 72225	VIN Code "E"; "Impala" & "Monte Carlo" models
	00-96	ES 72225	VIN Code "E"; Truck
	99	ES 72225	VIN Code "E"; Car

Beware of Swapped Heads

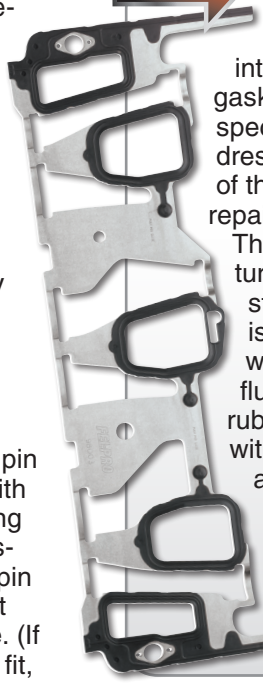


If your gasket pin doesn't align with the location hole, as above, chances are you're working on a non-original head that's been swapped between a 3.1L and 3.4L engine during an earlier repair.

It is not unusual to encounter an engine with a non-original head that has been swapped between a 3.1L and 3.4L engine during an earlier repair. In other words, never assume you have the right cylinder head when beginning the repair – doing so might cause you to install the incorrect replacement gasket.

Do not rely on the casting number to identify the cylinder head on a 1993-2005 GM 3.1L or 3.4L engine. The only way to verify head design on these applications is to match the intake port dimensions and pin location holes with the corresponding replacement gasket. The gasket pin must precisely fit the location hole. (If the pin does not fit, check the other head; you might have inadvertently swapped gaskets.)

NOTE



The Fel-Pro PermaDryPlus intake manifold gasket is designed specifically to address the challenges of the aftermarket repair environment. The gasket features an aluminized steel carrier that is encapsulated with a proprietary fluoroelastomer rubber compatible with all types of oil and coolant. Three separate beads around the coolant ports ensure a permanent seal.

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Intake Manifold Gasket Repairs

Double-Check Pushrod Lengths And Guides Before Assembly

When ordering replacement pushrods for a GM 3.1L engine, double-check intake and exhaust pushrod lengths. Intake push rods for these engines should be 5.676" in length, and exhaust pushrods 6.004" in length. Installing the wrong pushrods will lead to engine damage.

Pushrod guides are another important consideration. In some 1993-95 engines, the pushrod guides are intregal to the intake manifold gasket, while in others they are part of the cylinder head itself. The best solution is to rely on the Fel-Pro PermaDryPlus series of gaskets that accommodate both designs.

Premium Leak-Sealing Technologies

PermaDryPlus®	Problem-solving gaskets featuring advanced technologies designed specifically for the aftermarket repair environment
PermaDry®	Premium molded-rubber gaskets for applications originally equipped with molded-rubber technology

Doing the Complete Job

Preferred sealing repair process for GM 3.1L/3.4L engines

By John Gurnig
Field Test Technician

John Gurnig

Replacing intake manifold gaskets on GM 3.IL/3.4L engines is a little more complex than other common sealing repairs. We've done quite a few of them in the Fel-Pro test lab, and have used this experience, combined with our materials expertise, to develop the best replacement gasket technologies.

As with any important repair, make sure you have the right parts before beginning the job, and always follow the preferred repair sequence to ensure a perfect seal. The parts you'll need are: new intake manifold bolts (with threadlocker applied); push rods (verified to the correct lengths); rocker arms; Fel-Pro PermaDryPlus replacement intake manifold gasket(s); and RTV sealant.

As you may know, the Fel-Pro PermaDry and PermaDryPlus names mean "install this gasket dry." The use of RTV in this job is not associated in any way with the Fel-Pro gasket, so do not apply RTV to the gasket or its mating surface. The RTV is to be used only in forming the end seals on the block.

Once you've got all of the right parts, apply the RTV beads for the end seals and then install the intake manifold gasket, being careful to align the pin location holes with the pins.

Next, install the push rods and rocker arms and snug them down, then install and torque the intake manifold to specifications. The next step is to torque the rocker arms to spec. and, finally, reinstall the valve cover with a new gasket.

NOTE

You can add value to this important repair by replacing the thermostat and flushing the cooling system. It's extremely difficult to access the thermostat on these engines unless the intake manifold is removed; chances are the customer will need a new "stat" before needing another sealing repair, so do the complete job now for enhanced customer convenience and satisfaction.

Why flush the cooling system? The introduction of air to the engine's long-life coolant will degrade the coolant chemistry. This is a common problem on older engines, where loose hose clamps and low coolant levels can cause air to be sucked into the cooling system.

John Gurnig runs the Fel-Pro Field Test Garage in Skokie, Ill. He usually can be found under a hood, out on a road test or back in the Fel-Pro dyno lab.

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Other Repairs

Oil Pump Drive O-Ring Issues; Rear Main Seal Solution

NOTE **GM 3.1L and 3.4L** engines feature an oil pump drive at the original location of the distributor in the old 2.8L. The original equipment O-ring, which seals high-pressure oil, is highly susceptible to hardening and contamination and should be replaced as part of any other sealing repair.

Fel-Pro has developed an exclusive FKM O-ring material that stands up to the high temperatures encountered in this location. The Fel-Pro O-ring is included in all PermaDryPlus MS98000T series intake manifold repair sets.

NOTE **Fel-Pro engineers** have developed an exclusive PTFE rear main seal that provides a longer lasting, reduced-drag, highly temperature resistant solution for GM 3.1L and 3.4L engines. These aftermarket-engineered seals are ideally suited to the repair environment and help provide an extra margin of protection against a comeback.

It is crucial to note that PTFE seals should only be installed dry. This enables a portion of the PTFE material to be transferred to the shaft, which ensures proper sealing performance. Also be certain that the seal is installed straight within the bore.

3.1L/3.4L Parts Check

100 PERCENT VEHICLE SEALING

Only Fel-Pro offers 100% application-specific sealing solution components for GM 3.1L and 3.4L engines. And each Fel-Pro gasket and seal for these applications features the best material and design for the aftermarket repair environment.

Repair Type	
Cooling System	Thermostat Gaskets
	Water Tube O-rings
	Thermostat Bypass Seal Gaskets
	Water Pump Gaskets
Engine Repair	Valve Stem Seals
	◆ Head Gaskets
	T-T-Y Head Bolts
Exhaust System Repair	Exhaust Manifold Gasket
	Exhaust Pipe Packing
Fuel System	Throttle Body Mounting Gasket
	Fuel Injector O-rings
	Fuel Rail O-rings
	Idle Air Control Seals
	Upper Plenum Chamber Gaskets
	EGR Gaskets

Repair Type	
Leak Repair	Valve Cover Gaskets
	Valve Cover Grommets
	◆ Intake Manifold Gaskets
	Intake Manifold Bolts
	Distributor Mounting O-rings
	Oil Pan Gaskets
	Oil Pan Drain Plugs
	Oil Cooler O-rings
	◆ Timing Cover Gaskets & Seals
	Rear Main Bearing Seals
	Oil Filter Adapter Gaskets
Drivetrain	Transmission Pan Gaskets
	Differential Cover Gaskets

◆ Premium Materials Upgrade Available
- PermaDryPlus Intake Manifold Gaskets
- SD Severe Duty Head Gaskets
- PTFE Rear Main Seals