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3.3L/3.8L  
ENGINE**

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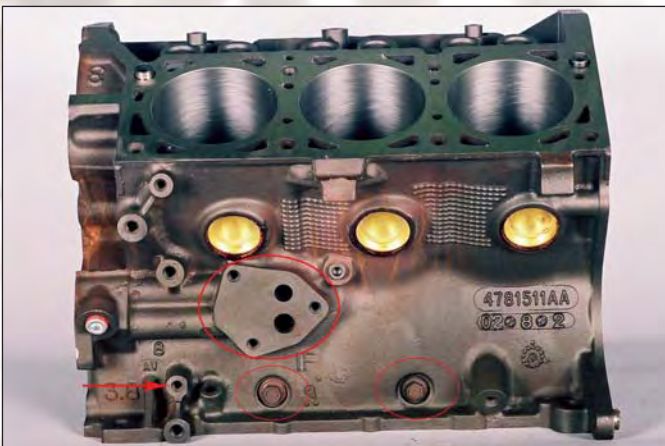
Rebuilding the:

# CHRYSLER 3.3L/3.8L ENGINE

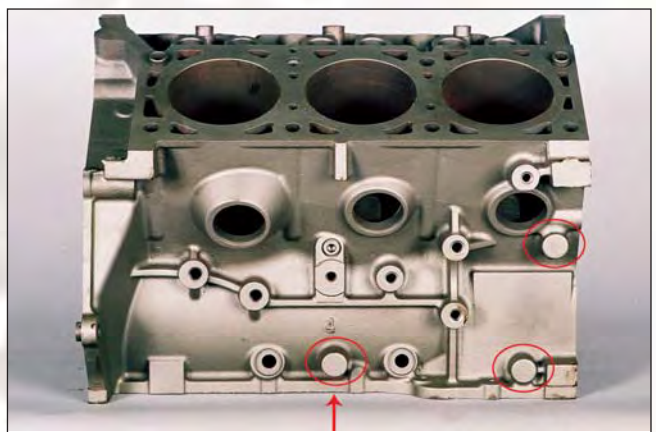
BY DOUG ANDERSON, CONTRIBUTING EDITOR | [danderson@enginebuildermag.com](mailto:danderson@enginebuildermag.com)

Chrysler introduced its new family of 60 degree V6 engines back in 1990, and we covered them through 2000 back in '03, but Chrysler has made a number of changes since then, so it's time to update them through '09. Before we do that, though, here's a quick overview of the 3.3L and 3.8L engines:

- They're conventional 60 degree V6 motors with iron blocks and aluminum heads, including some castings that are shared by both engines and some that aren't.
- The differences between the 3.3L and 3.8L engines are all internal with different cranks, rods, pistons and cams.
- Both engines were used exclusively for FWD applications



The 4781511AA block had a flat pad for the oil filter adapter and crossbolted mains. It also had one more bolt hole than the 4781511AB (see arrow).



The 4666031AA block had three more bolt bosses on the passenger side, but they weren't drilled. The boss between the crossbolts (see arrow) must be machined down flush with the block if the engine is used for an AWD minivan.



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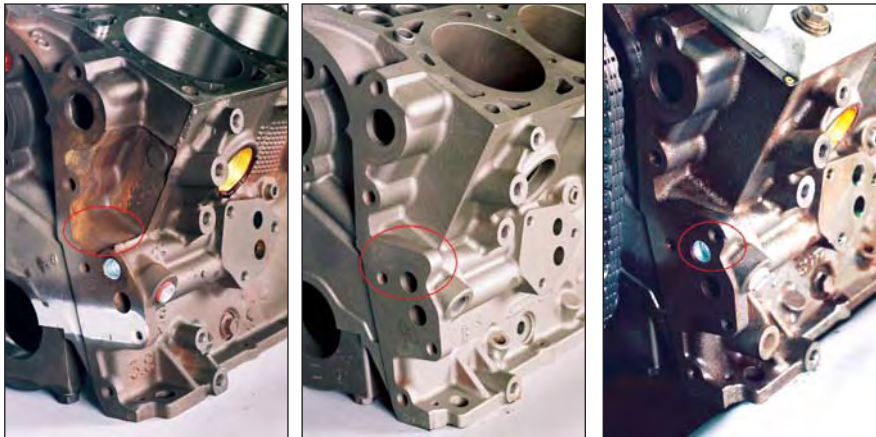


# CHRYSLER 3.3L/3.8L ENGINE

until '07 when the 3.8L became the optional engine for the RWD Jeep Wrangler.

- They were designed to provide good torque over a broad range, reasonable fuel economy and long life. They have developed a good reputation over the years because they have performed well in a variety of applications.

- And, Chrysler has continued to update them on a regular basis so they're still doing a good job nearly 20 years later. With that in mind, let's see what's changed since model year 2000, starting with the blocks.



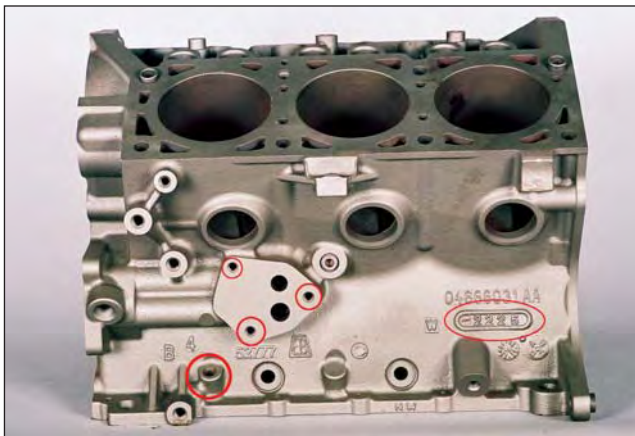
Chrysler added another ear to the front of the 4666031AA block (center), but the extra hole for the front cover wasn't drilled until the 4666031AB block (right) arrived in '07. The 4781511AB (left) didn't have the ear.

## BLOCKS

Prior to 2001, Chrysler used the same block castings for both the 3.3L and 3.8L engines by simply changing the bore and stroke, so cataloging them was easy. That all changed in '01 and it got real confusing through '07, because there were several different blocks and there's no information available on the specific applications for any of them. So, this chronology is based on the cores we've seen and the research we've done on related components, such as gaskets and knock sensors, that have helped us to see when and why the blocks were changed.

### 3.3L

The 4621944 casting was replaced by the 4621944AB in '01. The



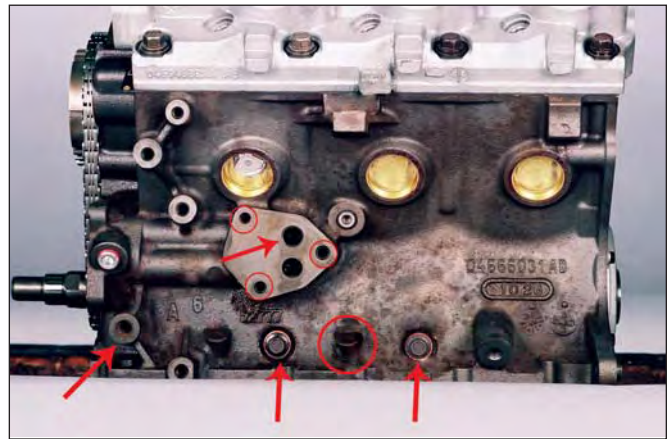
This is a 4666031AA block for a 3.3L that's date coded '05. It has three 8.0mm holes for the oil filter adapter, an 8mm hole for the knock sensor and a front dipstick.

most noticeable difference was the addition of a flat pad for the bolt-on oil filter adapter instead of the cast boss for the spin-on filter that was used on the earlier blocks.

Sometime in early '03, Chrysler dropped the 4621944AB casting and started using the same 4781511AA block that had been used for the 3.8L since '01, but with one major difference; the bosses for the crossbolted mains were still there, but they weren't drilled when the block was used for the 3.3L. These blocks all had a 10mm hole for the knock sensor

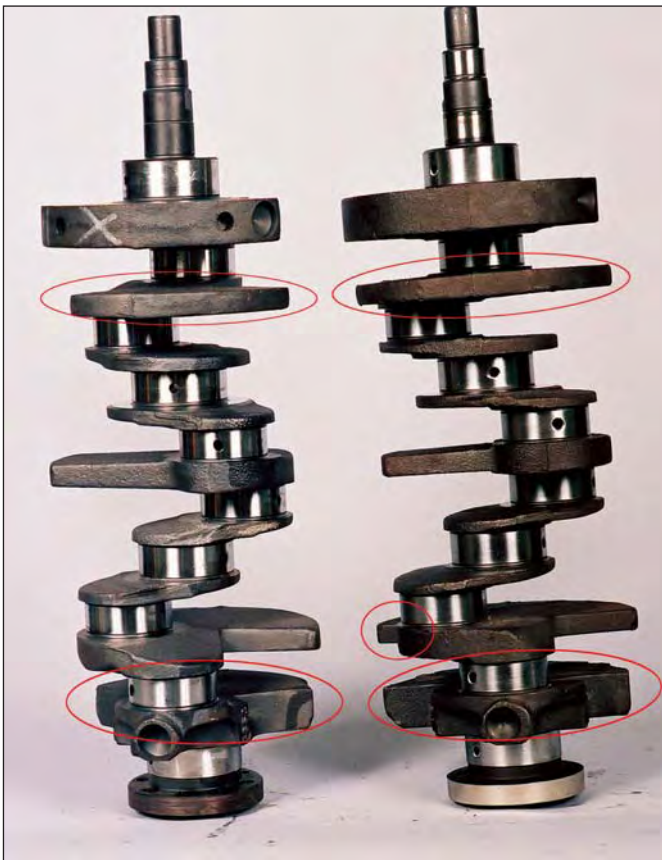
The 4781511AB block replaced the 4781511AA in '04. The only differences were the 8.0mm hole for the knock sensor, instead of the 10mm hole that was found on the 4781511AA block, and the absence of one bolt hole on the driver's side that was close to the front and just above the pan rail on the 4781511AA casting.

The 4781511AB and the 4666031AA were both used in '05. We've seen a 4781511AB with an 11/29/05 casting date on it and a 4666031AA with an August '05 Julian date on it, so we know they were both used during '05. The 4666031AA was noticeably different than the earlier 4781511AB block, but it still wasn't the same as the 4666031AB block that was used in '07. Here's what you can expect to see:



The 4666031AB block has crossbolted mains, two 8.0mm holes and one 10mm hole for the oil filter adapter, a center dipstick and one more bolt hole for the RWD motor mount (see arrow in front). The upper hole for the oil filter is tapped so it can be plugged for the Wrangler.



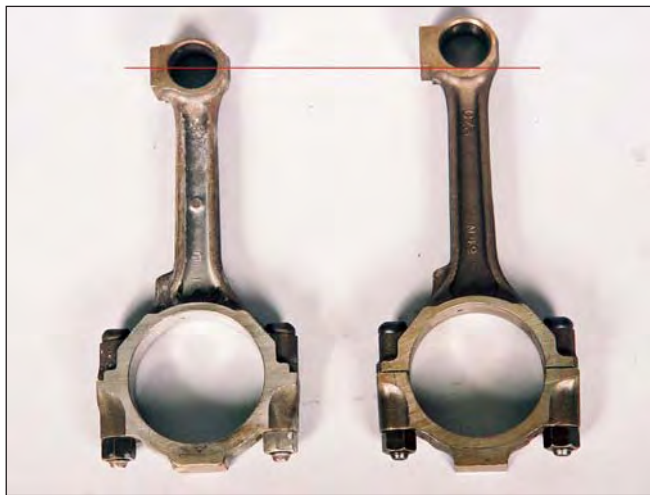


Some of the counterweights on the 3.8L crank (right) are noticeably larger than the ones on the 3.3L cranks (left).

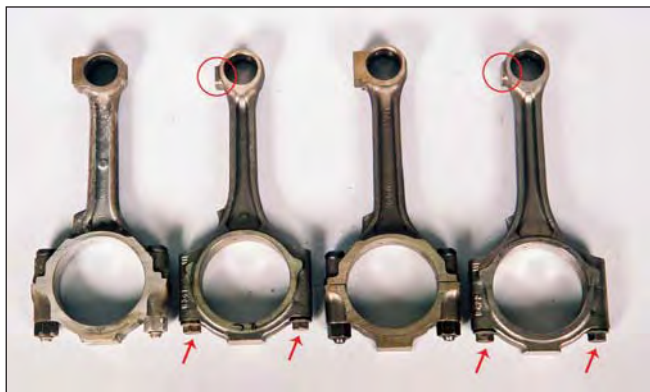
- 1) The 4666031AA block had three additional bolt bosses on the passenger side, but they weren't drilled.
- 2) It has two bosses for the dipstick, instead of one, but the front one was always drilled.
- 3) There was an additional ear on the front of the block (see pictures on page 34 and 36), but the extra bolt hole (#13) wasn't drilled.
- 4) There were three 8.0mm bolt holes in the flat pad for the oil filter adapter.



The piston for the 3.8L (left) is smaller in diameter and has a lower compression height than the one for the 3.3L (right).



The rods for the 3.8L (left) are shorter than the ones for the 3.3L (right) because of the longer stroke.



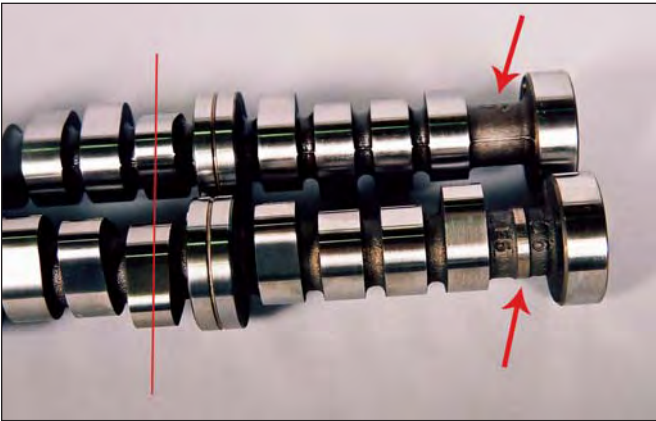
The early forged steel rods were replaced by the powdered metal forgings with cracked caps in '07. Note the capscrews and the small balance pads on the pin ends of the powdered metal rods.

This same basic block was used from '07 through '09 and probably in '10, but it was identified as a 4666031AB casting because there were several important differences:

- 1) The three bolt bosses on the passenger side were always drilled although they're only used for the 3.8L in the RWD Wrangler.
- 2) The center dipstick was drilled instead of the one in the front. (Note: we have seen one of these 4666031AB blocks that had a front dipstick...)
- 3) There's one more bolt hole for the front cover in the ear that was originally added to the 4666031AA block. That makes a total of 13 bolt holes for the front cover instead of the 12 that were found on all the previous blocks.
- 4) There's one more bolt boss near the front of the block just above the pan rail on the driver's side that's used for the motor mount for the 3.8L Wrangler, too.
- 5) There was one more change, too; the lifters were downsized from 0.900" O.D. to 0.840" O.D. in the middle of '07.



# CHRYSLER 3.3L/3.8L ENGINE



Both of the late model cams are 063 castings with the machined ring (bottom) instead of the earlier 645 casting (top), but the lift at the lobes is 0.030" to 0.035" higher on the ones for the 3.8L.

## 3.8L

The 3.8L blocks are not as complicated as the 3.3L, but they have the share of differences, too.

The 4781511AA block that was introduced for the 3.8L in '01 had the flat pad for the bolt-on oil filter adapter and a 10mm hole for the knock sensor.

In '04, it was replaced by the 4781511AB casting that had an 8.0mm hole for the knock sensor and one less bolt boss on the driver's side, just like the 3.3L.

The 4781511AB and the 4666031AA were both used in '05. We call the 4666031AA the "fits-all" block because it was used for both the 3.3L and 3.8L engines and for the RWD Jeeps (beginning in '07) along with all the FWD applications. It was the same casting that was used for the 3.3L engines, so it had two bosses for the dipstick and three bosses for the RWD motor mounts on the passenger side. The bolt hole in the ear for the front cover wasn't drilled and it had three 8.0mm holes for the oil filter adapter.

Then, beginning in model year '07, the 4666031AB casting became THE block for all 3.8L applications and continued through '09 or '10. There were several differences between the 4666031AA and 4666031AB blocks:

1) The rear bolt hole for the oil filter adapter was enlarged to 10mm because it was used for



Chrysler changed to the smaller lifter on the left (0.840" vs 0.900") in mid-'07 so the openings in the "dogbones" are smaller, too.

the motor mount on the Wrangler.

2) The upper hole for the oil galley for the oil filter adapter was tapped and plugged because the oil filter was moved to the front cover on the Wranglers.

3) The center dipstick was used for all applications.

4) There was one more bolt hole for the front cover drilled in the ear on the front of the block.

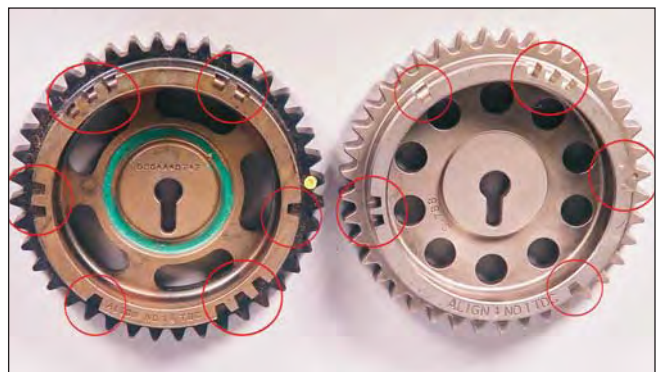
5) There was one more bolt hole toward the front of the block on the driver's side, just above the pan rail.

6) The three bolt bosses on the passenger side were drilled. We have seen one of these blocks with the center dipstick that didn't have the three holes drilled; it would fit an '07 minivan in that configuration so there may be a few more like that out there, too.

7) And, just for the fun of it, they switched to the small diameter (0.840") lifters in mid-year '07, just like they did on the 3.3L.



The cam gear and chain were reduced in width after 1/1/05. There's about 0.125" difference between the wide gear (0.540") (left) and the narrow one (0.415") (right).



The '04 cam gear (left) came with NGC, so it had 12 notches instead of the nine found on the earlier engines.



The timing gears, from left to right, are wide w/o NGC, wide with NGC and narrow with NGC.





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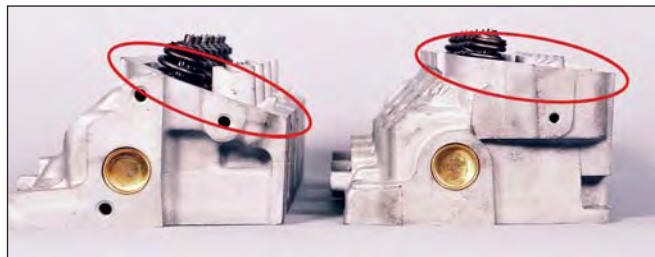
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# CHRYSLER 3.3L/3.8L ENGINE



Chrysler modified the chambers and relocated the spark plugs for the '01 heads (right).



The rocker rail was raised on the '01 heads to help prevent oil leaks.

## CRANKS

There have been two cast iron cranks used for these engines, one for the 3.3L and another for the 3.8L.

**3.3L:** The 3654 casting with a 3.19" stroke fits all the 3.3L engines.

**3.8L:** The 3.8L uses a 6433 casting with a 3.42" stroke. It's easy to tell them apart because the second counterweight on the 3.8L is noticeably larger along with some of the others.

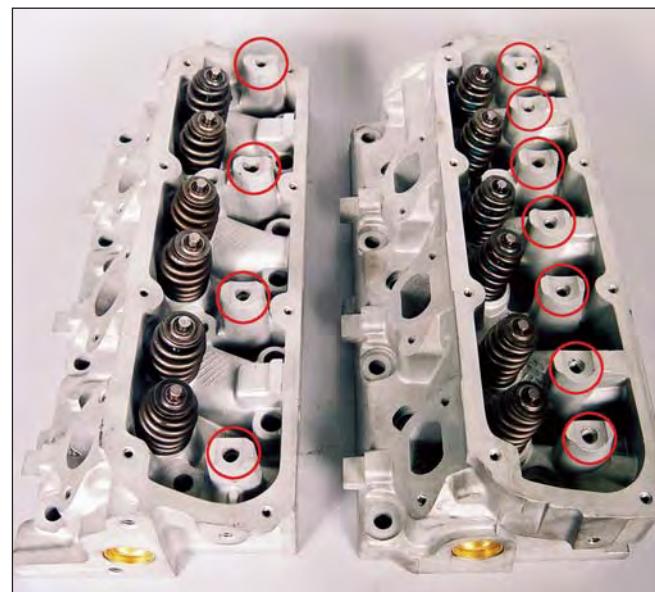
## RODS

There are two different rods for these engines, a long one for the 3.3L and a short one for the 3.8L, but there are several different castings along with two powdered metal rods that have been used over the years.

**3.3L:** There have been several rod castings used for the 3.3L, but the only noticeable difference between them is the size of the balance pads, so they're all interchangeable in sets. The early 4621694 rods were replaced by the 4448903 rods that were replaced by the 4654355 castings around '01. The 014AA powdered metal rod with the cracked cap showed up in '07.

**3.8L:** Chrysler used two cast rods, a 4448904 in the earlier engines and 4654356 from '01 through '06. The 0015 powdered metal rod with the cracked cap was used from '07 through '09.

The rod bolts for the cast rods are a torque-to-yield design that are supposed to be replaced after being torqued three times, so



The '01 heads (right) had seven rocker stands instead of the four found on the earlier heads (left).

some rebuilders reuse them and others replace them; it's your choice. The powdered metal rods use capscrews that require a torque-turn procedure, so be sure to follow the right specifications for each version.

## PISTONS

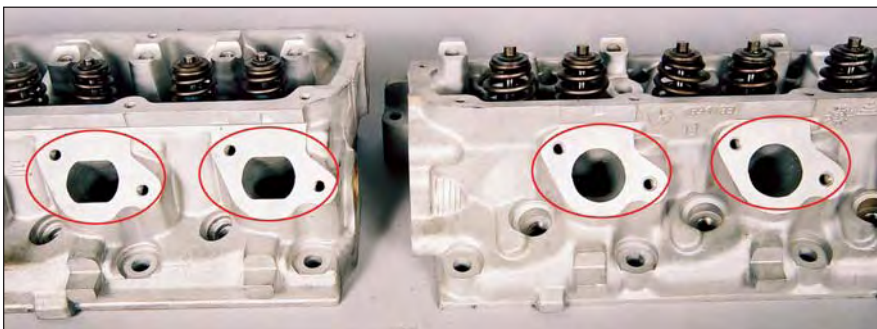
There have been two pistons used for the late model engines, one for the 3.3L and one for the 3.8L.

**3.3L:** The original dished piston was replaced in '98 by a flat top that was used with minor changes up through '09.

**3.8L:** The early 3.8L piston had a deep, oblong dish, but it was replaced by a flat top that had a lower compression height in '98, too. The 3.8L continued to use this version up through '09.

## CAMS

The late model roller cams for the '01 and later engines can cause some problems because there are two different profiles, one



The exhaust ports on the '01 heads (left) were revised, too.



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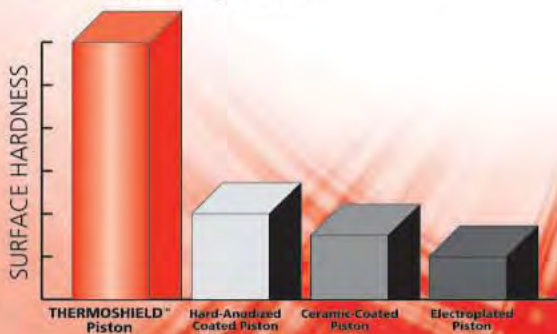


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# CHRYSLER 3.3L/3.8L ENGINE

## VIN CODES

	3.3L Minivan	Minivan	3.8L Pacifica	Wrangler
2001	R/3/G	L		
2002	R/3	L		
2003	R/3	L		
2004	R	L		
2005	R	L	L	
2006	R	L	L	
2007	R	L	L	1
2008	H	L	L	1
2009	H	L	L	1

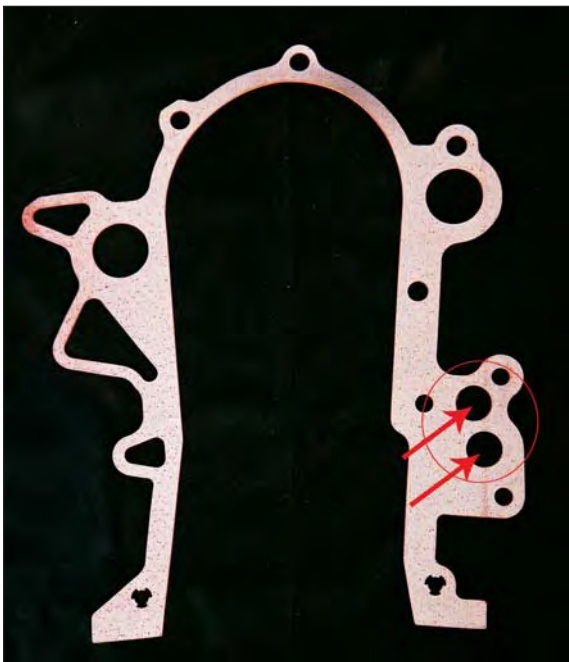
NOTE: VIN 3 is flex fuel.

for the 3.3L and one for the 3.8L, and they both use the same 063 casting that has a raised, ground ring around the barrel behind the last lobe.

**3.3L:** This cam can be identified by the

063 casting number and by checking the lift; it should measure approximately 0.250" at the lobe. The OEM part number is 4781013AA.

**3.8L:** These cams have the same 063 casting on the barrel along with the raised, ground ring, but the lift measures between approximately 0.280" and 0.286" at the lobe, depending on which lobe you check. The OEM part number is 4781061AA. We wouldn't recommend interchanging these cams with the ones in the 3.3L engines because the profiles are considerably different.



The front cover gasket for the RWD engines had two holes for the oil passages instead of the single lower hole that was open for the FWD engines.

## LIFTERS

Chrysler used their standard 0.900" OD roller lifter in these engines until mid-year '07 when they changed to a new design with a smaller diameter that measured 0.840". The new lifter is a p/n 4892465AA and the matching "dogbone" is a p/n 4892450AA.

## TIMING GEARS AND CHAINS

The timing components were changed three times from '01 through '09 and they're not interchangeable, so it pays to know the difference. Here's what they did:

**2001-'03:** These engines used the same chain and gears that were used back in '94 because all the vehicles used the same "SBEC computer" which is commonly called "w/o NGC" now. The cam gear is p/n 4778707AB.

**2004-1/1/05:** Chrysler introduced the



The gasket for the oil filter adapter had two 8.0mm holes and one 10mm hole (with arrow) in '07-'10 instead of the three 8.0mm holes that were used for the '01-'06 applications.



The aluminum intakes used two of the fiber gaskets (top) instead of the individual molded ones (bottom) that were used for the plastic intakes.



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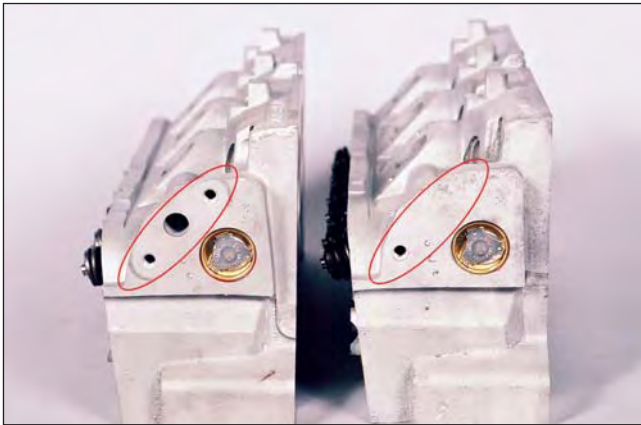
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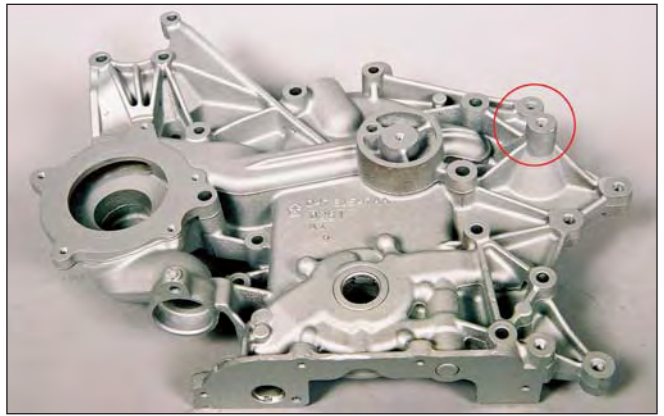
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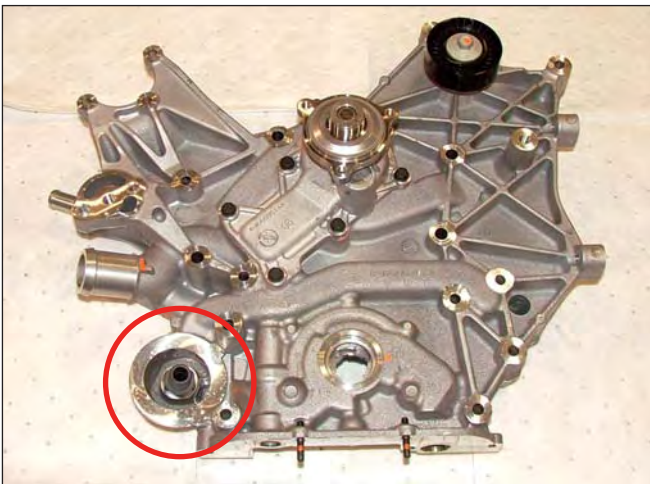
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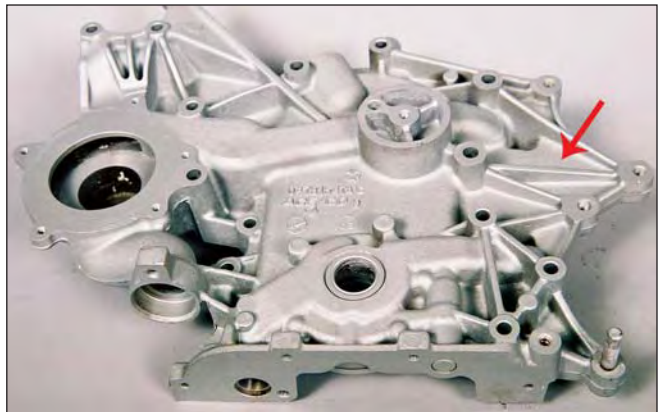
These heads came with and without EGR and it was either on the left front or right rear, so it's easy to make a mistake when building an engine.



The 4781547AA front cover with the post was used for the minivans in '01 and '02. Some of the posts were drilled and some weren't, so we suspect it wasn't used very often, especially since the replacement cover comes without it.



The front cover for the Wrangler is unique because the oil filter is on the cover instead of on the side of the block.



The 4781547AB/AC front cover without the post was used for the minivans from '03 through 1/1/05. It fits the engines with the wide chain and gears.

"next generation controller" (NGC) in '04, so there are three more notches in the cam sensor and all of the notches are in different locations; the new cam gear is part number 5127185AA. It still uses the wide gear that's about 0.540" wide along with the wide chain that measures about 0.685" across the links.

**1/1/05-'08:** Chrysler continued to use NGC setup, but they switched to a narrow gear that's approximately 0.415" wide with a chain that measures about 0.555" across the links. This gear is a p/n 5137663AA.

There are a couple of caveats regarding the timing components, too:

1) The front covers were modified to relocate the cam sensor when the cam sprocket and chain were changed, so they're not interchangeable by application unless you use the matching chain and gears.

2) Chrysler has superseded all the old front covers for the mini-

vans to the latest version that requires the use of a special narrow gear and chain setup (p/n 68001398AA) for the engines that originally came without NGC. Be sure to check all of the narrow gears that come off any cores to see if they are with or without NGC before reusing them.

## CYLINDER HEADS

There have been three different head castings used from 2000 through 2010, including some that came with EGR and some that didn't.

**2000:** The 4694183 heads with the longer valve stems were used from '98 through '00. These heads didn't have provisions for EGR.

**2001-'07:** The 4694688AA/AB castings that were introduced in '01 were considerably different. They had seven rocker stands instead of the four found on the earlier castings, the exhaust ports were flattened on the top and bottom, the chambers were revised

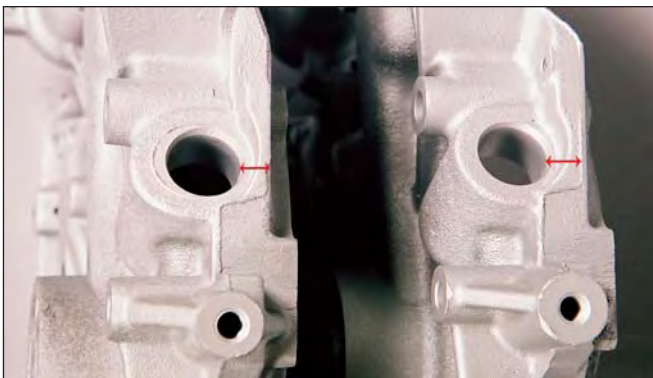


## CHRYSLER 3.3L/3.8L FRONT COVERS

Application	Casting Number or Part Number	Notes
'01-'02 Minivan	c/n 4781547AA p/n 5019333AA	With wide chain and extra boss
'03-1/1/05 Minivan	c/n 4781547AB/AC p/n 5019333AB/AC/AD	With wide chain, w/o extra boss
1/1/05-'06 Minivan	c/n 4666005AA p/n 5019333AE/AF	W/narrow chain, w/o extra bolt hole
'07-'08 Minivan	c/n 4666005AC p/n 5137544AD	W/narrow chain and 1 extra bolt hole
'01-'10 Minivan	c/n ????? p/n 5137544AE	W/narrow chain and 1 extra bolt hole Supersedes all minivan covers
'04 -'08 Pacifica	c/n 4648947AB p/n 68001673AB	With torque axis mount Requires front cover package
'07 - '08 Wrangler	c/n 4666020AA p/n 68003438AA	With oil filter on front cover Requires front cover package

and the rocker rail was raised for better sealing. It appears that the '01-'02 engines had EGR, most of the '03s didn't have it, and all the '04 through '09 engines have had EGR.

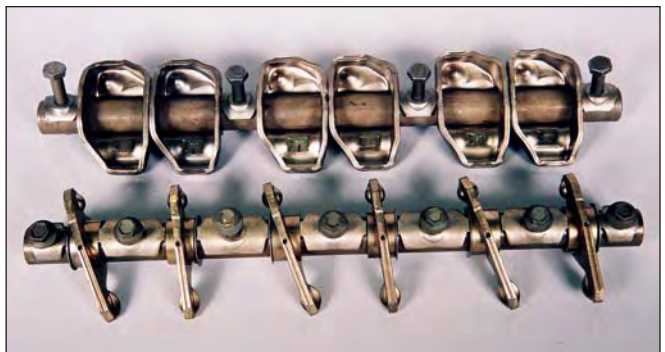
**2008-'10:** The 4666049AA casting that superseded the 4694688AA/AB castings fits all the 3.3L and 3.8L engines from '01 through '10. There are a couple of minor changes on the inner edge of the deck surface, but the head gaskets seal so everything fits and works.



The hole for the cam sensor (left) was moved back about 0.125" on engines that were built after 1/1/05 because the cam gear was about 0.125" thinner.

## ROCKERS

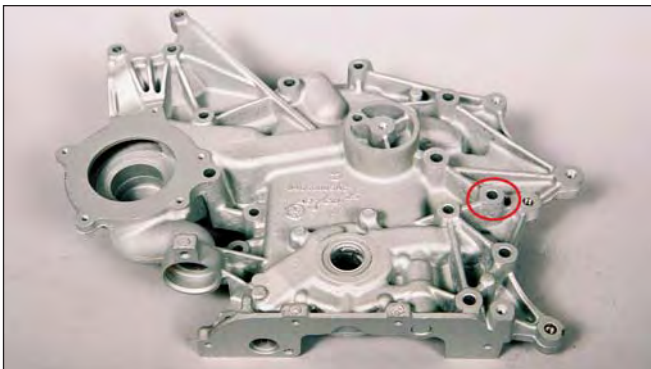
Chrysler used their typical stamped steel, shaft-mounted rockers on these engines through 2000. Then, in '01, they switched to a set of lightweight, welded rockers that looked a lot like the ones found on the old Slant Six. They were still shaft-mounted, but they used seven pedestals instead of the four that were used for the earlier rocker assemblies.



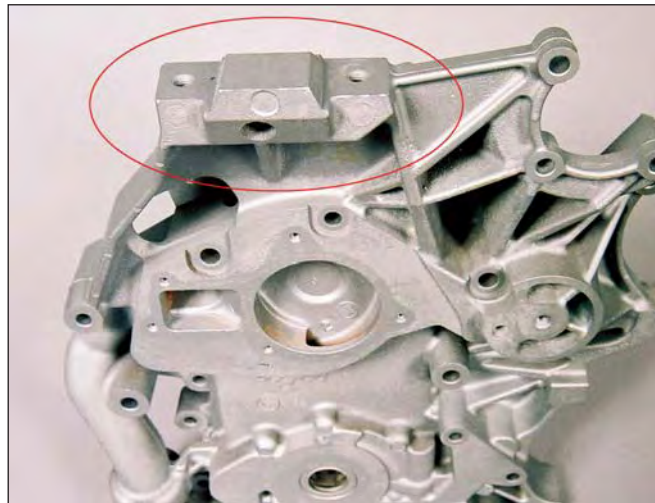
The new style welded rockers (bottom) replaced the earlier "magnum" style, stamped steel rockers (top) in '01. The assembly was held on with seven bolts instead of the four found on the earlier heads.



# CHRYSLER 3.3L/3.8L ENGINE



The 4666005AC front cover for the '07-'09 minivan is held on by one more bolt on the driver's side for a total of 13 fasteners. We believe it's the same as the current fits-all cover serviced by Chrysler.



The front cover for the Pacifica has a torque axis mount for the engine.

## GASKETS

There are several gasket sets listed for the late model 3.3L and 3.8L, because there are some important differences, depending on both the year and the application, but there are also a couple of mid-year changes that can really cause rebuilders some problems.

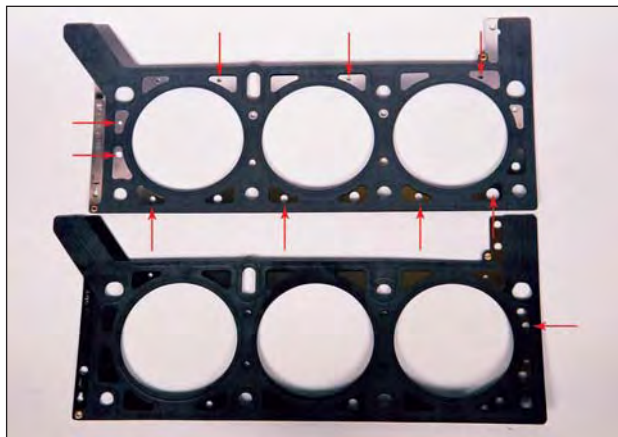
Chrysler made a mid-year change to the intake plenum in '02. The early '02 engines came with an aluminum intake and the later ones had the plastic intake that has been used ever since, so they switched from two fiber gaskets to six individual molded gaskets sometime in '02. That means you will have to supply both intake sets for your '02 motors to make sure the installer has the one he needs.

Likewise, Chrysler changed the rocker covers in mid-year '04. They switched from the stamped steel covers to the plastic ones that used a different gasket, so you will have to include both pairs of rocker gaskets for '04 applications. The plastic covers were still being used up through '09 and appear to be the same in '10.

The gasket for the oil filter adapter had three 8.0mm holes up through '06, but it has two 8.0mm holes and one 10mm hole beginning in '07 because the RWD motor mount is fastened to the back hole for the filter adapter with a 10mm bolt.



The rigid rocker gaskets for the stamped steel covers are on the bottom and the flexible ones for the plastic covers are on the top.



The RWD head gaskets (bottom) have fewer holes and some that are in different places than the ones on the FWD gaskets (top) because the coolant flow is reversed due to the change in the location of the water outlets.





The knock sensor was changed to an 8.0mm bolt-on design in '04 instead of the 10mm screw-in design that was used previously.

**Knock Sensors:** These engines used a screw-in knock sensor with a 10mm hole from '98-'03 (PN 4686362AB). It was replaced by the one that looks like a side-post battery cable in '04 that's still used up through '10 (PN 5033316AA). Selling a block with the wrong hole for the knock sensor can cause a problem because the wiring connectors are different, too, and the "conversion kit" that's available from Chrysler costs about \$100. Chrysler supposedly used a special stud that had 10mm threads on one end and 8.0mm on the other end to convert the early blocks for the late sensor, but we



Chrysler covers the EGR port with this plate and gasket when the vehicle comes without EGR.



The new tube for the center dipstick (bottom) replaced the one that was used for the front dipstick (top) up through '06. The inset photo is the fixture we made so we can drill both dipstick holes when converting a block.

## OTHER THINGS YOU NEED TO KNOW:

**EGR:** Chrysler has an EGR blockoff plate (PN 4591227) and gasket (PN 4663247AB) that can be installed on the heads or included with the engines that don't have EGR. The gasket for the blockoff plate isn't included in most gasket sets, so rebuilders will have to send it along with the plate for the engines without EGR.

**EGR Locations:** The EGR valve is on the front of the left head for the minivans and on the back of the right head for the Pacificas and Wranglers.

haven't been able to find a part number for it, so we're putting a Time Sert in the 10mm hole to convert an earlier block for a later application.

**Dipsticks:** All the '01-'06 blocks had a front dipstick and all the '07-'09 blocks used the center dipstick, so the 4666031AA blocks are drilled for the front dipstick and the 4666031AB blocks are usually (almost always) drilled for the center dipstick. Depending on the application, we convert some blocks by drilling both holes with a homemade fixture, plugging both of them, and telling the customer to remove the plug from the hole he needs for his application. If all else fails, and you get a late block out there that has the hole for the center dipstick instead of the one in the front, you can order a 4666148AB "oil indicator and tube assembly" from Chrysler to move the dipstick to the center hole.

## ALL WHEEL DRIVE

The 4666031AA/AB block can be used for the minivans with AWD by machining the third bolt boss from the front on the passenger side pan rail down flush with the block.

## FRONT COVERS

There have been seven front covers used on these engines since '01, depending on the year and the application. See the chart on page 45 for more information.

Note: The p/n 5137544AE cover supersedes all prior applications for the minivans, but it requires a special timing set (p/n 68001398AA) that has the narrow chain with the old style cam gear so it can be used on the '01 through '03 vehicles without NGC.

## NGC

All of the platforms, including the Pacifica and minivans, got "NGC" for the 3.3L and 3.8L beginning in '04, so the engines must be built with the corresponding timing set and front cover.

## CONCLUSION

So, that's the story. These engines have been around for a long time and have been used in a lot of high value cars, trucks and minivans, so we can expect to see quite a few of them for some time to come. They're easy to build if you pay attention to the details, so you should be able to make some money on them now that you know all the right combinations. **EB**



**Doug Anderson** is Manager of Technical Services for Grooms Engines, located in Nashville, TN. He has authored numerous technical articles on engine rebuilding for *Engine Builder* magazine for nearly 20 years. Anderson has also made many technical presentations on engine building at AERA and PERA conventions and seminars. To find Doug's other articles for *Engine Builder* magazine, visit our Web site at [www.enginebuildermag.com](http://www.enginebuildermag.com).



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