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REBUILDING THE CHRYSLER 2.4L

Chrysler replaced its old SOHC four cylinders with an all-new family of SOHC and DOHC engines in 1995. There were 2.0L SOHC and DOHC versions, along with a 2.4L DOHC that was installed in the FWD cars and minivans.

Over the years, this engine has been used in several other applications including the PT Cruiser, the RWD Liberty and Wrangler, and the SRT4 Neon. It has evolved over the years, too, so there are seven short blocks that use six block castings along with a couple of different cranks, rods, and pistons. Add seven different head castings that came with and without EGR and A.I.R. and throw in 14 different cams and you have a recipe for disaster, if you're not careful. So, let's take a look and see if we can make some sense out of all the changes Chrysler made from '95 up through '06, before the 2.4L engine was replaced by another all new family of "world class" four-cylinders.

BLOCKS

There are six distinctly different castings including four FWD blocks and two RWD blocks. And, the latest FWD block may or may not be machined for a turbo application.

1995-2000: The original casting was a 4621443 block that had a 4621445 bedplate. It was used up through 2000.

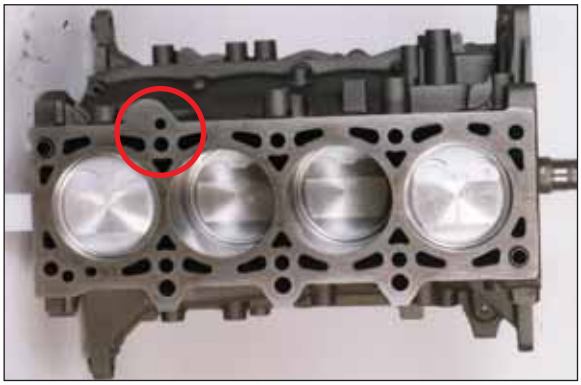
2001: The hole for the oil pressure sender on the passenger side was moved back about 6″ in 2001 so it was much closer to the bell housing. It's a 4621443AB casting.

2002: The oil drainback hole in the head was enlarged in '02 so there was another "bulge" added to the block on the driver's side, between the third and fourth cylinders. It's an all new casting that has 4781655AA on the driver's side.

2003-2006: There was another all new FWD block in '03 that incorporated several more changes, but the most noticeable one was the change in the location of the hole for the crank sensor; it was moved from the front of the block on the passenger side to the back of the block on the driver's side in order to accommodate the new, bolt-on "target ring" for the crank sensor.

There were some other changes made to accommodate the turbo motor, too, including a boss on the passenger side that can be drilled for the oil return from the turbo and an additional oil galley inside the block that's machined for the four "oil squirters" that are used to help cool the pistons on the turbo motors. Look for a 4781632AA/AB casting.

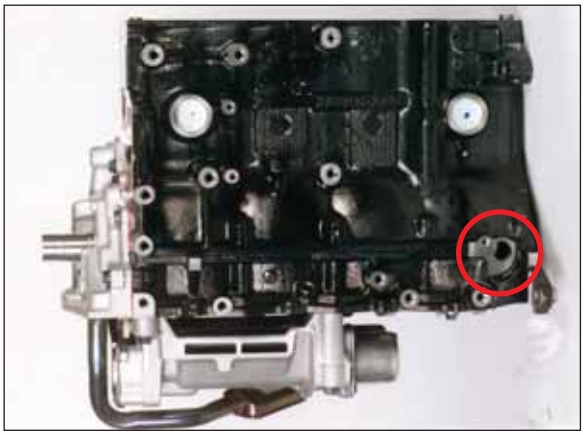
The hole for the oil sender on the passenger side was moved back about 6″ in 2001 so it's much closer to the bell housing.



The oil drainback hole in the head was enlarged in 2002, so the block had a pronounced bulge on the driver's side between the third and fourth cylinders.

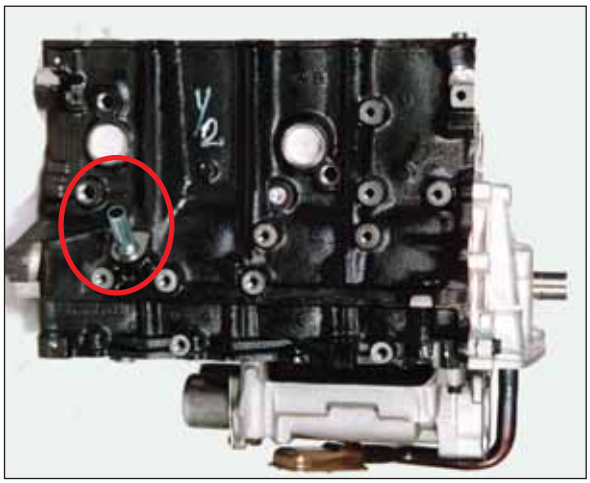
2003-2004 RWD: Chrysler installed the 2.4L motor in both the RWD Jeep Wrangler and Liberty beginning in 2003. The RWD block is a unique casting (53010502AA) that doesn't have the "ear" that sticks out from the front of the block down by the pan rail on the passenger side of the FWD blocks.

These blocks have "RWD" cast on the passenger side so they're easy to spot. The Catch-22 is that this block was used for both the Wrangler and Liberty in '03, but only for the Wrangler in '04 because the Wrangler platform continued to use the old style computer and crankshaft (without "NGC") through '04 even though the Liberty got the "NGC" computer along with a new block and crank in '04.

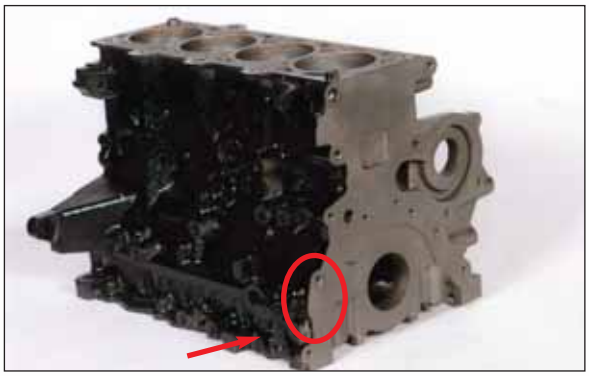


The "tone ring" was bolted to the back of the crank in '03 so the hole for the sensor was moved from the right front cover to the left rear corner of the block.

2004-2005 RWD: The RWD block was revised in 2004 to accommodate the bolt-on "target ring" with more notches that was used with the new "NGC" computer so the hole for the sensor was moved over to the driver's side and back toward the bell housing, just like it was on all the '03 cars. The revised 53010502AB casting was used for the Liberty in '04 and '05 and the Wrangler in '05 and '06.



The 2003-'06 PT/Turbo came with the same 4781632AA/AB block that was used for the naturally aspirated engines, but it had an extra tube on the passenger side for the oil drainback from the turbo.



The RWD blocks are unique because the "ear" in the front, down by the pan rail, is missing. The original RWD block had the crank sensor hole in the right front corner, just like the early FWD blocks.

CRANKS

There have been two cast cranks used in the 2.4L from beginning to end, one that has the sensor wheel machined directly on the second counterweight and one with a bolt-on "target ring."

The 4621916 casting was used from 1995 through 2002 for all the FWD applications and for some RWD applications in 2003 and 2004. It can be identified by the "sensor ring" with 18 windows that is machined right on the second counterweight. This crank was used for the platforms that came "without NGC," meaning they had the old style computer, so it was used for all the FWD applications until '03

The early crank (left) had the notches for the crank sensor machined into the second counterweight, while the later cranks had a "tone ring" that was bolted to the back counterweight.

when they were changed over to the "next generation controller" (with NGC). It was used for both the Liberty and the Wrangler in '03 and for the Wrangler in '04, because the RWD platforms weren't changed over to "NGC" until '04 and '05.

2003-2006: The 4781590AA crank has a "target ring" with 32 windows bolted on the back of the rear counterweight. This crank must be used with any platform that has "NGC" including all FWD applications beginning in 2003, the Liberty in '04 and the Wrangler in '05.

According to the parts book, Chrysler used a different crank for the early turbo motors, but both of the new turbo short blocks we bought while researching these engines had the 4781590AA casting, so Chrysler has apparently decided that the regular cast crank is strong enough for the turbo motors, too. However, there may be a turbo crank with a different casting number out there, so don't be surprised if you stumble on one in a core.

RODS

There have been only two rods used for the 2.4L engines, one that's made of powdered metal and one that's a steel forging.

All of the naturally aspirated engines came with a press-fit, powdered metal rod that measures 4.46″ from edge-to-edge between the big and little ends. These rods are easy to recognize because they don't have a balance pad on either end, but don't mix them up with the 2.0L rods that look the same, because they're too short for the 2.4L.

The press-fit rod (left) was used for the naturally aspirated engines and the forged rod was used for the turbo motors. Note that the pin bore on the turbo rod is bushed and the rod is drilled for a squirt hole.

The turbo motors all have a forged rod that's bushed for a full-floating pin. There isn't an actual forging number on it, but our sample had "m" and 23/151 on the cap. These rods also have oil squirt holes that spray oil on the walls to help "reduce piston noise at start up and improve scuff resistance."

PISTONS

The pistons for these engines are pretty straightforward. There are two versions for the naturally aspirated motors and there's one turbo piston. The original piston had a "dome" on it, but both of the later ones have a dome that's shaped more like a "ski ramp" on the crown. They all sit pretty low in the cylinder at TDC, but the turbo sits way down in the bore.

1995-2000: The original, naturally aspirated piston had a "dome" with a flat spot on it.

2001-2006: The original piston was modified slightly in '01. The dome was converted into more of a "ski-ramp" design without the flat spot on top. This

There have been three pistons used for the 2.4L. The original piston for the naturally aspirated engines on the left was replaced by the one in the middle in '01. The turbo piston on the right is considerably different.

All of the pistons sit unusually low in the cylinders at TDC.

added about 2cc to the crown so the compression ratio went up slightly.

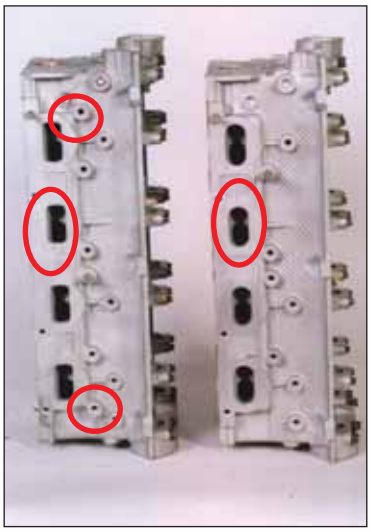
2003-2006 Turbo: All of the turbo motors have a coated, cast piston in them. According to the SAE paper on the turbo engine, Chrysler was satisfied that the cast piston would be adequate as long as they cooled it from the bottom with the "oil squirters." It has a full-floating pin, it's coated with Mahle's Grafal™ material and the upper ring groove is hard anodized to prevent microwelding of the top ring. It has an 8.0:1 compression ratio, so it sits way down in the hole at TDC. It has the "ski ramp" crown on top "because it contributes to improved WOT spark and idle stability," according to Chrysler.

HEADS

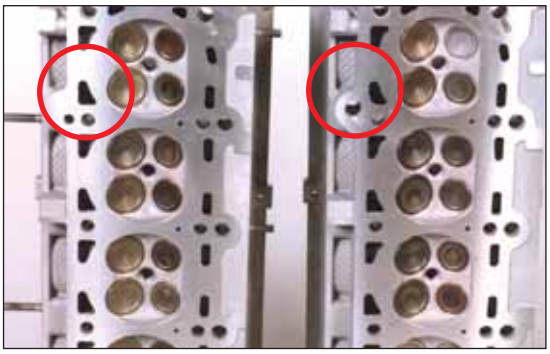
Chrysler has used several heads on the 2.4L along with some additional variations, depending on the application.

1995-2000: The first head that was used from '95 through '02 was a 4667086 casting, but we catalog the two different part numbers because of the cam change in '98.

2001: The original head was replaced by the 4667086AB casting in 2001. It had smaller exhaust valves, smaller, rectangular exhaust ports, two more bolts (10 total) for the exhaust manifold plus one more for the intake manifold and one more for the rocker cover. There was also a pronounced bulge added to the head on the driver's side, between the third and fourth chambers.



The original head (right) was replaced by the "AB" casting in '01. It had smaller, rectangular exhaust ports and two more bolt holes for the exhaust manifold.

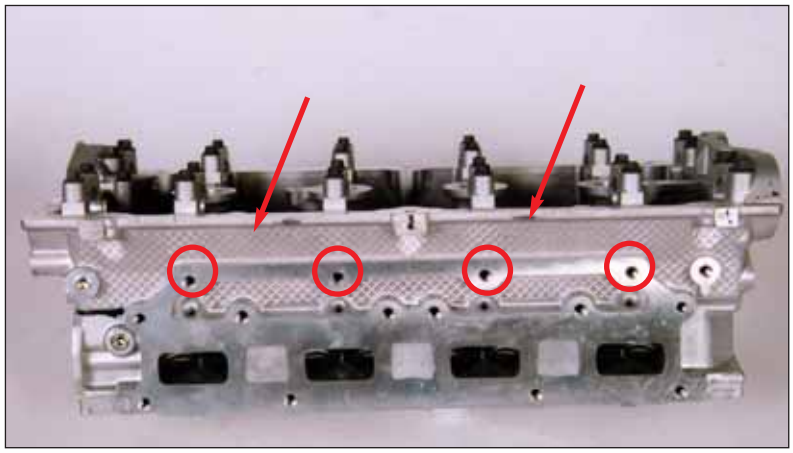


The oil drainback hole on the driver's side was enlarged in '02 (right), so the later heads can't be used on the early blocks that don't have the extra bulge.

2002: The oil return hole in the "bulge" on the driver's side was enlarged in 2002, so the casting number was revised again; it's a 4667086AC or AC-J now. All of the '02 cars and minivans with this head appear to have had EGR, so we drill the hole in all of them, but we include the Chrysler EGR block off plate (p/n 4591803AA) and gasket (p/n 4861535AA) along with the engine just in case there's an '02 application that came without EGR.

2003 w/o Turbo: None of the '03s had EGR, according to our research, so we use the 4667086AC-J castings without EGR for all '03 applications or build the engine with an EGR head and install the block off plate on it.

2003 w/ Turbo: The turbo engine was available in the SRT4 Neon and supposedly in the PT Cruiser according to the AAIA list of VIN codes, but there's nothing listed in the Chrysler parts book for a '03 PT Cruiser with a turbo, so we don't think it really exists. In either case, the turbo motors would have had the 4667086AC-J casting that came with special exhaust valves and no EGR in '03.



The AG-D casting replaced the AC-J casting in '04. Note the difference in the machined surface for the exhaust manifold and the provisions for the four holes over the ports for A.I.R.

2.4L CHRYSLER CASTING INFORMATION

Years	FWD	RWD	PT Turbo	Blocks	Cranks	Rods PM	Rods Forged	Heads	Comments
1995	X			4621443	4621916	X		4667086	
1996	X			4621443	4621916	X		4667086	
1997	X			4621443	4621916	X		4667086	
1998	X			4621443	4621916	X		4667086	
1999	X			4621443	4621916	X		4667086	
2000	X			4621443	4621916	X		4667086	
2001	X			4621443AB	4621916	X		4667086AB	Oil pressure sender moved
2002	X			4781655AA	4621916	X		4667086AC/AC-J	Oil drainback hole enlarged Smaller exhaust ports on head
2003	X			4781632AA/AB	4781590AA	X		4667086AC/AC-J	Crank sensor moved
2003		X		53010502AA	4621916	X		4667086AC/AC-J	RWD block for Wrangler & Liberty
2003			X	4781632AA/AB	4781590AA		X	4667086AC/AC-J	PT Turbo has oil drain hole for turbo and oil squirters for pistons
2004	X			4781632AA/AB	4781590AA	X		4667086AG-D	Except VIN J
2004	X			4781632AA/AB	4781590AA	X		4667086AG-D	VIN J with A.I.R.
2004		X		53010502AA	4621916	X		4667086AG-D	Wrangler
2004		X		53010502AB	4781590AA	X		4667086AG-D	Liberty. Crank sensor moved
2004			X	4781632AA/AB	4781590AA		X	4667086AG-D	PT Turbo
2005	X			4781632AA/AB	4781590AA	X		4667086AG-D	Except VIN J
2005	X			4781632AA/AB	4781590AA	X		4667086AG-D	VIN J with A.I.R.
2005		X		53010502AB	4781590AA	X		4667086AG-D	Wrangler & Liberty
2005			X	4781632AA/AB	4781590AA		X	4667086AG-D	PT Turbo
2006	X			4781632AA/AB	4781590AA	X		4667086AG-D	
2006		X		53010502AB	4781590AA	X		4667086AG-D	Wrangler
2006			X	4781632AA/AB	4781590AA		X	4667086AG-D	PT Turbo

2004-2006 w/o Turbo, with Federal Emissions: There was another new head introduced in ’04. It had a recessed area right above the exhaust manifold that created a plenum for the A.I.R. system that was used on the Stratus and Sebrings with “California emissions.” All of these castings had four cast bosses that could be drilled for A.I.R., but they weren’t drilled for the engines that came with “federal emissions.” Some of these heads were drilled for EGR and some weren’t, depending on the year and the application.

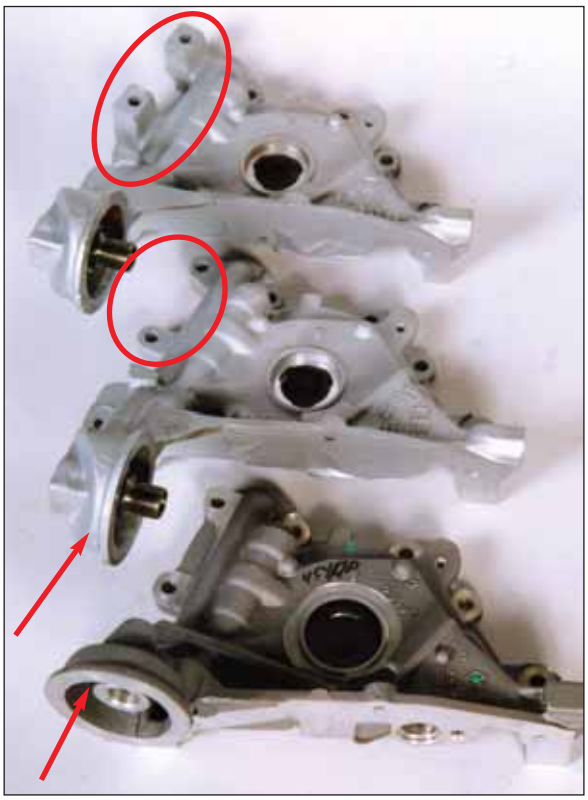
Our research says that the 2004-’06 Minivans and the 2005-’06 PT Cruisers, both with and without turbo, came with EGR and the rest didn’t, but I wouldn’t care to bet the farm on it, so we recommend drilling all of these heads for EGR and including the block off plate and gasket along with the engine in order to avoid any possible problems.

Chrysler has superceded the ’02 and ’03 heads with the later 4667086AG-D casting so it can be used backward, but there’s one extra bolt hole on the passenger’s side of the AG-D head that may or may not be used for some applications, so we don’t recommend installing the ’02 or ’03 heads on any of the later engines.

2004-2006 Turbo: The 4667086AG-D casting was used on the PT/Turbo from ’03 through ’06. The A.I.R. holes were never drilled for this application. We believe that the turbo motors came without EGR in ’04, but it appears that they had EGR in ’05 and ’06, so it’s best to drill them all for EGR and include the plate and gasket for the ones that came without EGR. Don’t forget that the turbo heads are unique because they have special exhaust valves.

2004-2006: The FWD Stratus/Sebring cars with VIN “J” and “California emissions” had the 4667086AG-D casting with

Chrysler has used several different oil pumps on the 2.4L, but they all fall into three separate families including FWD cars and minivans (top), the PT Cruiser (middle) and RWDs (bottom). They are all noticeably different.



The original FWD cars and minivans had a hydraulic tensioner, so they used the pump with the raised bolt pads (top). It was replaced by the one in the middle that was used with the mechanical tensioner and it was replaced by the one on the bottom that had the oil filter adapter parallel to the pan rail.

the four A.I.R. holes drilled. We were surprised to see that the new head we bought specifically for this application didn't have EGR, but we have to assume that these cars were built without EGR since the head came without the EGR hole.

OIL PUMPS

There have been six distinctly different oil pumps used on the 2.4L engines, depending on both the year and application.

The original oil pump for the PT Cruiser (left) was replaced by the turbo pump (right) that was used for all the PT Cruisers beginning in '03. It has a "T" cast on the front of it.

FWD Cars & Minivans (except PT Cruiser)

1995 through early 1996: The original oil pump was designed to be used with a hydraulic tensioner, so it had two raised pads with bolt holes in them. It was a 4663588 casting that was available as p/n 4663589, but it's been discontinued by Chrysler so you will have to rebuild the old pump, unless you can find one in the aftermarket.

Mid 1996 through 2000: Chrysler modified the oil pump when they switched to a mechanical tensioner in mid '96. It was a 4694306 casting that was sold under a 4694304 part number.

2001 through 2006: The FWD oil pump was changed again in 2001 when the angle of the mounting pad for the oil filter was changed. It was originally a 4781456AA casting, but the latest version is a 4781456AD casting that carries a 4781454AD part number.

FWD PT Cruiser

2001-2002: Chrysler had to modify the oil pump in order to fit the engine into the PT Cruiser, so the engineers left the oil filter off the pump and bolted it directly onto the aluminum oil pan. This pump used

The Wrangler (left) and Liberty (right) use different filter adapters that bolt onto the same oil pump.

The oil filter adapter was moved from the pump to the pan (right) so the 2.4L would fit in the PT Cruiser.

The 2.4L has used three different oil pans. There's one for the FWD cars and minivans (left), a special one for the PT Cruiser (middle) and another one for the RWD Jeeps (right).

the same gerotor gear set that was found in the FWD oil pump. It's a 4694401AB casting that's sold under part number 4777955AA/AB.

2003-2006: When Chrysler designed the turbo motor, the oil pump was upgraded to provide 25 percent more oil for the engine because of the turbo and the "oil squirters." This pump is part number 4884390AB, and it has "4390" cast on the inside of the pump housing. It's used for all the turbo and non-turbo engines in the PT Cruiser from '03 through '06.

RWD Liberty & Wrangler

2003-2006: The RWD Jeeps share another pump that's unique because the oil filter adapter bolts onto the pump housing. The adapter points toward the front if it's in a Wrangler and toward the back if it's in a Liberty. The pump is a part number 53010487AA and it has "0487" cast on the inside of the pump housing.

There have been several inner timing covers used on the 2.4L, but there are really only three different versions in use today. From left to right, there are FWD mechanical, FWD PT Cruiser and RWD covers.

The cover for the early FWD cars with the hydraulic tensioner (left) is considerably different that than the one for FWD cars with the mechanical tensioner.

PICKUP SCREENS

According to Chrysler, there are three pickup screens that cover everything.

- The 4792304 fits the FWD cars and minivans.
- The 4792304AC fits all the PT Cruisers.
- The 53010488AA fits all the RWD applications.

CAM SENSORS

There have been two cam sensors used on these engines, one for the FWD applications and one for RWD Jeeps.

- The FWD sensor bolts on the back of the intake cam. It's a round, plastic disc with a circular magnet inlaid in it. We don't supply it with the engine.
- The RWD motors have a stamped, metal "washer" that has a larger diameter half way around it so it can be read by the cam sensor that sticks through a hole in the front cover. It must be properly installed when the engine is assembled or it won't start when it's in the vehicle. The "tone-ring" for the cam sensor is available under p/n 53010549AA.

The cam sensor was located on the back of the intake cam for all the FWD cars and minivans (right), but it was sandwiched between the cam and the sprocket on all of the RWD applications (left).

The hydraulic tensioner (left) was replaced by a mechanical tensioner in mid 1996.

INNER FRONT COVERS

There have been several inner front covers, but it only takes four to cover everything, even if you include the one for the early engines with the hydraulic tensioner.

• The FWD cars and minivans used a 4621446 cover for the engines with the hydraulic tensioner.

• The FWD cars and minivans use a p/n 4781593AA that fits everything from '96 through '06 with a mechanical tensioner.

• The front cover for the PT Cruiser was slightly different than the one that was used for the other FWD applications up through 2002. It was a p/n 4694318AD. However, the latest parts book for the PT lists the same one that's used on all of the other FWD applications. Chrysler specifies a p/n 4781593AA inner cover along with the 4884409AA upper front cover for the PT Cruiser beginning in '03. The early cover for the PT Cruiser was slightly different, but we have always modified the FWD version to fit the PT by simply cutting a small amount off the top of the inner cover so outer cover would fit over it.

• The RWD Liberty and Wrangler have a unique cover that has the hole for the cam sensor. It's a 53010482AC.

TENSIONERS

There have been two tensioners for the timing belt, an early hydraulic version and the later mechanical one.

• The hydraulic tensioner (p/n 4621455) was used up to 1/1/96 on the minivans and 4/15/96 on the FWD cars. It's the same one that was used on the 2.0L engines.

• The mechanical tensioner (p/n 4781570AB) has been used for everything built after the dates listed above.

• There are several differences between the hydraulic and mechanical setups including the oil pump, front cover and tensioner. The oil pump for the engines with the hydraulic tensioner (p/n 4663589) is no longer available from Chrysler, but the tensioner (p/n 4621455) and the inner belt cover (p/n 4621446) are still available and so is the water pump.

BALANCERS

Chrysler deliberately designed the turbo motor with cast pistons and lightweight, forged rods so they could use the same balance housing and shafts on all of the 2.4L motors. However, the chain, chain guides and tensioner were all upgraded with better materials to "withstand the higher loads for this application" for the turbos.

CHRYSLER 2.4L CAM CHART
OEM PART NUMBERS & SUPERCESSIONS

INTAKE CAMS

'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
4621533	4777638AA	4694536AA	4694680AA	4694680AA	4694680AA	4694680AA 4781678AA	4781681AA	4781681AA	4781681AA	4781681AB

EXHAUST CAMS

'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
4621535	4777637AA	4694537AA	4694681AA	4694681AA	4781271AA	4781271AA 4781679AA	4781679AA	4781679AA	4781679AA 4781679AB	4781679AB

CAMS

There have been seven different intake cams and seven different exhaust cams used for these engines since ’95. The cam chart on page 10 spells it out in greater detail, but here’s a quick overview:

INTAKE CAMS:

• Chrysler superceded the ’96 intake cam up to the ’97 part number.

• They superceded the ’98 intake cams up to the ’02 part number.

• Then, there’s another intake cam used from ’03 through ’06.

EXHAUST CAMS:

•The ’96 exhaust cam was superceded to the ’97 part number.

•The ’98 exhaust cam was superceded up to the 2000 part number.

•The ’01 cam is superceded all the way up to 2006.

We’ve been a little more aggressive with our consolidations; we consolidate the ’96 and ’97 cams and use all the rest in pairs up through 2006. We haven’t turned the red light on yet, but… it may not work out in the long run, so let your conscience be your guide.

A FEW MORE COMMENTS

That pretty well tells the story of all the major pieces, but there are a few more things that are worth knowing, too.

• The bolt-on “target ring” for the crank is a part number 5114417AA.

• The turbo motors have special rods, pistons, rings and exhaust valves, along with a unique, stainless steel; MLS head gasket and a special water pump. They also have special rod bearings that have squirt holes and special thrust bearings “with contoured faces to provide higher load-carrying capacity.”.

• Chrysler changed the thrust bearing to an assembled design in ’05, but it appears that the earlier bearings can be used up through 2006.

• Chrysler has adapted a new numbering system for both casting numbers and part numbers. They add a suffix to the base number to indicate that there’s some kind of a change, so rebuilders will have to pay close attention the both the base number and the suffix from now on. Sometimes the change in the suffix indicates that it’s the same part from a different vendor, but most of the time it means that there’s a change in the casting or part number, so be careful.

The 2.4L cams look just like the 2.0L DOHC cams, but they can be easily identified by checking the location of the first lobe when the dowel pins are at 6:00. The first lobe on the 2.4L cam(left) is at 1:00, but it’s at 9:00 on the 2.0L. They’re not interchangeable.

• The Chrysler 2.4L was used in the Stratus/Sebring sedans and the Sebring convertible, but the Stratus/Sebring coupes have a 2.4L Mitsubishi engine in them because they’re built on a Mitsubishi platform. Don’t let your customer order the wrong engine.

CONCLUSION

So, that’s the overview of the 2.4L Chrysler motors. There have been lots of variations, but they all make sense when you see how the engine has evolved over time. The good news is that there are a bunch of them out there in cars, trucks and vans that are worth rebuilding. The bad news is that these engines are already history, because they’ve been replaced by a whole new family of engines designed and built by Chrysler, Mitsubishi and Hyundai that’s a real “world class” motor. Stay tuned. **EBTG**

Editor Bio

Doug Anderson is president of Grooms Engines, and has won both regional and national awards for technical articles on engine rebuilding. This article first appeared in the March, 2007 issue of *Engine Builder* **magazine.**

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