

GENERAL MOTORS

Revised Timing Chain Design For 2000-2003 GM 2.2L VIN D & F Engines

General Motors has developed a revised timing chain design for its 2000-2003 2.2L VIN D and F engines. The affected models include:

- 2000-2003 Saturn L-Series with 2.2L Engine VIN F - RPO L61).
- 2002-2003 Saturn VUE with 2.2L Engine (VIN D - RPO L61).
- 2003 Saturn ION Vehicles.

This change was implemented to

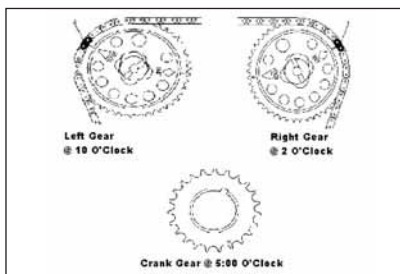


Figure 1 Revised timing chain index links for 2000-'03 2.2L GM engines are now two common links and one unique colored link.

improve oiling of the timing chain. With this revision, it's important to know about updated service procedures for the timing chain and timing chain oiling nozzle. All GM timing chain kits now include the updated oiler nozzle.

This new nozzle has higher flow rate characteristics that will increase oil flow to the timing chain under low rpm operating conditions. Whenever you are replacing a timing chain, it is important to install the new oiler nozzle.

Service manuals for the affected engines may have, in the past, explained that the timing chain index links were colored silver and copper. With the implementation of the newer design chain and oiler assembly, the index link colors have changed. In order to avoid confusion, the service procedure text has been modified and now refers to the index links as two common col-

ored links and one unique colored link (**Figure 1**, below).

Timing Component Positioning For 1994-2003 GM 2.2L VIN 4 Engines

The AERA Technical Committee explains that confusion regarding the correct positioning of the timing gear components on 1994-2003 GM 2.2L VIN 4 engines is not surprising. Engine builders say it's not always easy to locate "traditional" markings during installation and assembly.

The biggest area of concern is on the cam sprocket, say builders. GM's traditional method of marking has been a raised casting area to look like a "dot," as shown in **Figure 2**, right. However, depending on the manufacturer, there may not be a familiar "dot" near the outer "tooth area." Additionally, some service manuals published in the past have been unclear about any illustration showing markings and keyway locations for both crank and cam sprockets.

The components are correctly timed when they appear as shown in **Figure 2**. There are also two tabs on the timing chain tensioner to assist in aligning the marks properly.

Alternative Cam Bearing For 1993-2005 GM 3.1L & 3.4L VIN E, J, M & S Engines

An alternative cam bearing developed for block salvage repairs to 1993-2005 GM 3.1L and 3.4L VIN E, J, M and S engines is available. This alternative cam bearing set has been developed to use for block salvage repairs. The bearing inserts are .080" larger in outside diameter while maintaining the original inside bore diameter.

These engine blocks have been recognized for having common failures of the intermediate cam bearings rotating in the block. Over time this

action will damage the bore to a point that it must be machined oversized before it can be reused. After qualifying an affected block in all other areas for reuse, the block cam bores can be align bored .080". This is done similarly as main bores are oversized while maintaining the correct cam-to-crank centerline. The revised oversize cam bearings should be installed in the same manner as the standard replacement bearings are installed.



Figure 2 White line and dots mark correct timing for 1994-2003 GM 2.2L engines. Note cam dowel and crank keyway locations.

Many of these engines were originally equipped with "hollow tube" camshafts and in many instances some of these cams have broken into two pieces. This breakage may have been the end result of the cam bearings breaking up or moving. Many shops are replacing those cams with a conventional design solid billet cam that is available from the aftermarket.

AERA is aware of at least one engine parts supplier offering oversize OD camshaft bearings for these engines. These bearings are also slightly longer than the original bearing, which affords an increase in load support while ensuring all oil galley are also covered. This revised bearing design has been performing well in the field without subsequent bearing damage. Consult your engine parts supplier for availability of this revised bearing set (p/n CC431).

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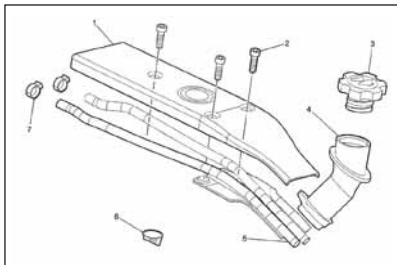


Figure 3 Crankcase ventilation (PCV) kit for 2003-'04 3.2L GM engines

Oil Leaking From Camshaft On 2003-2004 GM 3.2L VIN N Engines

The AERA Technical Committee offers the following information regarding an engine oil leak from the camshaft area of 2003-2004 GM 3.2L VIN N engines. This condition has

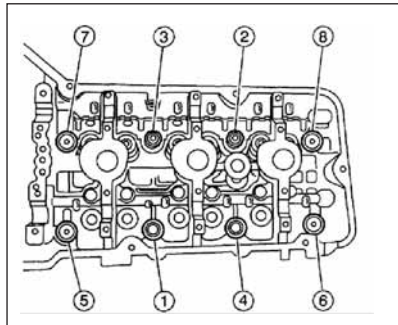


Figure 4 GM 3.5L cylinder head M11 bolt torque sequence

been most noticeable during extremely cold weather conditions and is most prevalent on the left side just below the oil fill hole in the cam/valve cover.

This condition may be due to the closed crankcase ventilation system

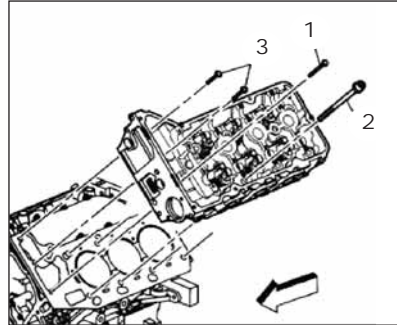


Figure 5 Cylinder head M6 (numbers 1 and 2) bolt locations on GM 3.5L

becoming blocked by ice. When the ventilation system is blocked, the crankcase vapors and engine oil will then vent through the cam/valve cover seals.

To repair this type of condition, GM now offers a revised Positive Crankcase Ventilation (PCV) hose kit and oil filler cap (**Figure 3**, above left). Installing the kit and cap will keep water from accumulating and freezing in the ventilation system. The PCV kit is available as p/n 55558592, and the oil filler cap is p/n 12589430.

To install the revised PCV kit, be aware of the following procedures. You'll need to:

- 1) Enlarge two drilled holes in the primary vent hose adapter.
- 2) Shorten two existing hoses.
- 3) Install a new secondary PCV vent hose adapter
- 4) Reseal the entire system.

Cylinder Head Installation For 1998-2003 GM 3.5L VIN H Engines

The AERA Technical Committee offers the following information regarding cylinder head installation for 1998-2003 GM 3.5L VIN H engines. This information should be referenced anytime the cylinder heads.

There are three different length bolts used to secure the

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cylinder head to the engine block for this engine. The M11 bolts should be replaced after only a single use. The other M6 bolts may be re-used, unless damage is evident. Follow the procedure listed below for correct bolt location and tightening sequence.

1) Align the cylinder head with the deck face locating pins (**Figure 4**, page 10, left side shown, right side similar).

2) Place the cylinder head in position on the deck face. Important: DO NOT reuse the old M11 cylinder head bolts.

3) Install new M11 cylinder head bolts and finger tighten (number 2 in **Figure 5**, page 10).

4) Install the M6 cylinder head bolts at the front of the cylinder head. Install the longer M6 cylinder head bolt (number 1 in **Figure 5**) in the outboard location as shown. Install the two shorter M6 cylinder head bolts (number 3 in **Figure 5**) in the locations shown.

5) Tighten the NEW M11 cylinder head bolts a first pass in sequence to 22 ft.lbs. (40 Nm).

6) Tighten the M11 cylinder head bolts a second pass in sequence an additional 60°.

7) Tighten the M11 cylinder head bolts a third pass in sequence an additional 60°.

8) Tighten the M11 cylinder head bolts a final pass in sequence an additional 80° (total step 6-8 equals 200°)

9) Tighten the long M6 cylinder head bolt (number 1 in **Figure 5**) to 106 in.lbs. (12 Nm).

10) Tighten the two shorter M6 cylinder head bolts (number 3 in **Figure 5**) to 106 in.lbs. (12 Nm).

Revised Valve Spring For 2004-2005 GM 3.5L VIN 6 Engines

Customer complaints about an occasional “check engine light” or engine noise from a 2004-2005 GM 3.5L VIN 6 engine may be cured by a revised valve spring, according to the AERA Technical Committee.

Some customers may comment on an occasional check engine light flashing. Additionally, they may comment about a light engine knocking or misfire noise during warm up or

Part Number	Description	Qty
12596078	Spring, Exhaust Valve	10
12596501	Seal, Exhaust Valve Stem	10
24100165	Gasket, Throttle Body	1
12565425	Bolt, Camshaft	1
24100263	Bolt, Camshaft Position Actuator	1
12586690	Gasket Kit, Intake Manifold	1

Chart 1 Revised valve spring for 2004-2005 GM 3.5L VIN 6 engines.

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Year	Engine RPO	Part #	Housing Style	Housing Gasket Type	Housing Gskt P/N	Seal P/N
1994	L27	24506986	2 - Bolt	Flange	25535214	25535126
	L67	24506986	2 - Bolt	Flange	25535214	25535126
1995	L27	24506986	2 - Bolt	Flange	25535214	25535126
	L36	24506986	2 - Bolt	Flange	24502433	25535126
	L67	24506986	2 - Bolt	Flange	25535214	25535126
1996	L36	24506986	2 - Bolt	Flange	24502433	25535126
	L67	24506986	2 - Bolt	Flange	24502433	25535126
1997	L36	24506986	2 - Bolt	Flange	24502433	25535126
	L67	24506986	2 - Bolt	Flange	24502433	25535126
1998	L36	24505924	2 - Bolt	Flange	24502433	25535126
	L67	24505924	2 - Bolt	Flange	24502433	25535126
1999	L36	24505924	2 - Bolt	Flange	On T-stat	25535126
	L67	24505924	2 - Bolt	Flange	On T-stat	25535126
2000	L36	24505924	2 - Bolt	Flange	On T-stat	25535126
	L67	24505924	2 - Bolt	Flange	On T-stat	25535126

Chart 2 GM 3.8L engine thermostats, housing, gasket or O-ring, and their respective part numbers.

on deceleration after the engine is fully warmed.

Upon investigation, the technician may find a misfire code P0300 through P0305 if the condition per-

sists long enough. To determine the cause of these codes, perform the diagnosis for the P0300 code as found in the appropriate section of the service information. If no concern is iso-

lated through the diagnosis tree, then replace all of the exhaust valve springs and seals.

The chart on page 10 (**Chart 1**), is a complete list of the revised parts required to make a successful repair. Aftermarket parts are currently unavailable for this revised valve spring.

Cooling System Caution For 1994-2000 GM 3.8L VIN 1, K & L Engines

The AERA Technical Committee offers the following information regarding a cooling system caution for 1994-2000 GM 3.8L VIN 1, K and L engines, specifically regarding proper thermostat use for these engines.

During the 1999 and 2000 model year production a design change occurred and that change affects service replacements of all previous year engines. Due to a change in the position of the pintle and a different shape of the upper thermostat assembly, the new design will not fit previous 90 degree V6 engines.

Refer to **Figure 6**, page 13, for identification of the current thermostat and the noticeable offset of the pintle position.

Parts are currently available from GMSP0. Use the table shown (**Chart 2**, above) to order the correct replace-

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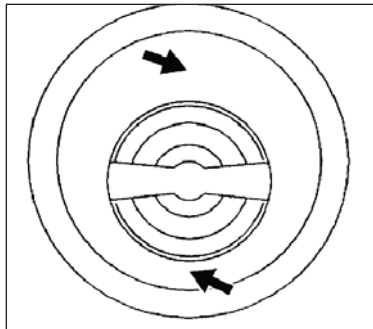


Figure 6 Offset thermostat pintle position on 1994-2000 3.8L GM engines.

ment thermostats. Aftermarket thermostats may or may not reflect this change.

The table for this bulletin contains: part numbers for the thermostats, the type of housing, whether it uses a gasket or O-ring, and their respective part numbers. The information is listed by year, then engine RPO code.

Cylinder Boring Caution For 1996-2002 GM 5.7L VIN R Engines

The AERA Technical Committee offers the following caution regarding cylinder boring with 1996-2002 GM 5.7L VIN R engines. These engines are the last version of the original small block series and are commonly called "Vortec" engines.

Cylinder bore distortion is prevalent in these blocks. Therefore, it is absolutely necessary to use a stress plate while boring/honing for oversize pistons. The pistons used for this engine feature a short skirt design and piston noise is likely if excessive clearance exists. In some cases engines that were bored/honed without a stress plate had notice-

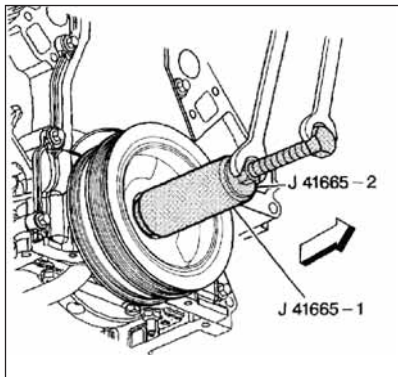


Figure 7 Installer tool J41665 will aid installation of balancer and sprocket.

able noise only during initial start-up. In other cases however, the noise quieted as the engine warmed, but it never completely disappeared.

As much as .003" out of round has

been reported when measuring bore size with and without stress plates installed. The exact amount of distortion in a cylinder wall thickness is not identical on all blocks.

To measure distortion on a particular block it is suggested to bolt and torque on both cylinder heads. Then, take measurements from the bottom side of the block and compare to the first measurements made before the heads were installed. Make sure to also torque the main bolts as well before measuring.

Crank Balancer Caution For 1997-2006 GM 4.8, 5.3, 5.7 & 6.0L Engines

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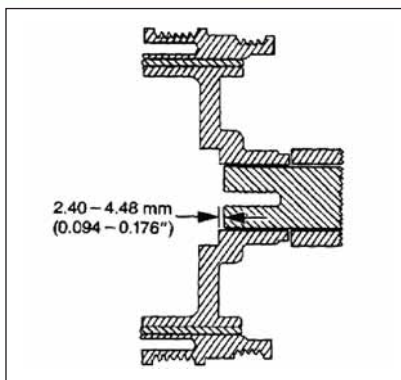


Figure 8 The nose of the crankshaft should be recessed .094"-.176"

offers the following information regarding the crankshaft balancer installation on 1997-2006 GM 4.8, 5.3, 5.7 and 6.0L engines.

The crankshaft balancer used for

these engines is balanced as an individual component. It is not necessary to mark the balancer prior to removal.

The crankshaft balancer installation involves a four stage tightening process. The first pass ensures that the balancer is installed completely onto the crankshaft. The second, third and fourth passes tighten the new bolt to the proper torque.

The used crankshaft balancer bolt will be used only during the first pass of the balancer installation procedure. Install a NEW crankshaft balancer bolt and tighten as described in the second, third and fourth passes of the balancer bolt tightening procedure.

Follow the steps listed here to properly install the crankshaft balancer on these engines. Obtaining a J41665 "Crankshaft Balancer and Sprocket Installer" tool will aid greatly in installation.

Important note: the balancer should be positioned onto the end of the crankshaft as straight as possible prior to tool installation.

1) Locate and begin to install the balancer onto the end of the crankshaft.

2) Using the J41665 install the balancer, assemble the threaded rod, nut, washer and installer. Insert the smaller end of the installer into the front of the balancer.

3) Use a wrench and hold the hex end of the threaded rod; use a second wrench and rotate the installation tool nut clockwise until the balancer is started onto crankshaft (**Figure 7**, page 13).

4) Remove the tool and reverse the installation tool. Position the larger end of the installer against the front of the balancer.

5) Use a wrench and hold the hex end of the threaded rod.

6) Use a second wrench and rotate the installation tool nut clockwise until the balancer is installed onto the crankshaft.

7) Remove the balancer installation tool.

8) Install the used crankshaft balancer bolt. Tighten the crankshaft balancer bolt to 240 ft.lbs. (330 Nm).

9) Remove the used crankshaft balancer bolt. Important: The nose of the crankshaft should be recessed .094"-.176" (2.4 - 4.48 mm) into the balancer bore as shown in **Figure 8** (page 13).

10) Measure for a correctly installed balancer. If the balancer is not installed to the proper dimensions, install the J41665 and repeat the installation procedure.

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11) Install the NEW crankshaft balancer bolt and tighten to 35 ft.lbs. (50 Nm).

12) Tighten the crankshaft balancer bolt a second pass to 140° using the a torque angle meter (J36660-A).

Cylinder Boring Caution For 1999-2006 GM 6.0L VIN U Engines

The AERA Technical Committee offers the following information regarding a cylinder boring caution for 1999-2006 GM 6.0L VIN U engines. These engines are the newest version of the small block series and have been commonly called Gen III engines.

Like the caution regarding GM's Vortec engines, it has been reported that cylinder bore distortion is prevalent in these blocks. As is the case with the 5.7L, it is extremely important to use a stress plate while boring/honing for oversize pistons. The pistons used for this engine are a short skirt design and piston noise is likely if excessive clearance exists.

As much as .002" out of round has been reported when measuring bore size with and without stress plates installed. Each block (and cylinder) may vary on the exact amount of distortion as cylinder wall thickness is not identical on all blocks.

To measure distortion on a particular block, it is suggested to measure and record bore sizes for all eight cylinders. Then, install a new head gasket along with the heads and torque the bolts in the following sequence (see **Figure 9**, page 14, for details).

1) Tighten the 11 mm bolts (1-10) in sequence to 22 ft.lbs.

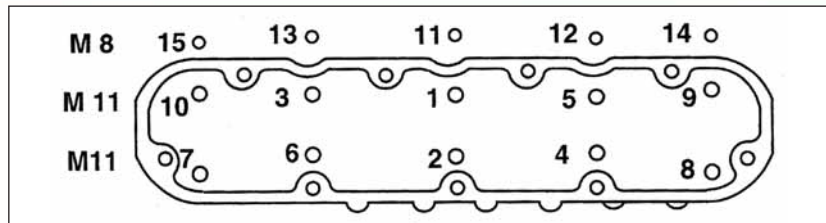


Figure 9 Torque the cylinder head bolts in the following sequence for 1999-'06 6.0L GM engines.

(30 Nm).

2) Rotate those bolts (1-10) in sequence an additional 90° turn using a torque angle meter.

3) Rotate only bolts 1-8 in sequence an additional 90° turn using a torque angle meter.

4) Rotate the remaining 11 mm bolts 9 & 10 in sequence an additional 50° turn using a torque angle meter.

5) Install the 8 mm bolt and tighten those bolts (11-15) in sequence to 22 ft.lbs. (30 Nm).

Then, flip the block over and take measurements from the bottom side of the block and compare to the first measurements made before the heads were installed. Make sure to also torque the main bolts as well before measuring. *TSG*

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