

## ZZ454/440 Engine (12498777) Specifications

Specifications Part Number 19172103

**This ZZ454/440 engine specification sheet should be used in conjunction with the 454 short block specification sheet, GM part number 19172101**

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This publication provides general information on components and procedures that may be useful when installing or servicing a ZZ454/440 engine. Please read this entire publication before starting work. Also, please verify that all of the components listed in the Package Contents section below were shipped in the kit.

The information below is divided into the following sections: package contents, engine fastener torque specifications, component information, start-up and break-in procedures, ZZ454/440 engine specifications, additional parts that you may need to purchase, and a service parts list.

The ZZ454/440 base engine is a fully assembled long block. This engine is assembled using brand new, premium quality components. The ZZ454/440 engine is manufactured on current production tooling; consequently you may encounter dissimilarities between the ZZ454/440 engine assembly and previous versions of the big block V8. In general, items such as motor mounts, accessory drives, exhaust manifolds, etc. can be transferred to a ZZ454/440 engine when installed in a vehicle originally equipped with a big block V8 engine. However, as noted in the following sections, there may be significant differences in the water pump, torsional damper, etc., between a ZZ454/440 engine and an older big block V8 engine. These differences may require modifications or additional components not included with the ZZ454/440 engine. When installing the ZZ454/440 engine in a vehicle not originally equipped with a big block V8, it may be necessary to adapt or fabricate various components for the cooling, fuel, electrical, and exhaust systems. Due to the wide variety of vehicles in which a ZZ454/440 engine can be installed, some procedures and recommendations may not apply to specific applications.

It is not the intent of these specifications to replace the comprehensive and detailed service practices explained in the GM service manuals.

For information about warranty coverage, please contact your local GM Performance Parts dealer.

Observe all safety precautions and warnings in the service manuals when installing a ZZ454/440 engine in any vehicle. Wear eye protection and appropriate protective clothing. Support the vehicle securely with jackstands when working under or around it. Use only the proper tools. Exercise extreme caution when working with flammable, corrosive, and hazardous liquids and materials. Some procedures require special equipment and skills. If you do not have the appropriate training, expertise, and tools to perform any part of this conversion safely, this work should be done by a professional.

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	16AP07	Initial Release - Rusty Sampsel	
	15JA08	Revised - Rusty Sampsel	

The information contained in this publication is presented without any warranty. All the risk for its use is entirely assumed by the user. Specific component design, mechanical procedures, and the qualifications of individual readers are beyond the control of the publisher, and therefore the publisher disclaims all liability incurred in connection with the use of the information provided in this publication.

**Legal and Emissions Information**

This publication is intended to provide information about the ZZ454/440 engine and related components. This manual also describes procedures and modifications that may be useful during the installation of a ZZ454/440 engine. It is not intended to replace the comprehensive service manuals and parts catalogs which cover General Motors engines and components. Rather, it is designed to provide supplemental information in areas of interest to do-it-yourself-enthusiasts and mechanics.

This publication pertains to engines and vehicles which are used off the public highways except where specifically noted otherwise. Federal law restricts the removal of any part of a federally required emission control system on motor vehicles. Further, many states have enacted laws which prohibit tampering with or modifying any required emission or noise control system. Vehicles which are not operated on public highways are generally exempt from most regulations, as are some special interest and pre-emission vehicles. The reader is strongly urged to check all applicable local and state laws.

Many of the parts described or listed in this manual are merchandised for off-highway application only, and are tagged with the %Special Parts Notice+reproduced here:

**Special Parts Notice**

This part has been specifically designed for Off-Highway application only. Since the installation of this part may either impair your vehicle's emission control performance or be uncertified under current Motor Vehicle Safety Standards, it should not be installed in a vehicle used on any street or highway. Additionally, any such application could adversely affect the warranty coverage of such an on-street or highway vehicle

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**Package contents:**

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Part Number</u>
1	Base Engine Assembly	1	12496963
2	Short Block Instructions	1	19172101
3	Long Block Instructions	1	19172103

**ZZ454/440 Engine Torque Specifications:**

Cylinder head bolt /screw .....	Long / Short Bolts
First pass .....	25/20 ft.-lbs. / 34/27 N·m
Second pass .....	50/40 ft.-lbs. / 68/54 N·m
Final pass .....	75/65 ft.-lbs. / 102/88 N·m
Distributor bolt/screw .....	18 ft.-lbs. / 25 N·m
Engine block oil gallery plug .....	15 ft.-lbs. / 20 N·m
Engine front cover bolt screw .....	106 in.-lbs. / 12 N·m
Flywheel bolt/screw .....	65 ft.-lbs. / 90 N·m
Intake manifold bolt/screw	
First pass .....	10 ft.-lbs. / 14 N·m
Second pass .....	25 ft.-lbs. / 34 N·m
Oil filter adapter bolt/screw .....	18 ft.-lbs. / 25 N·m
Oil level indicator tube bolt/screw .....	106 in.-lbs. / 12 N·m
Oil pan assembly bolt/screw .....	18 ft.-lbs. / 25 N·m
Oil baffle nut .....	30 ft.-lbs. / 40 N·m
Oil pan drain plug .....	15 ft.-lbs. / 20 N·m
Oil pump bolt/screw to rear crankshaft bearing cap .....	66 ft.-lbs. / 90 N·m
Oil pump cover bolt/screw .....	106 in.-lbs. / 12 N·m
Spark plug .....	22 ft.-lbs. / 30 N·m
Starter motor bolt/screw .....	35 ft.-lbs. / 48 N·m
Valve lifter guide retainer bolt/screw .....	18 ft.-lbs. / 25 N·m
Water pump bolt/screw .....	30 ft.-lbs. / 40 N·m

Note: These torque values are in addition to those documented within the short block instructions.

**Component Information:**

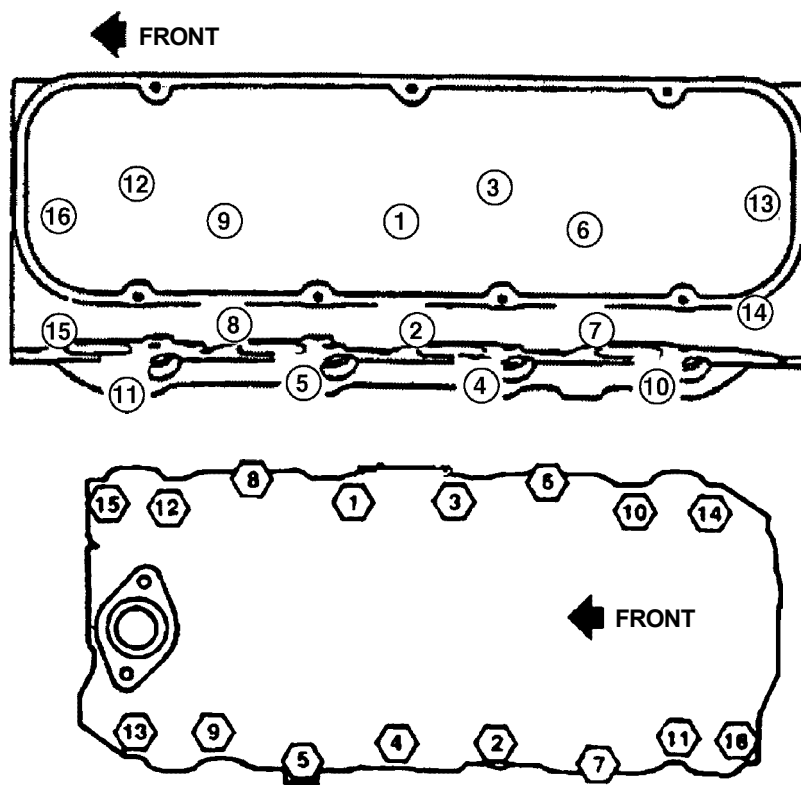
**Cylinder heads:**

The ZZ454/440 engine comes with fully assembled cylinder heads, GM Part Number 12363392. These cylinder heads are aluminum, oval port heads with 110cc combustion chambers, 2.19" stainless steel intake valves, and 1.88" stainless steel exhaust valves.

**Cylinder Head Installation:**

Installation is the same as for original equipment cylinder heads. Be sure to thoroughly clean the surface of the block and the surface of the cylinder head prior to installing. Apply liquid Teflon to all head bolts that protrude into coolant passages. Tighten the bolts alternately per the sequence and pattern shown below. Apply torque in 25 ft.lb. increments over two repetitions with the third repetition to the final tightening specification. A re-torque of the cylinder head bolts is recommended after heat cycling the engine.

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**Caution**

This engine assembly needs to be filled with oil and primed. You should add the specified oil (see start-up instructions) to your new engine. Check the engine oil level on the dipstick and add accordingly.

**Start-up and Break-in Procedures**

1. After installing the engine, ensure the crankcase has been filled with 5W30 motor oil (non-synthetic) to the recommended oil fill level on the dipstick. Also check and fill as required any other necessary fluids such as coolant, power steering fluid, etc.
2. The engine should be primed with oil prior to starting. Follow the instructions enclosed with the tool. To prime the engine, first remove the distributor to allow access to the oil pump drive shaft. Note the position of the distributor before removal. Install the oil priming tool, GM part number 12368084. Using a 1/2" drill motor, rotate the engine oil priming tool clockwise for three minutes. While you are priming the engine, have someone else rotate the crankshaft clockwise to supply oil throughout the engine and to all the bearing surfaces before the engine is initially started. This is the sure way to get oil to the bearings before you start the engine for the first time. Also, prime the engine if it sits for extended periods of time. Reinstall the distributor in the same orientation as it was removed.
3. Safety first. If the vehicle is on the ground, be sure the emergency brake is set, the wheels are chocked and the car cannot fall into gear. Verify everything is installed properly and nothing was missed.
4. Start the engine and adjust the initial timing. If using the HEI distributor P/N 93440806, set the ignition timing to 4° before top dead center (BTDC) at 650 rpm with the vacuum advance line to the distributor disconnected and plugged. This setting will produce 26° of total advance at wide-open throttle (WOT) when using the HEI distributor P/N 93440806. The HEI vacuum advance canister should remain disconnected. This engine is designed to operate using only the internal centrifugal advance to achieve the correct timing curve. Rotate the distributor counterclockwise to advance the timing. Rotate the distributor clockwise to retard the timing.

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5. When possible, you should always allow the engine to warm up prior to driving. It is a good practice to allow the oil sump and water temperature to reach 180°F before towing heavy loads or performing hard acceleration runs.
6. Once the engine is warm, Double check the total advance timing is 26° at 4000 RPM if using the HEI distributor P/N 93440806.
7. The engine should be driven at varying loads and conditions for the first 30 miles or one hour without wide open throttle (WOT) or sustained high RPM accelerations.
8. Run five or six medium throttle (50%) accelerations to about 4000 RPM and back to idle (0% throttle) in gear.
9. Run two or three hard throttle (WOT 100%) accelerations to about 4000 RPM and back to idle (0% throttle) in gear.
10. Change the oil and filter. Replace with 5W30 motor oil (not synthetic) and a PF1218 AC Delco oil filter. Inspect the oil and the oil filter for any foreign particles to ensure that the engine is functioning properly.
11. Drive the next 500 miles under normal conditions or 12 to 15 engine hours. Do not run the engine at its maximum rated engine speed. Also, do not expose the engine to extended periods of high load.
12. Change the oil and filter. Again, inspect the oil and oil filter for any foreign particles to ensure that the engine is functioning properly.
13. Do not use synthetic oil for break-in. It would be suitable to use synthetic motor oil after the second recommended oil change and mileage accumulation. In colder regions, a lower viscosity oil may be required for better flow characteristics.

**ZZ454/440 Engine Specifications:**

Compression .....9.6:1  
 Cylinder Head: .....Cast aluminum, oval port  
     Valve Diameter (Intake/Exhaust): .....2.19"/1.88"  
     Chamber Volume: ..... 110cc  
 Camshaft:.....Hydraulic roller tappet  
     Lift: .....510" intake, .540" exhaust  
     Duration: .....211( intake, 230( exhaust @ .050" tappet lift  
 Centerline: .....112( ATDC intake, 112( BTDC exhaust  
 Rocker Arm Ratio: .....1.7:1, stamped steel  
 Oil Pressure (Minimum): .....6 psig @ 1000 RPM  
     .....18 psig @ 2000 RPM  
     .....24 psig @ 4000 RPM  
 Recommended Oil: .....5w30 synthetic racing oil (after break-in)  
 Oil Filter: .....AC Delco part # - PF 1218  
 Valve Lash .....1/8 turn down from 0  
 Fuel: .....Premium unleaded - 92 (R+M/2)  
 Maximum Engine Speed: .....5500 RPM  
 Spark Plugs: .....AC Delco Rapidfire # 4  
 Spark Plug Gap .....040+  
 Firing Order: .....1-8-4-3-6-5-7-2

Information may vary with application. All specifications listed are based on the latest production information available at the time of printing.

**Additional parts that may be needed:**

**Flywheel / Flexplate:**

Like all big block V8 engines, the ZZ454/440 engine has 3.58" diameter flywheel flange bolt pattern. This engine comes equipped with a 14" diameter flexplate with a 168 tooth ring gear, GM Part Number 10185034. If your application requires a flywheel, GM Part Number 14096987, should be used. This flywheel is 14" diameter, 168 tooth ring gear, and is a for 11" diameter clutch. Use flywheel bolt GM Part Number 12337973 (6 required).

**Pilot Bearing:**

You must install a pilot bearing in the rear of the crankshaft if the engine will be used with a manual transmission. The pilot bearing aligns the transmission input shaft with the crankshaft centerline. A worn or misaligned pilot bearing can cause shifting problems and rapid clutch wear. A roller pilot bearing, GM Part Number 14061685, is recommended for this engine. This heavy-duty bearing adds an extra margin of reliability to a high performance drivetrain.

**Oil Pan:**

The ZZ454/440 engine includes oil pan, GM Part Number 10240721. This six-quart pan was originally designed for marine and truck usage and may cause interference problems when installed in certain applications. Check for clearance before installation of the engine. If the six-quart pan will not fit into your application, GM Part Number 12495360 is recommended as a substitute. This is a four-quart, right-hand dipstick oil pan, which comes with the gasket, four main cap bolts, oil pump screen, dipstick and tube.

**Headers:**

A ZZ454/440 engine should be equipped with a header exhaust system for maximum performance in applications where a non-production exhaust system is legal. For street performance and limited competition applications, the recommended header configuration is 2" diameter primary pipes, 36 inches long, with 3 1/2" diameter collectors. Use 3" diameter tailpipes with a balance tube (1/2" pipe) and low restriction mufflers.

**Rocker Covers:**

The ZZ454/440 engine comes equipped with die cast rocker covers, GM Part Numbers 12553666 and 12553667. Additional tall and short valve covers are available. Please see the website at [www.GMPerformanceparts.com](http://www.GMPerformanceparts.com) or your local GM Performance Parts dealer. When using either the cast aluminum or the tall, chrome rocker covers; ensure that enough clearance exists between the cover and the brake booster.

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**ZZ454/440 Service Parts List:**

<b>Part #</b>	<b>Quantity</b>	<b>Name</b>
6264902	1	Seal-Cr/Shf #5 Brg Cap Oil
10181306	1	Bearing-Cr/Shf Upr/Lwr #1
12529885	3	Bearing-Cr/Shf Upr/Lwr #2-3-4
10181307	1	Bearing-Cr/Shf Upr/Lwr Thrust
14096983	1	Crankshaft Asm
10101164	1	Seal Asm-Cr/Shf Rr Oil
14097040	1	Deflector Asm-Cr/Shf Oil
10216339	1	Balancer Asm-Cr/Shf
10114166	1	Key-Cr/Shf Bal
10126796	1	Bolt/Screw-Cr/Shf Bal
3864814	1	Washer-Cr/Shf Bal
10185034	1	Flywheel Asm
3727207	6	Bolt/Screw-Flywhl
10198922	8	Rod Asm-Conn
10215228	8	Piston Asm,Std (W/Pin)
14089095	8	Ring Kit, Pstn
10181277	16	Bearing-Conn Rod
10240721	1	Pan Asm-Oil
10106407	1	Gasket-Oil Pan
12555167	1	Pump Asm-Oil (W/Scrn)
3998289	1	Shaft-O/Pmp Drv
3764554	1	Retainer-O/Pmp Drv Shf
10105879	2	Pin-O/Pmp Loc
10230954	1	Cover Asm-Eng Frt (W/ Tmg Ind)
10191640	1	Seal Asm,Cr/Shf Frt Oil
10198910	1	Gasket,Eng Frt Cvr
12498778	1	454 Engine Asm, Partial
12363392	2	Head Asm,Cyl (Oval Port) W/Val
12363399	1	Cylinder Head
12366986	4	Intake Valves

<b>Part #</b>	<b>Quantity</b>	<b>Name</b>
12366988	8	Exhaust Valves
12495690	4	Valve Stem Seals
12462970	4	Outer/Inner Valve Spring
3947880	16	Valve Locks
3875916	8	Valve Spring Shim
3921912	8	Rocker Arm Stud
3860038	4	Guideplate
12555728	2	Gasket-Cyl Hd
88960334	8	Bolt/Screw,Cyl Hd (Short)
88960333	16	Bolt/Screw,Cyl Hd (Long)
12484890	1	Pump Asm-Wat
3860039	2	Gasket-W/Pmp
3860039	2	Gasket-W/Pmp
12363420	1	Manifold Pkg,Int*Q-Jet Base No
12366985	1	Gasket Pkg,Int Manif
24502611	1	Camshaft Asm
12560176	1	Sprocket-Cm/Shf
9424877	3	Bolt-Hex
12560177	1	Sprocket-Cr/Shf
10114177	1	Chain Asm-Tmg
10227762	8	Rod Asm-Vlv Push
10227763	8	Rod,Exh Vlv Push
17120061	16	Lifter Asm-Vlv
12551399	1	Retainer-Vlv Lifter
12562369	8	Guide-Vlv Lftr Push Rod
12553667	1	Cover Asm-Vlv Rkr Arm
12553666	1	Cover Asm-Vlv Rkr Arm
12368082	16	Arm Kit,Vlv Rkr(Qty 1)
10114123	16	Bolt/Screw-Vlv Rkr Arm Piv
19145286	1	Sparkplug

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